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For scientists, scientists, students, graduate students, representatives of business and public organizations and higher education institutions and a wide range of readers.

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Yevhen Mishenin, *D.Sc., Prof.,*
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An important function of the sustainable spatial forest management is to resolve conflicts through the use of facilitation methods that arise in the framework of socio-ecological and economic harmonisation of forestry and forestry production at different hierarchical levels of management (including public relations). Comprehensive solutions are also required for the processes of providing ecosystem services by forestry to enterprises (in particular, agriculture, water, recreation), when the value of the ecological and economic effect is not fully assessed and is not clearly covered by the system of economic market relations. Disclosure of the features and application of methods and mechanisms of ecological and economic facilitation for resolving conflict situations in forestry requires defining the general provisions, essential and substantive basis of this concept.

Socio-ecological and economic facilitation is a component of socio-psychological methods in the implementation of sustainable spatial development management of forestry. *Facilitation of the forestry and ecological direction* can be interpreted as a management process within the framework of environmentally oriented forest management, which helps forestry workers to carry out the processes of rational integrated multipurpose use and reproduction of forest resources in a more coordinated and responsible manner, as well as to minimise the emerging ecological, economic and socio-ecological contradictions with different forest users.

The main functions of environmentally oriented facilitation in the field of forestry are as follows:

1. Facilitating the resolution of forest and ecological, ecological and economic, and socio-ecological conflicts at different hierarchical levels of sustainable spatial forest management.
2. Support and strengthening of socio-ecological and economic processes in the harmonisation of production and management relations in the forestry.
3. Professional organisation of labour processes in the direction of their ecologisation at different stages of reproduction processes.
4. Dissemination of positive experience for sustainable ecologically balanced forest management.

Forestry and environmental facilitation should address the following objectives:

1. What forestry, ecological, economic and socio-ecological objectives are to be achieved.

2. Which units and employees, representatives of external forest users and public stakeholders should be involved in the process of resolving problematic and conflict situations regarding the sustainable spatial use of the resource and environmental potential of forests.

3. How should the process of solving problematic ecological, economic and socio-ecological situations in forestry develop?

4. What specific results should be achieved in solving the agreed tasks (e.g., regulation of clear-cutting and reforestation of unproductive agricultural lands, etc.).

5. What should be the model of communication with stakeholders with the necessary information, analytical and resource support, as well as the level of awareness of employees and various stakeholders in solving environmental and economic problems of natural resources management?

Thus, the facilitator contributes to the implementation of environmental and economic objectives of forest management within the competence of stakeholders (internal and external). In other words, the facilitator provides procedures and a format for activities that allow a group of participants and stakeholders to accumulate shared knowledge about how to address the environmental and economic challenges of sustainable forest management, structure it. And then they make informed choices about courses of action that are supported by compatible and agreed decisions and commitments to each other.

The components of the facilitation mechanism as a separate element of integrated management of sustainable and ecosystem-based forestry are: audit of forestry, ecological, economic and socio-ecological problem (conflict) situations of forest management; formation of a system of ecological and economic knowledge management in accordance with professional competence, qualification level of specialists and stakeholders; assistance in resolving and correcting identified inconsistencies with the existing requirements of sustainable spatial forest management; dissemination and extension of effective environmental, economic and rational management solutions to other interconnected units of the forestry enterprise and forestry districts (implementation of voluntary forest certification mechanisms).

Thus, ecologically oriented facilitation in forestry should become an effective method, a mechanism for solving socio-ecological and economic problems of nature management for sustainable spatial development of forestry.

ENVIRONMENTAL TAXATION IN THE SYSTEM OF SOCIO-ECOLOGICAL AND ECONOMIC SECURITY

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Environmental taxes are an effective organisational and economic mechanism for compensating and preventing economic losses caused by pollution and ecologically destructive state of natural resources at different spatial levels of governance (global, national, regional, local) and thus ensure the achievement of national (socio-ecological and economic) security parameters.

It is important to emphasise that revenues due to environmental taxation should provide funding for environmental protection measures and correspond to the amount of environmental and economic damage caused by environmental pollution. This is also indicative of the non-tax nature of environmental taxes, as non-tax payments are characterised by their compensatory nature.

Thus, the environmental tax, by its economic nature, is a compensation for environmental and economic losses caused by environmental pollution. Environmental payments are levied on natural resource users as part of their social, environmental and economic responsibility for pollution. The main target function of environmental taxes for pollution is to compensate the state for legitimate environmental damage, accumulate funds for territorial and spatial environmental protection measures, and stimulate environmental protection activities of natural resources' users [1].

Implementation of the environmental taxation system in Ukraine and improvement of the efficiency of the target functions of environmental taxes require its development in the form of transformation, modernisation and other aspects.

The further introduction of eco-taxes requires the identification of budgetary and time constraints as key parameters in the field of tax regulation of environmental quality and the efficiency of natural capital use on an entrepreneurial and innovative basis.

The formation of a system of budgetary and time constraints for the introduction of environmental taxes in the format of maximising national security should be carried out in the context of a comprehensive socio-ecological and economic policy (economic, energy, social, and environmental).

The main principles of ensuring socio-environmental and economic security in the context of formation and regulation of the environmental taxation system can be presented as follows:

1. Identification of environmental safety as a priority component of national security in the context of gradual practical implementation of sustainable development principles.

2. Recognition of environmental security as an important component of the overall state policy at different hierarchical levels of governance (national, regional, and local).

3. Formation of a system of indicators and target parameters that ensure the necessary objectivity of environmental safety assessment in the sustainable development.

4. Creation of efficient functional subsystems of support (legislative and legal, financial, personnel, information) in the system of achieving socio-ecological and economic security and functioning of the environmental taxation mechanism.

5. Ensuring effective sustainable management in the national security system due to tax regulation.

6. Gradual achievement of full compensation for economic losses from ecologically destructive environmental impact based on the mechanism of environmental taxation and social responsibility.

7. Implementation of a regulatory framework for environmental restrictions on environmentally destructive economic activities of national security entities.

8. Ensuring an increase in the level of national (economic, social, environmental, energy security) and efficiency of environmental taxation by introducing a comprehensive system of relevant control, including environmental and economic.

The strategic guidelines of the state environmental regulation for environmental taxes in the format of an organisational and economic mechanism for ensuring their effectiveness require their certain assessment in relation to macroeconomic indicators of sustainable spatial nature management and socio-ecological and economic parameters of national security. It is also necessary to take into account the significant impact of the shadow economy on threats to environmental security, which necessitates a hypothetical assessment of shadow "failures" in the system of state environmental regulation of spatial nature management.

Ultimately, environmental regulation mechanisms should be aimed at enhancing the incentive role of environmental taxation and thus ensure a more complete implementation of the necessary environmental protection measures.

The comprehensive mechanism of state regulation of environmental taxation is a holistic and balanced set of organisational and economic forms implemented in the form of sub-mechanisms, tools and technologies that organise, regulate and coordinate the processes of environmental taxation implementation in the context of practical implementation of the principles of sustainable development and national economic security.

The main tasks of the mechanism of state regulation of environmental taxation in terms of ensuring national security are as follows:

1. Ensuring national security (including economic, environmental and energy security) on the basis of environmentally sustainable development by regulating the system of relations between taxpayers and the state.

2. Ensuring effective implementation of the target functions of environmental taxation.

3. Establishment and legal regulation, collection of environmental taxes.

4. Formation of the necessary budgetary environmental funds for the greening of business management on an entrepreneurial basis at different hierarchical levels of spatial development (national, regional, local) in the context of ensuring national security.

Strategic guidelines for the implementation of the regulatory and incentive functions of environmental taxes in the system of ensuring national socio-ecological and economic security should address the following issues:

- creation of optimal economic conditions for further development of civilised market relations in the system of balanced spatial nature management in accordance with the European experience of introduction and functioning of the environmental taxation system;
- stimulating the greening of production in various sectors of the economy and the integrated, rational use of natural resources (natural and environmental capital);
- expanding investment opportunities for territorial communities in the field of balanced socio-economic development in the context of ensuring national economic security;
- preventing eco-destructive impact on the environment and natural resource potential.

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ANALYSIS OF THE IT OUTSOURCING MARKET: TRENDS AND FORECASTS

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The development of the IT outsourcing market is significant for the country's economy, as it contributes to the creation of highly qualified jobs, stimulates the growth of the export of intellectual services and attracts foreign investments. IT outsourcing increases the competitiveness of the national economy on the global market and promotes innovation and technological progress. This helps to strengthen economic stability, reduce dependence on traditional industries and promote the development of modern infrastructure and educational programs. As a result, IT outsourcing not only brings direct financial benefits but also contributes to the comprehensive development of the economy, increasing its stability and dynamism.

The global IT outsourcing sector has emerged as one of the most rapidly expanding areas within the global business landscape. This dynamic market is constantly evolving to address challenges such as the Covid-19 pandemic, climate change, and global political and economic shifts, among other issues that organizations face. Projections indicate that the worldwide outsourcing market will grow at a robust compound annual growth rate (CAGR) of 8.5%, anticipated to reach $620 billion by 2032, with the United States maintaining the largest market share at 60% [1; 2].

More and more companies today choose to outsource IT services for several reasons, the most common being cost reduction, access to top talent pools, increased efficiency, enhanced competitive advantage, and improved focus on core business processes. Businesses strive to keep up with the latest outsourcing trends for faster onboarding, better resource management, and overall performance optimization. In 2022, the main outsourcing trends include:

- The rise of cloud computing: Cloud services, known for their flexibility and scalability, have significantly streamlined the outsourcing process. These services are consistently accessible online, facilitating continuous information sharing. According to Gartner, cloud spending is expected to reach $597.3 billion in 2023, up from $491 billion in 2022, with further growth anticipated [3].

- Remote work and global outsourcing: Outsourcing allows companies to hire top talent globally, while advanced technology and cloud infrastructure ensure seamless workflows from anywhere. This model offers high flexibility, access to a vast pool of specialists, and eliminates geographical boundaries, remaining a key global trend in 2023 [3].

- AI technology and Robotic Process Automation (RPA): RPA enables outsourcing companies to automate processes and manage robots for repetitive tasks, reserving critical tasks for human interaction. This approach saves money

while boosting productivity, efficiency, accuracy, and security. The use of RPA in business is expected to remain a significant trend in the future.

- Robust cyber security: Securing data is a top priority in outsourcing, with data being the most valuable asset. Most outsourcing companies implement multi-level security measures like multi-factor authentication and adhere strictly to GDPR standards to prevent breaches, making robust cybersecurity both a trend and a necessity.

- Strategic partnerships: The outsourcing industry has increasingly focused on forming strategic partnerships with companies, prioritizing growth over mere cost-cutting and emphasizing the importance of skills. In 2022, outsourcing firms have started building global teams to ensure seamless and agile collaboration. This approach to cooperation is expected to gain more traction in the near future.

In the era of global digitalization, developed technologies, and software, almost all industries resort to outsourcing to perform some projects. Access to a vast pool of specialists worldwide and abilities for short-term and long-term collaboration keep attracting more and more businesses, leading to the rapid growth and development of the IT outsourcing industry.

Academic Supervisor: *PhD, Assoc. Prof. Bohdan Kovalov, Sumy State University.*

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A CITATION AND PUBLICATION PERFORMANCE ANALYSIS ON INNOVATION, BUSINESS AND DIGITALISATION

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In today's digitised environment, innovation is critical for business administration, allowing companies to remain competitive and efficient. Using the latest technologies, such as artificial intelligence, big data, blockchain and automation, helps optimize business processes, improve the customer experience and reduce costs. In addition, innovative approaches allow us to adapt more quickly to changes in the market, respond to new challenges and open new growth opportunities. Thus, introducing innovations becomes necessary for the successful development and long-term survival of business in the era of digital transformations.

A bibliometric analysis was conducted to analyse a state of the art of the "Innovation, business and digitalisation" thematic domain in 2013-2022. It was established that publication activity on the researched topic has been increasing rapidly since 2019, possibly related to COVID-19 and its impact on business.

Analysis of outputs in top citation percentiles indicated that a share of publications in the top 1% most cited varies from its minimum of 5.3% in 2018 to its maximum of 39.1% in 2019. Moreover, 118% of 342 publications, which is 34.5%, have belonged to the top 10% of most cited publications worldwide.

Citation count analysis indicated a rapid increase of citations in 2019-2021 to 4 026, 4 104, and 4 487, respectively. The average value is 48.5 for the entire period. The lowest value of citations per publication is observed in 2017 and 2022, with values of 20.4 and 20.6, respectively.

The top 5 publications in Innovation, Business and Digitalization were analysed by number of citations in 2013–2022. The journal article of Verhoef et al. (2021) titled "Digital Transformation: A Multidisciplinary Reflection and Research Agenda" has the highest number of citations and the highest Field-Weighted Citation Impact, which equal 1 608 and 72.32, respectively. The research "Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal" by Warner and Wager (2019) is the second most cited publication with 1 140 citations and 43.19 of Field-Weighted Citation Impact. The article "Digitalization and its influence on business model innovation" authored by Rachinger et al. (2019) is the third most cited research with 533 citations and 19.58 of Field-Weighted Citation Impact. The publication titled "Digital servitization business models in ecosystems: A theory of the firm." by Kohtamäki et al. (2019) is the fourth most cited article with 508 citations and 15.08 of Field-Weighted Citation Impact. Finally, the fifth most cited article is "The relationship between digitalization and servitization: The role of servitization in capturing the financial potential of digitalization" by Kohtamäki et al. (2020), which has 347 citations and 22.32 of Field-Weighted Citation Impact.

After an analysis of journal quartiles in 2013-2022 by year, it was established that the number of Q1 publications has increased significantly from five items in 2018 to 67 items in 2022.

It was analysed the top 10 most cited authors, Top 10 most cited institutions, Top 10 most cited countries and Top 10 most cited Scopus academic journals. Representatives from Sweden, the United States, the United Kingdom, the Netherlands and Germany appeared in the Top–3 of each ranking. Journal of Business Research (Elsevier, United States) is the 1st most cited source with 2 915 citations of 12 publications. However, the journal has a medium value of Views Count and Field–Weighted Citation Impact, which equal 8 016 and 10.98, respectively.

It was found that between 2013 and 2022, publications in Innovation, Business and Digitalization have contributed to 99 topic clusters. The main three are "Industry; Information Technology, Business Model", "Supply Chain Management; Industry; Airline", and "Industry 4.0; Digital Twin, Internet of Things".

It identified the top 10 subject areas to which publications contributed. The second largest area is "Economics, Econometrics and Finance", which counts 304 authors, 101 publications (29.5%) and 3 490 citations.

It identified the top 50 keywords by relevance and appearance in 2013–2022. The top 10 most popular keywords are Digitalization, Business Model, Industry, Digital Transformation, Digital Innovation, Value Creation, SME, Innovation Management, and Business Model Innovation.

Academic Supervisor: *PhD, Assoc. Prof. Bohdan Kovalov, Sumy State University*.

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THE IMPACT OF DEMOCRACY ON SUSTAINABLE DEVELOPMENT: A CASE OF THE EU

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Democracy provides opportunities for citizens to participate in decision-making processes related to sustainable development. Through voting, public consultations, and participation in civil society organizations, citizens can voice their concerns, advocate for environmental protection, and influence policy decisions that promote sustainability.

Democratic systems emphasize transparency and accountability, which are crucial for sustainable development. Democratic institutions, such as independent judiciaries and media, can help expose corruption, ensure compliance with environmental regulations, and hold governments and businesses accountable for their actions [1, 4]. This transparency helps prevent environmental degradation and promotes responsible resource management.

Such kind of a political regime often engage in long-term planning and policy formulation, taking into account the needs of current and future generations. Sustainable development requires strategic thinking and the consideration of environmental, social, and economic factors [2]. In a democratic system, different stakeholders can engage in open debates, leading to more inclusive and well-informed decision-making processes that prioritize sustainable practices.

Democracy promotes the protection of human rights, including environmental rights. People living in democracies have the freedom to express their concerns about environmental issues and seek remedies through legal channels. Strong human rights protections also ensure that marginalized communities are not disproportionately affected by unsustainable development practices.

Democratic societies often foster innovation and knowledge sharing, which are essential for sustainable development. Freedom of expression, academic freedom, and access to information facilitate the exchange of ideas and the development of sustainable technologies, practices, and policies [3]. Additionally, democratic societies are more likely to invest in research and development, promoting scientific advancements in environmental conservation and renewable energy.

While democracy generally has a positive impact on sustainable development, there are also potential negative impacts that can arise in certain situations. In democratic systems, politicians may prioritize short-term gains and popular policies to secure electoral support. This can lead to neglect of long-term sustainable development goals, as politicians focus on immediate economic benefits or appeasing certain interest groups. For example, governments may

prioritize projects that have short-term economic benefits but have negative environmental consequences in the long run.

Democratic systems often involve a multiplicity of stakeholders with diverse interests and viewpoints [1]. This can lead to policy gridlock and instability, making it difficult to implement coherent and consistent sustainable development policies. Frequent changes in government or political party shifts can disrupt long-term planning and hinder the implementation of sustainable policies.

This political regime places importance on public opinion and majority rule. In some instances, public opinion may be resistant to necessary changes or reforms that are crucial for sustainable development [2]. For example, there may be resistance to environmental regulations or policies that require significant economic adjustments, particularly if they are perceived as negatively impacting jobs or economic growth.

It is important to note that these negative impacts are not inherent to democracy itself but can arise due to specific circumstances, systemic issues, or failures in governance. Overcoming these challenges requires strengthening democratic institutions, fostering citizen engagement, promoting long-term thinking, and addressing socioeconomic inequalities to ensure that sustainable development remains a priority.

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FINANCIAL AND INNOVATION PERFORMANCE OF THE COMPANIES IN THE CONTEXT OF GREEN DEAL TARGETS

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The paper evaluates relationships between the financial, innovation, and environmental performance of the North American companies. We seek to reveal, how companies' performance is reflecting potential implementation of emissions reduction and climate targets. Systematization of scientific literature, selection of input and output variables based on the previous research results, statistical analysis and regression models as the main research methods are applied to achieve the research target. The analysis results provide insights that companies financial and innovation driven performance in North American region analyzed significantly concur with the implementation of climate targets. Both financial and innovation indicators of companies have a significant influence on environmental performance. Return on assets and leverage as financial performance indicators significantly interacts with carbon dioxide emissions as an indicator of climate targets. Research and experimental development expenditure as an indicator of innovation performance has a significant relationship on emission reduction targets as well.

Companies' financial performance can significantly impact environmental performance, as profit distribution enables the creation of innovation that reduce environmental pollution, and capital allocation increases innovation development possibilities [1, 2, 9]. Positive financial performance results directed to the expenditures of research and experimental development can create a stronger effect in reducing environmental pollution. In general, sustainable growth in the world cannot be achieved without spending on research and development and innovation activities [3, 4]. But also, companies that invest in environmental issues suffer from increased operating costs [5]. Therefore both - the financial and innovation performance of companies are examined in this research. Financial and innovation indicators are independent variables (see Table 1) that can influence environmental performance (dependent variable) [6, 7]. Environmental performance is the dependent variable that reveals the carbon emissions of companies and is calculated as CO_2 equivalent direct emissions (Scope 1) divided by market capitalization multiplied by 1000 [6].

Table 1. Description of the independent variables [6]

Part of performance	Name of ratio	Abbreviation	Formula
Financial performance	Company size	Size	ln(assets)
	Leverage	Leverage	((long-term debt + short-term debt)/assets)
	Tobin q	Tobinq	((assets + (market capitalization * 1000) – common equity))/assets
	Return on Assets	ROA	(net income/assets)
Innovation performance	Research and development (R&D) expenditures	R&D	R&D expenditures/assets
Multiplication of financial and innovation performance	Multiplication of R&D expenditures and net profitability	R&D& Profitability	R&D expenditures*(net income/net sales)

Following the constructed methodology, research sample is based on data collected from North America (USA and Canada) are provided in Tables 2, 3. Based on the developed regression models, a comparative analysis was performed. The analysis results from American region are presented in terms of descriptive statistics and regression models presenting. Based on the obtained results, the variables influencing the environmental performance of companies' financial and innovation performance are discussed.

In total, we collected 5,895 observations from companies in the North America region (Canada – 1035; USA – 4860). The data sample was for the same period: 2008 - 2019 (all in 12 years). Data was collected from these databases (Bloomberg, Orbis and Thomson Reuters). Statistical descriptions of the North America region are presented in Table 2.

Table 2. Statistical description of companies from American region

Variable	N	Mean	p50	SD	Min	Max
Size	5895	15.94272	15.9177	1.326244	9.375516	18.3
Leverage	5895	.2892479	.2711417	.177494	0	1.21
TOBINQ	5895	1.995926	1.604686	1.290115	.5617709	10.9
ROA	5895	.0827331	.0807809	.1009821	-1.148215	.395
R&D	5895	.0244217	.0019239	.0467759	0	.589
R&D& profitability	5895	.0010738	0	.0346025	-1.392053	.150
Environmental performance	5895	.2459101	.0134367	.7097484	.0000219	4.97

The results of the OLS regression models from the American region are provided in Table 3. Return on assets (ROA) of companies have a significant impact on environmental performance (negative relationship). Research and development (R&D) expenditures significantly influences the environmental performance (negative relationship). Leverage, as an indicator of a company's financial performance, has a significant influence on environmental performance (positive relationship).

Table 3. OLS models from American region

	model1	model2	model3	model4	model5	model6
Size	-0.055***	-0.056***	-0.056***	-0.056***	-0.046***	-0.052**
	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]	[0.015]
Leverage	0.431***	0.416***	0.423***	0.407***	0.414***	0.367**
	[0.118]	[0.121]	[0.117]	[0.121]	[0.118]	[0.118]
TOBINQ	-0.060***	-0.054***	-0.055***	-0.049***		
	[0.010]	[0.011]	[0.011]	[0.012]		
ROA	-0.525***	-0.556***	-0.642***	-0.674***	-0.764***	-0.941**
	[0.140]	[0.141]	[0.167]	[0.170]	[0.157]	[0.166]
R&D		-0.399		-0.397		-0.966**
		[0.300]		[0.292]		[0.264]
R&D& profitability			0.483**	0.408*		0.463**
			[0.237]	[0.232]		[0.232]
Constant	1.634***	1.640***	1.652***	1.657***	1.504***	1.596**
	[0.219]	[0.219]	[0.220]	[0.219]	[0.214]	[0.217]
Adjusted R-squared	0.361	0.361	0.361	0.362	0.352	0.357
Observations	5895	5895	5895	5895	5895	

In summary, we provide evidence that the financial and innovation performance of companies has a significant relationship with the environmental performance. We provided that return on assets, R&D expenditure, and leverage are statistically highly significant for environmental performance in different regions around the globe. This proves that targeted capital allocations, sustainable assets usage can contribute to the long-term goals of the emissions reduction and climate targets regardless of regional differences. It also confirms that reduction of environmental pollution and achievement of climate neutralization goals is without geographical boundaries.

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DISRUPTIVE TECHNOLOGIES TO ENSURE ECONOMIC AND RESOURCE SECURITY OF UKRAINE

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Disruptive technologies are essential to ensuring the economic and resource security of Ukraine and the whole world. These technologies can change traditional industries and create new opportunities to increase productivity and efficiency, reduce costs and improve the economy's energy efficiency [4]. This study examines specific aspects of Disruptive technologies that can improve the national economy's economic and resource security.

1. Artificial Intelligence (AI)

Artificial intelligence (AI) has become a critical technology in the first two decades of the twenty-first century. AI increases production efficiency, optimises business processes and ensures accurate and quick decision-making. Artificial intelligence is also helpful in ensuring the security of national resources, including energy and transportation systems. In particular, artificial intelligence systems can detect dangerous situations and prevent road or energy network accidents [1].

Artificial intelligence is widely used to deepen encryption and cryptographic data protection methods, which are now crucial in the economic and business spheres. Encryption and cryptography help solve problems related to transaction security and protection against cyber attacks.

Artificial intelligence is helpful for protecting financial transactions and banking information. Artificial intelligence helps to ensure the security of users' data and prevent the theft of money from bank accounts. Moreover, cryptography and AI can improve solutions to secure online commerce and ensure online privacy.

AI is also useful for developing e-commerce and international trade, thanks to secure electronic transactions and guaranteeing customer privacy. Artificial intelligence can help protect supply chains and reduce business risks from data breaches and cybercrime.

Artificial intelligence is useful for solving energy sector security problems. Firstly, it is possible to increase the technological safety of nuclear and thermal power plants by reducing the risk of nuclear disasters. For green energy sources, artificial intelligence is helpful in the form of intelligent networks (Smart grids), which are necessary to combine many solar generating stations into a powerful energy hub. Artificial intelligence is useful for creating safe control and monitoring systems for energy networks.

2. Blockchain

Blockchain is a technology based on a distributed database that helps store and transfer information without intermediaries. This technology can provide

security and transparency in finance, economy, logistics, medicine, trade, and other vital sectors of the economy, as well as the protection of the country's resources. Blockchain improves efficient and secure trade and supply chain management [2].

Blockchain has become one of the most important technologies today, especially in the context of its use in business practice. The use of blockchain technology can help ensure the economic and resource security of the national economy.

The most crucial advantage of blockchain technology is its apparent security. Blockchain guarantees a high level of security because, at every step, any block contains a digital signature confirming the data's authenticity. This protects against abuse, theft and counterfeiting.

Blockchain technologies help ensure the transparency of financial transactions and help reduce transaction costs. Blockchain is useful for improving economic security by creating decentralised systems that do not depend on governments. This provides excellent resistance to financial crises and reduces the risks of corruption and market monopolisation [3].

Moreover, the blockchain is helpful in auditing and monitoring, guaranteeing the security of resources by creating mechanisms to control the use of resources. For example, with the help of blockchain, you can develop a system for monitoring consumer energy use. All of the Disruptive technologies listed above have a chance to increase the sustainability of modern economic systems based on the improvement of the digital financial sector. Disruptive technologies are more energy efficient and, therefore, more climate-friendly.

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THEORETICAL AND INSTITUTIONAL FOUNDATIONS OF SOCIAL SOLIDARITY ECONOMY

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Social solidarity economy (SSE) is an alternative form of building economic relations. This model can play an important role in overcoming existing social and economic crises, in particular, reducing the negative consequences of the COVID-19 pandemic [1]. CCEs are recognized as an important lever to stimulate an inclusive and fair transition to green and digital technologies, support social innovation, strengthen local development and job creation, and support vulnerable groups [2].

In a broad sense, the social solidarity economy refers to such forms of labor organization that make it possible to combine economic, social and environmental goals and objectives. In a narrow sense, the social solidarity economy is understood as a form of labor organization that uses the principles of solidarity interaction of members of the economic system and in which social and ecological interests prevail over economic ones, that is, economic results are considered as a means of achieving social goals [3]. The social solidarity economy is significantly different from the public and private sectors in terms of its functioning principles, acting as the so-called "third sector" as an alternative form of organization of social work. The social solidarity economy is characterized by the use of ethical principles and collective solidarity responsibility on the way to the sustainable development of socio-economic and ecological systems.

In modern scientific literature, there are several approaches to the structuring of the social solidarity economy and its holistic understanding. These approaches are based on the relevant criteria that underlie the classification of SSE subjects and determine the manner of its functioning. Social solidarity economy includes several subjects [1], in particular, associations, cooperatives, mutual societies belong to the sphere of SSE in most countries, while the inclusion of public funds and social enterprises remains an open question. Social solidarity economy actors act as a driving force for urban development, often being small or medium-sized organizations that focus on local development, although there are examples of actors that have reached the macroeconomic or international level with a global reach [4].

The lack of perfect competition and perfectly circulating information, the concentration of market subjects can lead to an imbalance in the production of goods, insufficient provision of collective benefits and the emergence of negative external effects in the economy. There is a problem of insufficient consideration of the interests of future generations of people. The deficit of budget funds and

political interests can reduce the efficiency of solving market problems by the state, in particular in the production of collective goods. Social solidarity economy actors are able to partially fill the gaps between the market and the state, mitigating concentrated market power and providing relative advantages to certain participants through collective action [5].

A promising form of organization of the social solidarity economy is platform cooperatives as subjects of local development in the transition to sustainable development of communities. Platform cooperatives implement innovative business projects using digital technologies. The use of the digital environment enables cooperative members to meet to exchange goods and services [6]. This gives the entities of this form of SSE certain advantages in the development of their capabilities. Cooperative platforms operate on the principles of common ownership and enable their members to collectively control production processes and make decisions regarding the development of an online platform. These actors have developed in specific sectors as childcare, transport, urban recycling, data entry, catering, accommodation and support to small and medium enterprises.

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THE IMPACT OF THE DIGITAL ECONOMY ON CARBON REDUCTION POTENTIAL

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Since the Industrial Revolution, Massive energy consumption have led to a large amount of carbon dioxide (CO2) emission, which resulted in many eco-environmental problems such as global warming, extreme weather, etc. In 2023, China's carbon dioxide emissions increased by 565 million tons, accounting for 35% of global carbon dioxide emissions [1], which is 2.6 times the peak carbon emissions of the European Union (4.85billion tons) and 2.1 times the peak carbon emissions of the United States (6.00 billion tons). However, in terms of GDP, excluding exchange rate fluctuations, China is only about 70% of the United States. In 2020, China exceeded the national emission reduction targets promised at the 2009 Copenhagen Climate Summit and clearly set goals for peaking carbon emissions before 2030 and achieving carbon neutrality before 2060. At the same time, the rapid development of information technology provided an environment for the growth of digital economy, which is gradually becoming the engine of economic growth and carbon reduction in China. In 2025, China will update its emission reduction targets and submit a national independent contribution towards 2035. Carbon reduction targets are urgent and the task is heavy. How the digital economy affects the carbon reduction potential is worth studying.

The digital economy is a more advanced and sustainable form of economy [1]. The digital economy has accelerated the penetration and integration of digital technology and digital elements into deeper and broader fields through continuously upgrading network infrastructure and information tools such as smartphones, promoting the transformation of economic forms from industrial economy to smart economy, and thus bringing about a transformation of the entire economic operation mode [2]. The integration of the digital economy and various industries has shown significant positive externalities, such as inclusive economic growth [3], high-quality development [4-7], regional innovation [8], industrial structure upgrading [9, 10], etc., and has also shown positive effects on total factor productivity [11], enterprise management [12], and corporate governance [13] at the micro level. Furthermore, the development of the digital economy will provide support for carbon reduction through the use of digital technology, the mutual promotion of digital elements and digital technology, and cross disciplinary technological complementarity. Firstly, research has shown that technological progress can drive carbon dioxide reduction [14]. The digital technology has the characteristic of sustainable improvement [15], which is a typical manifestation of technological progress. The effective application of continuously developing digital technology in various aspects of carbon reduction can improve the efficiency of emission reduction work and increase the potential for carbon

reduction. Secondly, digital technology can fully tap into the potential value of carbon emission related big data such as energy data and carbon footprint, driving the comprehensive penetration of digital elements in the field of carbon reduction [16]. At the same time, the continuous accumulation and mining of carbon emission related big data promote the deep use and continuous progress of digital technology, increasing emission reduction capabilities. Finally, the digital economy can quickly compile and imitate complex advanced knowledge available in other regions or industries, triggering complementarity between existing technologies in different fields of use [2], providing richer technological and knowledge support for carbon reduction.However, digital technology and its digital industry itself are high energy consuming industries [16], and the operation of data centers requires a large amount of energy. Previous studies have shown that data centers and cloud servers are key sources of carbon footprint [17], which can lead to significant carbon emissions. However, this portion of carbon emissions is necessary for maintaining the operation of digital economy facilities such as data centers, and is difficult to eliminate through self-development. It belongs to typical non emission reducing new carbon emissions and does not have room for emission reduction. When the digital economy develops to a higher level, digital facilities such as data centers and cloud servers operate at full capacity, which will increase a large amount of non emission reducing carbon emissions, thereby reducing the potential for urban carbon reduction.

Green innovation plays an important role in carbon reduction, and various industries can produce green innovation results [18]. Green innovation efficiency refers to the degree of greenization of regional innovation efficiency, which measures the quality of innovation development after considering environmental pollution and energy consumption comprehensively. It is the green index of innovation quality [19]. Green innovation efficiency is a part of innovation efficiency, closely related to technological progress, and green innovation will promote energy structure and efficiency improvement through new energy technology and low-carbon technology, thereby promoting carbon reduction. Miao Lunjun and Chen Jing (2022) found that the development of the digital economy can have an indirect impact on carbon emissions through innovation efficiency [20]. The digital economy can promote carbon reduction through two paths: expanding social and economic scale and enhancing green technology innovation capabilities [21]. Some studies have also studied the mechanism of green technology innovation that affects carbon emissions from the perspective of the absolute and average amount of green innovation [22], but few studies have explored the impact of the digital economy on urban carbon reduction potential from the perspective of the mechanism of green innovation efficiency.

In the theoretical mechanism and research hypothesis section, firstly, we discussed the concept of carbon reduction potential and digital economy, and conducted a theoretical analysis of the relationship between carbon reduction potential and digital economy. Secondly, we sorted out and discussed the role of

green innovation efficiency in the impact of digital economy on carbon reduction potential, and proposed our research hypothesis. In the section of calculating the carbon emission reduction potential index, we sorted out the research and calculation methods of three types of carbon emission reduction potential. Based on the panel data of 281 cities in China from 2011 to 2020, we construct the carbon reduction potential index which include the shadow prices of CO2 from the perspective of fairness and efficiency to evaluate the carbon reduction potential based on the in-depth analysis of the rest space of carbon reduction and the efficiency of carbon reduction. In the study design section, the dependent variable, explanatory variable, mediating variable and controlled variable were introduced. At the same time, We take green innovation efficiency as a mediating variable and constructs two-way fixed effects regression model and mediating effect model based on analyzing the relationship between digital economy, green innovation efficiency, and carbon reduction potential and their influencing mechanism. The results show that the digital economy presents an inverted "U"-shaped impact on carbon reduction potential, and the development of digital economy can improve the carbon reduction potential in most city at present. Further research shows that the green innovation efficiency presents an obvious mediating effect. But for some reasons, the digital economy has an inhibitory effect on green innovation efficiency which delays the time it takes for carbon reduction potential to reach it maximum value. At the same time, the impact of digital economy on carbon reduction potential has obvious heterogeneity on regional, urban scale and policy, that is, the impact in eastern China, the large urban scale, which is divided from GDP and population, as well as pilot cities of policy such as new energy cities, low-carbon cities, smart cities and broadband China, is significantly stronger than that in other area. Finally, this paper provides some relevant suggestions.

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THE ROLE OF SOCIAL SOLIDARITY ECONOMY FOR SUSTAINABLE DEVELOPMENT ESTABLISHING

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The quest for sustainable development is the quest not only for the preservation of the environment, but for the simultaneous satisfaction of three objectives: environmental protection, economic efficiency, and social equity.

At the same time, governments and social partners in many countries have started pay more and more attention to economic models, mainly human-oriented Global societal challenges such as the recent COVID-19 pandemic and economic crises have brought into public focus economic models that are well-adapted to withstand shocks and be efficient in key sectors such as health and social services, in addition to other vital economic and social sectors. It is solidarity and social economies that are so innovative types of economic development of society, which are combined within the framework of a single model "Social Solidarity Economy" (SSE).

The Social Solidarity Economy deals with a change process in the economy and development based on the relations between society and the environment that enhances human capacities and highlights the importance of relationships and work. The objective of this study is to approach a definition of the Social Solidarity Economy, to establish some successful experiences in countries worldwide, and to discern the elements that are necessary for its implementation. The conclusion at the end is for establishing a transformation economy that requires the creation of a collective identity, an inclusive economy, the inclusion of the Government and, in general, the support of the market itself [1, 3].

In the context of SSE, building relationships with the community and enhancing local development are integral to its principles. SSE focuses on creating an alternative economic system that prioritizes social and environmental well-being over profit maximization.

To enhance local development within the framework of SSE, it's crucial to foster an environment that encourages cooperation, mutual support, and a shared sense of responsibility among community members. SSE principles emphasize the importance of solidarity, cooperation, and social responsibility, laying the foundation for sustainable and inclusive local development.

Many SSE initiatives prioritize sustainable practices and environmental responsibility. They often promote environmentally friendly production methods, waste reduction, and conservation efforts, contributing to the overall territory sustainability.

The SSE environment welcomes economic activities that take into consideration social impact and not only financial gains. These ecosystems are an evolutionary step forward from standard social enterprises: rather than focusing

solely on promoting a social goal, they involve collaboration and sharing of knowledge and resources between companies, as well as co-design and consultation with citizens and civil society organizations [2, 4].

Unlike conventional large corporations, SSE ecosystems are often local in nature and prioritize improving surrounding social standards. Issues such as democracy, social rights, or sustainable development can become an integral part of their (more) ethical economic activities.

Through a project called “Respond, Rebuild, Reinvent,” nine cities from Europe and North America are sharing their work in fostering SSE ecosystems. Cities on both sides of the Atlantic Ocean have different ecosystems, and ways of promoting them. Below, we explore how Dublin, Warsaw, and Barcelona understand and implement this paradigm [2].

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FAIR-TRADE AS A TREND FOR SOCIAL SOLIDARITY ECONOMY DEVELOPMENT

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The fair-trade system can be considered one of the most successful real experiments of alternative economies. However, compared to other economic approaches, it relies excessively on mass market mechanisms and selling products through conventional distribution channels and retail. In order to gradually transform the "unfair" mechanisms of world trade and achieve social and environmental goals, the fair-trade system needs constant sales growth. It also means that fair-trade marketing in consumer countries is subject to established capitalist mechanisms of advertising and demand promotion. Although fair-trade brand building aims to distinguish itself through the alternative values of cooperation, trust, and fairness, it also operates within the constraints of simplistic advertising messages [5].

According to [2], fair trade is an easy way to make an impact on the lives of the people who grow and create the things we love. In addition, it is about the users of such things. Therefore, fair trade offers fair for:

- *producers*. In the global trading system, small rural farmers and workers are the most marginalized. In the fair-trade concept, they are at the center of everything. Producers have an equal voice in the running of fair trade, which makes it unique among certification schemes, and they are involved in all decisions;

- *farmers and workers*. Fair trade means: (1) fairtrade prices covering the average cost of producing the crops in a sustainable way and providing a safety net when market prices fall; (2) fairtrade premium, i.e. an extra amount of money paid on top of the sale price that is invested in businesses or projects of communities of their choice; (3) decent working conditions and prohibition of discrimination, forced and child labor; (4) access to pre-harvest subscriptions; (5) opportunity to plan more for the future with greater security and stronger relationships with buyers;

- *consumers.* Every fair-trade product a consumer chooses or campaign a consumer supports helps farmers and workers invest in their lives and take more control of their future. A "fairtrade" labeled product means that producers and businesses meet fair trade's strict social, economic, and environmental standards.

The modern global fair-trade system consists of:

- three regional producer networks representing over 2 million farmers and workers in Africa and the Middle East, Asia, and the Pacific, and Latin America and the Caribbean (more than 70 countries);

- over 25 national fair-trade and marketing organizations that promote fair-trade products in consumer countries;
- an independent non-governmental organization Fairtrade International that creates international fair-trade standards and coordinates fair-trade activities worldwide;
- FLOCERT, the main independent fair-trade certifier that verifies producers and traders for compliance with fair-trade standards [2].

To confirm the compliance with fair-trade principles, many companies certified their products and activities.

After establishing a fairtrade minimum price for most products, the fair-trade approach also includes a fairtrade premium. Farmers and workers decide together how to spend the fairtrade premium to reach their goals, such as improving their farming, businesses, or health and education in their community [3].

The top 7 fair-trade products include coffee, cocoa, bananas, sugar, flowers and plants, tea and cotton, which represent more than 90% of the farmers and workers in the fair-trade system.

Fair-trade practices in the EU are comprehensive and operate within a framework that emphasizes ethical, sustainable, and socially responsible trade. The EU promotes fair trade through various mechanisms, policies, and initiatives aiming to ensure fair treatment for producers in developing countries, protect the environment, and raise consumer awareness about ethical consumption.

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ESG POLICY IN BANKING AND FINANCES SECTOR: CASES OF EUROPEAN COMPANIES

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The contemporary landscape is characterised by a confluence of pressing issues, encompassing the exacerbation of climate change, environmental degradation, societal challenges arising from digitalisation, pandemic risks, and military conflicts. These multifaceted concerns have permeated the forefront of present-day discourse, influencing the agendas of modern businesses through intricate supply chain integration and interdependencies with business partners. A company's reputation, its unequivocal stance on these issues, and its commitments and proactive measures to address them collectively shape its image in the eyes of consumers and stakeholders. Such perceptions wield substantial influence over market positioning and competitiveness, underscoring the significance of non-financial considerations within contemporary business paradigms, i.e. the Environmental, Social, and Governance (ESG) policy.

The increasing importance of these facets within the business sphere and their palpable impact on competitiveness is underscored by the proliferation of diverse frameworks to measure, evaluate, and rate business sustainability. Consequently, the imperative of substantiating, articulating, and implementing an efficacious ESG policy and strategy has become increasingly salient. Within this framework, a comprehensive examination of exemplary ESG practices is paramount, elucidating a successful strategy's fundamental constituents and synergistic configurations.

The banking and finance sectors are not direct pollutants or resource consumers. It seems that those companies do not need ESG policies due to the specificity of their operations. However, these sectors play an important role in shaping sustainable transformations in other industries via investments. This makes them responsible for our future path and the success of the sustainability transition, leading to the need to elaborate and implement ESG policies.

This study aims to review current ESG policies in selected European companies and to provide insights into the main aspects companies consider when developing their practices.

Based on the most recent Sustainalytics Country Risk Rating [3], European nations emerge as frontrunners in embracing the ethos of sustainable development, with 14 European countries securing positions within the top 20 of the sustainability ranking. Consequently, for this study, three prominent European companies representing banking and finance sectors were selected based on Sustainalytics' ESG ratings [2]: 3i Group Plc (https://www.3i.com/#); ABANCA Corporación Bancaria SA (https://www.abancacorporacionbancaria.com/en);

Ackermans & van Haaren NV (https://www.avh.be/en). Among these companies, ABANCA has the lowest ESG risk rating score (6.7 – negligible), followed by Ackermans & van Haaren NV (7.1 – negligible) and 3i Group Plc (10.4 – low). To conduct research we apply Voyant-tools.org v. 2.6.13 (Sinclair & Rockwell, 2016). To explore the approach to ESG strategy, a textual analysis of the objectives, vision, and values articulated within the companies' ESG policies was conducted. Source materials for the study were extracted from the companies' websites and non-financial reports.

Research results reveal the prevalence of specific terms in policies across different companies. For instance, ABANCA Corporación Bancaria SA's policy is characterised by a predominant focus on environmental aspects, while 3i Group Plc places greater emphasis on value. Managers at Ackermans & van Haaren NV prioritise responsibility. This underscores the diversity of approaches in formulating ESG policies and their multifaceted nature. Nevertheless, despite these variations, companies have shared recognition regarding the paramount importance of addressing social and environmental aspects.

The analysis of company policy texts using "social" and "environmental" keywords reveals diverse trends. Social aspects are addressed across companies in various contexts, including the following: 3i Group Plc emphasises social policies and influence; ABANCA Corporación Bancaria SA highlights obligations to promote social progress and people's well-being, recognise social aspects as integral to the ESG approach and sustainability; Ackermans & van Haaren NV prioritises respect for social aspects.

Environmental issues are discussed in various contexts as well: 3i Group Plc mention environmental policies and impact; ABANCA Corporación Bancaria SA consider environmental issues as components of the ESG approach and outline key actions related to environmental aspects. Ackermans & van Haaren NV outline key actions related to environmental aspects (like ABANCA) and stresses respect for environmental aspects.

These trends demonstrate companies' nuanced approaches to addressing social and environmental aspects within their ESG policies, reflecting their commitment to sustainability and responsible business practices.

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MICROBIAL HYDROGEN PRODUCTION'S RECENT ACHIEVEMENTS

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Microbial hydrogen production development of hydrogen production is the approach of cultivating microorganisms for waste decomposition with hydrogen generation. The microbial methods of hydrogen production include dark fermentation (DF), biophotolysis, photofermentation (PF), and microbial electrolysis cells (MEC). Dark fermentation is a special case of anaerobic digestion (four-step) process that stops on the least step, called acidogenesis. In acidogenesis besides acids, the gaseous phase contains hydrogen; a desired product. A more exact description of the processes and feeds we deliver in Figure 1 shows anaerobic digestion and dark fermentation as two processes. Biophotolysis is a process similar to photosynthesis but these plants by contact with Solar light split water into hydrogen and oxygen. Biophotolysis uses cyanobacteria and algae (macro and micro). Due to the high applicability of these organisms as feed or raw materials are more assessed as feed for other hydrogen generation ways. We can reduce the greenhouse effect by employing biophotolysis organisms that capture carbon dioxide. At the same time, algae can produce materials for the chemistry, pharmacy, and energy industries. Photofermentation is a process that later was substituted by photosynthesis; transfers organic matter like organic acid into hydrogen during Sun radiation exhibition. Microbial electrolysis cells during the digestion of organic matter produce a voltage that can split some compounds like ammonia to hydrogen. DF and MEC are easier controllable than others and therefore are relevant parts of newly designed waste management plants both in industrial and municipal waste sectors. All earlier mentioned methods are sustainable methods for replacing and closing the loop of fossil waste also with the addition of biocenosis waste see Figure 1. The figure shows potential feed.

We showed that an important issue of microbial decomposition is their ability to pollutant removal, produced during fossil fuel combustion. Besides preserving modern life levels, the developed biological hydrogen production methods could allow for removing litter from lingering landfills. After the addition of some sugars DF can utilize fossil wastes like asbestos [21] and glycol ethylene [27] (see Table 1). Thermal decomposition like pyrolysis allows for utilized wastes, including plastics, resulting in faster and higher conversion but with the emission of pollutants. We can enhance thermal plastics conversion by mixing with lignocellulose waste. Therefore there is a necessary combination of biological methods with thermal decomposition for the efficient solving of a problem.

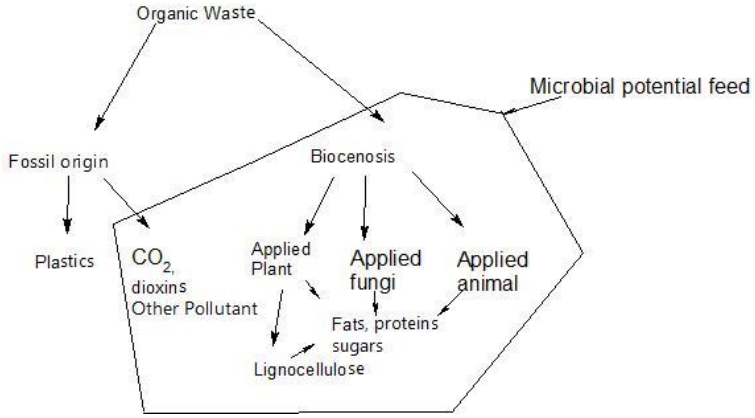

Figure 1. Pathway of organic waste

Table 1. Development of microbial decomposition in 2018-2023

	Dark fermentation		Biophotolysis		Photofermentation		Microbial electrolysis cell		Anaerobic Digestion	
Feed	2018	2023	2018	2023	2018	2023	2018	2023	2018	2023
Composed	Some started science mixtures besides hydrolysates of lignocellulose [2]	Most viewed substrates due to trials of industrial applications. [8]	Mostly as for pharmacy and hydrogen generation [20]	They are part of mixed substrates. The organic matter is important for splitting water into hydrogen [10]	There were attempts to combine with DF [14]	Lots of combinations of other types of microbial and thermal due to wider potentials substrates with limited work time [13]	Mostly limited to water [3]	There are wide mixtures after finding other substrates that water [31]	Biolayer packing upgrading using nanomaterials [12]	Many solutions improved with complex and changing feed [28]
Sugars	Much modelling attempts sugar-based substrate [19]	Allows as codigestion even utilization of hazardous material as asbestos.	Extracted sugars are potential for wound healing and some attempts for using as additive for improving water	Sugars are more efficient part of pharmacy [35]	Low interest [33]	The sugars extended lists of substrates besides acids [18]	Water splitting only partly without extra charging [29]	The digestion helps gaining energy for splitting molec	As part of lignocllulose wastes [11]	Combining with DF important for upgrading methane product

		Genetically modified can omit theoretical limitations [9]	splitting [23]					ules [34]		ion [24]
Fats	Trials of checking pathway [4]	Important part of mixture especially of processing of algaes used after biophotolysis [1]	NA	Fats of microalgaes are significant content of biodiesel and biolubricants. [7]	-	Additional processing after DF or biophotolysis	NA	NA	Usual for olive industry	
Proteins	Very seldom only theoretcially potential [6]	Change theory of DF, thus new approaches after successful processing [25]	No interest	Source of pharmacy and polymers	-	NA	NA	NA	Some interest of butchery industry	
Others	Mostly batch [22]	Attempts as part of management plant for upgrading anaerobic digestion or preparing earlier feed [5]	Process tried to intensify biophotolysis hydrogen production with increasing of phytopharmceuticals [15]	Hydrogen production is additional to carbon dioxide capture, and pharmacy and green polymers source [16]	Method widely tested for different feeds [32]	Part of combinations of future wastes utilization [13]	The limited mostly to water started to extend substrate [25]	Industrial attemps for ammonia splitting are common after discovery of approach of Haber process here [30]	Industrial available looking for solving problem of low concentration of chemical industry purposes	Modeling is change from ADM-1 to ANN allowing for more complex [17]

Therefore after looking at Table 1, the researchers combined methods for closing waste loops as tightly as possible. Therefore there are technologies that quite efficiently replace traditional, fossil-sources-dependent lifestyles. The recent

achievements are unsupported by legislators. The leaders should prioritize energy transformation as a major goal. The governments of every country should educate and convince all citizens of unity and solidarity in changing lifestyle into zero waste style and sustainable lifestyles, removing the desire for a Hollywood lifestyle. These changes should people rationalize for thinking as one body all population, for avoiding degradation of human living and even extinction by his 'own wish'.

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TOWARDS PROACTIVE POLICY: A FRAMEWORK FOR SAFE AND SUSTAINABLE FERTILISER MANAGEMENT

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The anticipated growth of the population in forthcoming decades is poised to exert a heightened strain on agricultural production, potentially exacerbating its dependence on fertiliser application. Within this milieu, pollution-related concerns stemming from imprudent fertilisation practices are progressively intensifying. Globally, numerous initiatives have been initiated to coordinate countries' endeavours in addressing these concerns. Concurrently, national frameworks for sustainable fertiliser management exhibit systematic organisation and efficacy deficiencies. Consequently, the health aspect of food security remains a pertinent pragmatic and scientific apprehension.

This study seeks to elaborate on the conceptual framework of proactive policies regarding safe and sustainable fertilisation, which aligns with extant global initiatives. The following research questions guide this study: What constitutes the global perspective on sustainable fertilisation? What are the main priorities at the national level? What measures could be undertaken to induce transformative change?

Since 2016, a plethora of global initiatives has emerged to spotlight concerns surrounding soil health, nutrients, and fertilisers [3]. After protracted multilateral deliberations, the Code of Conduct for Sustainable Use and Management of Fertilizers was established, containing voluntary standards for industry players and stakeholders [4]. Additionally, the approval of the Colombo Declaration under the auspices of the United Nations in 2019 marked a significant milestone, leading to the development of a Roadmap for Action on Sustainable Nitrogen Management 2020-2022. This roadmap fosters global cooperation and coordination towards improved and sustainable nitrogen management [1], sparking a global discourse and collective efforts to combat soil pollution from fertilisation.

Nevertheless, translating these global solutions into effective measures and promoting sustainable fertilisation at the national level remains a formidable challenge. Scholars have highlighted the dearth of locally tailored solutions and the inconsistency and inefficiency of national policies, even within developed nations. Raising awareness and transferring knowledge are identified as pressing and incomplete issues, particularly in countries reliant on agriculture [5].

The Ukrainian context serves as an apt illustration of these challenges. While the draft Food Security Strategy addresses fertilisation concerns within the framework of agroecological risks for food security [2], the previous Agriculture Development Strategy failed to consider health implications [8]. Although the Law of Ukraine, "On Pesticides and Agrochemicals", prioritises health preservation and

environmental protection over economic benefits [7], it neglects the need to analyse and assess pesticide and agrochemical use effects.

The national sustainable fertiliser management system could be envisaged as a formation comprising governmental bodies, industry stakeholders (including research and development, production, testing, and distribution of fertilisers), and end-users. Concurrently, components such as problem awareness, knowledge generation, and transfer directly affect fertiliser practices (Fig. 1).

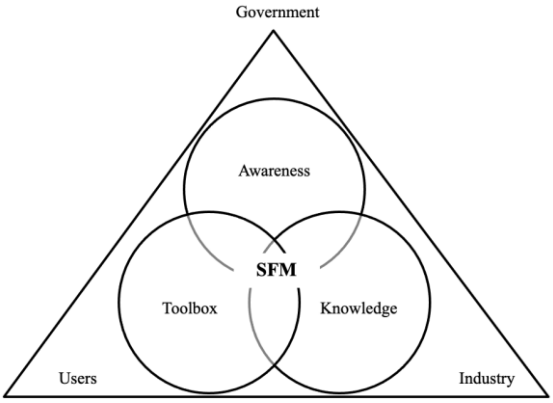

Figure 1. National sustainable fertiliser management (SFM) system view: actors & component dimension [6]

The government plays a pivotal role in the national sustainable fertiliser management system, serving as a mediator between the economic interests of producers and societal concerns, while also facilitating feedback mechanisms. Central to this process is fostering awareness of the issues surrounding fertilisation.

Producers often prioritise short-term economic gains through fertilisation, overlooking potential long-term social and environmental repercussions due to the absence of immediate negative consequences. It is imperative for the government to elucidate the long-term effects of fertiliser practices to stakeholders in a manner that is comprehensible and pertinent in the short term. This necessitates a comprehensive evaluation and demonstration of fertilisation's adverse social and environmental impacts.

A well-functioning national sustainable fertiliser management system entails collaboration among key actors and stakeholders (government, industry, and users) to continuously improve fertilisation practices through awareness-raising, knowledge generation, transfer, and selecting and implementing appropriate tools. The guiding principles of the system’s functioning include professionalism, transparency, innovation, knowledge transfer, information support, trust, and long-term sustainability [6]. This collaborative approach enables

the setting of strategic targets that encompass not only production and economic objectives but also environmental and social considerations, thereby facilitating monitoring, control, and evaluation processes, alongside the implementation of economic incentives for sustainable fertiliser practices.

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PACKAGE LABELING AND SUSTAINABLE DEVELOPMENT

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The challenge and imperative of sustainable development lie in the fact that even now humanity, by much overspending and without limiting the use of natural resources, can cause irreparable damage to the global system. Humanity has only two paths: a) sustainable development, in which national governments successfully cope with the task of effective resource management; b) unstable, unsustainable development, which inevitably leads to both national and global catastrophe.

Transitioning from these environmental concerns, it's clear that language plays a pivotal role in addressing sustainability challenges. As Ploof (2016) and Ezeh (2020) suggest, language – whether it is indigenous, universal, or politicized – can profoundly influence global sustainability initiatives. It achieves this by connecting with individuals on factual and emotional levels, molding personal and community convictions regarding sustainable ecological practices.

Without language, the concept of the Sustainable Development Goals (SDGs) would be inconceivable, highlighting its crucial role in conceptualizing and achieving these goals. Language experts contend that development is impossible without language, underscoring its importance in carrying out SDGs.

Words, like individual species, or elements, are essential to the composition and conservation of the world's endangered ecological niches and, equally important. The language, be it indigenous universal, or politicized, can effectively shape the future of global sustainability by engaging audiences on both factual and emotional levels.

Language is the foundation of sustainable economic development. Language is the basis of the skills, communication, and participation through which populations can play an active role in socio-economic development (Cheffy, Djité, and Mufwene) [2].

Language is essential in developing a sense of place and must be utilized effectively to foster sustainable choices' widespread appeal. Much like people "defend what they love," human nature tends to resist change unless that change is directly beneficial or otherwise wholly attractive to it. Sustainability has, until recently, carried the unattractive stigma of compromise. Recycled and eco-friendly products are frequently less comfortable, ineffective, and expensive [5].

"Packaging" means a process or method used to protect goods, facilitate their preservation, transport, sale, and provide information to consumers. In a scientific context, packaging research often focuses on developing more sustainable or innovative solutions to reduce environmental impact, improve product biosafety, and optimize logistics and storage.

The connection between sustainable development and packaging is quite close, as the choice of packaging materials and their processing methods affects the

ecological footprint of products. Here are a few ways packaging can contribute to sustainability:

1. Use of sustainable materials: By choosing biodegradable or renewable materials for packaging, such as paper, cardboard, or plant-based plastics, companies can reduce their negative impact on the environment.

2. Minimizing the use of materials: Developing packaging that requires fewer materials without losing the effectiveness of protecting the product helps reduce waste and energy costs in production.

3. Improving the recycling of packaging: Designing packaging that can be easily disassembled into recyclable or reusable components supports the circular economy.

4. Innovation in packaging: Development of new packaging technologies that reduce environmental impact or improve packaging efficiency, for example through the use of smart packaging that can monitor product freshness and reduce food waste

5. Communication with the consumer: Offering information on packaging about proper disposal methods or its environmental advantages can educate consumers to be more responsible and conscious of sustainable consumption. These methods lessen the adverse effects of packaging on the environment and engage consumers in sustainable development through their daily decisions.

Business owners must commit to running their operations sustainably – powering stores and factories with renewable energy, using sustainably harvested raw materials, etc. – to provide consumers with "beautiful, functional, affordable, sustainable products" that enhance, rather than compromise efficiency [3]. Using language to change consumers' perspectives is crucial to maximize the impact of these business shifts. Sustainable products alone will be ineffective if people do not feel enticed or compelled to purchase them.

Studying the system of social values reflected on the packaging, it is possible to highlight the following components: health as a value, safety as a value, ecological values, social values, and geographical values.

Thanks to its exceptionally well-argued and informative potential of packaging, it has become the number of marketing element communication, therefore it has become the task of specialists in various fields identification, classify, and analyze the main indicators and elements of packaging, among which product labeling has a special place [4].

Labeling is a text, conventional designations (pictures) that are applied to the packaging and goods, as well as other auxiliary means that are intended for identifying the goods (its individual properties), proving information (about the manufacturer (executor), quantitative/ product quality characteristics, etc.) to the consumer [6].

Text as a form of written information is the most common element of production and trademarking. It signifies a high level of accessibility to product information for all market participants. The text can do all the basic labeling

functions, but to the greatest extent inherent to it, it is informative and identifying. In a text element, all forms of written information can be used for labeling: letter, digital, and verbal.

Sustainable labeling is the procedure of using informative labels on products that provide data on the environmental, social, and economic impact of products throughout their life cycle. This labeling allows consumers to make more informed choices based on sustainable development criteria. It may include information on resource use, greenhouse gas emissions, material disposal, and corporate social responsibility. Sustainable labeling can encourage producers to adopt more environmentally friendly and socially responsible practices.

Sustainability labeling is important because it helps consumers make more responsible choices. Here are some key aspects to look out for:

1. Sources of Ingredients: Labeling that indicates sustainable or organic sources of supplement ingredients can certify that they were produced without harming the environment. For instance, vitamins are made with organic plant extracts or derived from sustainably pure sources.

2. Certification and production responsibility: Certified labeling, for example, according to USDA Organic (for products grown in the USA) or EU Organic (for products grown in Europe) standards, ensures that products are produced using methods that support the ecosystem and reduce chemical load.

3. Packaging and its disposal: Labeling that indicates environmentally friendly or recyclable packaging is crucial for consumers who want to minimize their environmental impact.

Using packaging that is easily recycled or biodegradable contributes to the circular economy.

4. Production transparency: Clear labeling demonstrating where and how vitamins were produced helps consumers make informed choices. Labels indicating the ethical sourcing of ingredients, or the execution of eco-friendly production techniques can sway consumer choices. A key aspect of all these practices is raising consumer awareness and encouraging them to make more sustainable lifestyle choices.

Sustainability has become one of the main business and society topics. Translating sustainable principles into real behavior requires integrating them into society and business ideology as a core value. It takes time, investment, and consistency in all stages. A sustainable labeling management perspective is an effective approach that can bring sustainability to life and provide multiple benefits for consumers and companies.

The labeling communicates with its audience with the help of language – a set of verbal and non-verbal tools. Sustainable labeling is labeling that undertakes sustainable practices in the working of businesses and champions them. They use label communication tools to convey these benefits to their end consumer, enabling them to make conscious decisions while being associated with or buying from

those goods. Sustainable labeling, an emotionally influential communication tool, is powerful in achieving sustainable development goals.

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STAKEHOLDERS' ROLE IN IMPROVING SMALLHOLDER FARMERS' RESILIENCE TO CLIMATE CHANGE EFFECTS IN CENTRAL, TANZANIA

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Abstract

This article investigates the role of stakeholders and challenges encountered in combating adverse effects of climate change in central Tanzania. A total of 366 household heads and 36 key informants were involved in this study. Both quantitative and qualitative data were gathered through household questionnaire, Focus Group Discussions, in-depth interviews and documentary reviews. Descriptive statistics were used to analyze quantitative data and content analysis was used to analyze qualitative data. The study indicates that, the government, private sector and non-governmental organizations have supported smallholder farmers in adapting to climate change effects through education provision and material support. The research findings further indicate that through implementing climate change adaptive measures, various obstacles particularly inadequate capital, high price of agricultural inputs, limited financial support, inadequate markets, inadequate weather information and inadequate extension services have affected effective adaptive strategies. It is concluded that climate change is evident in the study area and various stakeholders have responded in different capacities. The study recommends on the need to strengthen the support in implementing viable adaptation strategies in the study area and other areas of this nature so as to increase smallholder farmer's resilience to withstand the climate change effects.

Keywords: stakeholders, challenges, climate change, vulnerability, central Tanzania

Introduction

Africa like other developing countries of the world is experiencing negative effects of climate change due to high dependence on rain fed agriculture. Tanzania, like other East African countries is experiencing changes in climate variables particularly temperature and rainfall [5; 3; 7]. Though all sectors have been affected by the changing climate, the agricultural sector is reported to be more affected due to its high dependence on rainfall [6; 4]. Studies by Majule *et al.* (2013), Habiba *et al.* (2012) and Bryan *et al.* (2009), highlight that effective adaptation to climate change effects require strong interrelationship between different stakeholders such as government, private institutions, agricultural extension services, researchers, Non-Governmental Organisations (NGOs) and the eagerness of farmers themselves to execute effective the proposed adaptive strategies.

Though various studies on climate change adaptive measures have been conducted in Tanzania, little is known on response of stakeholders in facilitating implementation of the adaptive strategies calling for the need to conduct such study. This study therefore attempts to examine stakeholder's role in implementing climate change adaptation strategies in central Tanzania. The findings from this particular research add to the existing body of knowledge on response of various stakeholders in combating climate change effects at local level. The findings further add value on revealing the challenges affecting effective implementation of adaptive measures on climate change effects thus inform policy makers and planners on formulation and implementation of viable polices and plans for proper adaptation to the changing climate.

Materials and Methods

This study was conducted in Dodoma region, central Tanzania. The study employed a cross-sectional design under a mixed method research approach. Household questionnaire, field observation, in-depth interviews, Focus Group Discussions were used as data collection methods. Analysis was carried out through the use of two software packages for data analysis namely Statistical Package for Social Sciences (IBM SPSS version 20) and Microsoft excel 2010. The software enabled data to be summarized using summary statistics (frequencies and percentages) which simplified interpretation and presentation of research findings. Qualitative data from FDGs, in-depth interviews and field observation were analyzed through content analysis.

Results and Discussion

Role of stakeholders and challenges faced in implementation of climate change adaptation strategies

The effective implementation of climate change adaptation measures needs commitment of both smallholder farmers and other stakeholders. Various stakeholders were reported to be involved in supporting smallholder farmers on adapting to the changing climate. The Tanzanian government institutions through the Agricultural Research Institute (ARI) located in Hombolo, Ilonga and Uyole were reported as key stakeholders on research and produce varieties of cereal crop seeds that are supplied to farmers.

Apart from public institutions, non - Governmental Organisations (NGOs) were also reported to provide support to smallholder farmers in adapting to climate change effects. These included the World Vision International (WVI), Rural Livelihood Development Company (RLDC) and the Agricultural Development Program (ADP) which supported smallholder farmers on tree planting, supply of agricultural inputs and provision of education on energy conservation methods.

Moreover, various Community Based Organisations (CBOs) were reported to be involved in facilitating adaptation to climate change effects. These included

the Community Resource Development and Management (CORDEMA) and the Dodoma Development Association (DODEA) which offered capacity building on agricultural extension services and facilitated awareness creation on climate change issues.

Furthermore, private and international institutions such as Agro Vet Company, Bussico Company and Construction Company limited have been working cooperatively with international organisations such as Food and Agricultural Organisation (FAO) and World Food Program (WFP) in supplying agricultural inputs and equipment in the selected areas as well as in construction and rehabilitation of irrigation schemes to support implementation of adaptation strategies.

Though smallholder farmers in the study area have implemented various strategies in adapting to adverse effects of the changing climate through the support of various stakeholders, they have encountered various challenges which hinder them to adapt effectively. The reported challenges include inadequate capital, high price of agricultural inputs; limited financial support, inadequate markets, inadequate weather information and inadequate extension services. Apart from the reported challenges at the community level, supporting institutions also reported to encounter various challenges particularly, limited economic resources, limited infrastructure, lack of coordination between one sector and another, limited legal and regulatory framework for policy implementation, complex decision making processes, time lags in implementing the strategies as well as limited technical support. All these have hindered effective implementation of climate change adaptation strategies.

Conclusion and Recommendations

It is the fact that climate change is real in the study area as various stakeholders have shown interest to support smallholder farmers to adapt effectively. The research findings indicate that smallholder farmers in the study area have implemented a number of adaptation strategies but they still encounter challenges like inadequate capital, high price of agricultural inputs, limited financial support, inadequate markets, inadequate weather information and inadequate extension services were reported as major challenges affecting their effective responses. The study therefore recommends on the need to strengthen trainings for both agricultural extension officers and smallholder farmers on appropriate measures to be taken for effective adaptation to climate change impacts in the study area. Improvement of peoples' livelihoods through enhancement of rural credits to small holder farmers in the study area is also necessary for strengthening adaptive capacities.

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PROJECT-BASED LEARNING AS A METHOD OF FOREIGN LANGUAGE TEACHING

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Similar to any science, pedagogy undergoes constant development. Annually, thousands of professionals work to improve education, make it more accessible, develop new teaching methods that meet the needs of both educators and students and improve existing approaches.

As an indispensable part of modern education, foreign language learning is also experiencing significant changes. In this abstract, we will consider the place of project-based learning in the system of teaching methods in general and the context of language teaching in particular.

To begin our critical review, we need consider the circumstances under which it was included in the list of pedagogical methods and to define the notion of project-based learning. It is important to note that indicating a clear timeframe for the emergence of this method is challenging. The use of projects for educational purposes has been traced back several centuries, but they have yet to be related to teaching methods. The approximate time when project-based learning took shape and began to spread rapidly to different countries was the 19th century [4]. A necessary clarification should be made: such an approach was used in minimal circumstances. During the period in question, the leading application sector was, unexpectedly enough, agricultural education in the United States. In the 21st century, project-based learning is common at all levels of education and in all types of school, college, and university disciplines.

Generally, a project activity is a constructive and productive activity aimed at solving a vital problem and achieving the final result in goal setting, planning, and project implementation [5]. To supplement and expand on the abovementioned definition, a project is a practical activity. Its implementation is associated with the direct result in education, which is the acquired knowledge in the relevant discipline. Knowledge refers not only to what is studied within the subject because, in this case, although progress is observed, it is rather one-sided. It is also essential to understand that students acquire soft skills in addition to academic growth. Unlike hard skills, soft ones serve as a bridge between the theory provided by an educational institution and the practice required to build a successful career and life in society in general.

Having made a brief overview of the genesis of project-based learning, it would be logical to move on to the question of its place in the foreign language teaching system. In 21st-century language education, the general emphasis has shifted from grammar, memorization, and rote learning to using language and

cultural knowledge as tools for communication and connecting people worldwide [1]. In other words, learning a foreign language is bound up with applying a communicative approach. It has proven highly effective because it relies on real-life simulations, allowing learners to understand the language better through relevant examples. This approach is implemented in many countries, including Ukraine.

Thomas claims that in the context of project-based learning, projects are to 1) have a central character, 2) revolve around questions or problems that actively engage students, compelling them to confront and grapple with the core concepts and principles of a discipline, 3) encounter students in a productive inquiry, 4) give students a certain degree of independence and 5) be practical [3]. Although a certain amount of autonomy has been mentioned, the project members will likely encounter difficulties. They will need help from the teacher, who should be prepared to provide relevant guidance.

For an educator, the search for a suitable teaching method often rests on the advantages it has to offer. Let's look at those related to project-based learning in foreign language teaching. Researchers have identified quite a few positive aspects, so there have been highlighted the most significant ones [2]:

- Students' inspiration to succeed.
- Students are equipped for productivity in college, careers, and civic life.
- Students can achieve academic standards on assessments requiring deep knowledge and critical thinking.
- Teachers are provided with a more fulfilling teaching experience.

Considering the above facts, project-based learning is highly effective in teaching foreign languages. The method has been known to the world for quite some time, but it is still relevant and evolving. It keeps the focus on the communication approach of teaching but simultaneously allows for acquiring new skills. Through project-based learning, students can apply the vocabulary, grammar, and other material they have learned in practice and deepen their background knowledge.

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STRATEGIC MANAGEMENT IN SMALL IT BUSINESS SECTOR

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In the face of uncertainty and geopolitical tension, compounded by Russia's full-scale invasion of Ukraine since 2022, strategic management becomes critical for the successful development of small IT businesses in Ukraine. Geopolitical and economic changes due to the state of war have altered the business landscape in the country. Today, strategic management helps small IT enterprises in Ukraine adapt to new conditions, explore new markets and opportunities, while maintaining resilience and independence in their business models.

Strategic management in small IT businesses involves defining long-term goals and development directions for the company, as well as developing and implementing strategies to achieve these goals. This entails analyzing internal and external factors affecting the business, developing action plans, and mechanisms for monitoring their implementation. In times of instability, there is a risk of financial complications. Strategic management helps create financial reserves and contingency plans, enabling small businesses to cope with financial difficulties when needed.

Strategic management in small IT businesses utilizes various tools to achieve its goals and ensure successful company development. For instance, conducting SWOT analysis and PEST analysis allows small IT businesses to identify their strengths, weaknesses, opportunities, and threats in both internal and external environments [1]. Therefore, strategic management helps small IT businesses focus on future opportunities and challenges by developing long-term strategies that foster sustainable company growth. Additionally, this tool aids companies in developing effective development strategies, reducing risks, and enhancing competitiveness.

The IT industry is rapidly evolving, so strategic management allows for timely responses to technological and market changes, rationalizing the use of resources such as human, financial, and material, which is especially important for small businesses with limited resources.

For successful strategic management in small IT businesses, the following are necessary:

– Clear definition of the business mission and objectives, as well as understanding its position in the market and key development directions;

– Quality analysis of the internal and external environment, including SWOT analysis, PEST analysis, and analysis of the competitive landscape;

– Development of development strategies, including defining strategic goals, selecting strategies, and developing action plans to achieve them;

– Resources, including financial, human, and technical resources;

– Ongoing monitoring of the implementation of strategic goals and performance indicators, as well as timely adjustments to strategic plans as needed;

– Readiness to adapt to changes in the environment, use innovative approaches, and the latest technologies to enhance competitiveness.

Successful implementation of any project in the modern business environment inevitably encounters risks that can affect its success. Effective risk management allows avoiding negative consequences, preserving resources, and achieving set goals. In the IT sphere, where technologies change rapidly, risk management becomes extremely important. This involves continuous updating and analysis of risks, consideration of cybersecurity threats, application of Agile methods, and systematic analysis of technical risks. Strategic management helps identify potential risks and develop strategies for their management, reducing the impact of adverse events on business operations [2].

Therefore, the application of strategic management in small IT businesses in Ukraine within the context of geopolitical and economic changes is not just a necessity but also a strategic lever for survival and success. The new reality, shaped by conflict and technological changes, requires businesses to engage not only in reaction but also in active situation management. In conditions of instability and uncertainty, strategic management helps small businesses orient themselves towards future opportunities by developing flexible strategies that enable them to adapt and respond to changes quickly and effectively. Such an approach not only ensures survival but also stimulates development and competitiveness in unpredictable conditions.

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VIRTUAL EXCHANGE PRACTICE AS A PROCESS OF DEVELOPING SOCIOCULTURAL COMPETENCE

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Virtual Exchange, as a component of the educational shift, has become an essential tool in fostering sociocultural competence. With globalization and the frequent occurrence of intercultural interactions, acquiring effective communication skills with individuals from diverse cultural backgrounds is critically important.

By leveraging modern technology, online learning enables students to engage in intercultural dialogues and educational programs, irrespective of geographical boundaries. This practice not only broadens cultural perspectives but also promotes tolerance, mutual understanding, and global responsibility.

A recent European Commission-funded project brought together experts from various fields to define Virtual Exchange. According to it, a virtual exchange is a well-researched practice that involves ongoing, technology-facilitated educational programs or activities. These initiatives enable meaningful communication and interaction between individuals or groups who are geographically distant or culturally diverse, guided by educators [2].

Moreover, addressing the pedagogical discourse, schools and universities were closed due to the pandemic, necessitating a shift in educational methods. This situation catalyzed the rise of Virtual Exchange (VE). As study abroad programs were heavily impacted, educators sought alternative solutions. With the suspension of traditional language classes, teachers began exploring unconventional methods and discovered VE as a viable option. This brings us to the next aspect: education has been internationally acknowledged as crucial for tackling the critical global challenges confronting us all. By providing information and raising awareness, and more importantly, by empowering individuals to innovate and implement solutions, Education for Sustainability plays a crucial role in transforming our lifestyles [3].

One illustration of Education for Sustainability is the array of partnerships established among universities. Notably, the cooperation between SumDU and the University of Liverpool exemplifies this, spanning diverse initiatives including summer schools, student exchanges, teacher training, online educational resources, and access to global databases. More than 80 students and staff from Sumy State University graduated from the programme, studying two modules – 'Sustainable Development Goals – Global Challenges, Local Action, Achieved Outcomes' and 'Fake News, Fake Science and Critical Thinking. What should I believe?".

Students had the opportunity to participate in the international summer school both in offline and virtual formats. Since we are considering this from the perspective of virtual exchange practice and online learning, it is noteworthy that

immediately upon enrollment, students receive necessary instructions and materials in electronic format. After registering their account, students gain access to resources from two libraries simultaneously. They utilize CANVAS, the University of Liverpool's Virtual Learning Environment, where students can access all module information, timetables, learning resources, and assessment details. Teams' platform is utilized for hosting synchronous classes and social activities, providing students with a platform to connect with peers, Module Leaders, and the ISS Team.

Such a variety of information and communication technologies in online work creates full immersion in the learning process. As the second component of the theme is the development of sociocultural competence, it is worth noting that effective methods to be employed in the process of shaping sociocultural competency include: games, modelling and discussing sociocultural situations, conversation, debate, brainstorming, observation, and explanation. It is important to highlight that an ISS Social Event was held each week, focusing on the city of Liverpool, its culture, history, and sense of identity. Additionally, a range of social activities were available for participants to choose from, organized by the English Language Centre or the wider university. As the main components of Education for Sustainability are envisioning a better future, critical thinking and reflection, participation, partnerships for change and systemic thinking [1].

Therefore, all components that contribute to sustainable development align with the example. The initiative of establishing partnerships among universities and engaging in virtual exchanges are among the most effective methods for enhancing sociocultural competence and promoting cross-cultural dialogue.

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ECONOMIC GROWTH AND SUSTAINABLE DEVELOPMENT: THEORETICAL ANALYSIS OF KEY FACTORS

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Sustainable development ensures the long-term viability of the planet and the preservation of its resources for future generations. By applying sustainable practices, it is possible to mitigate eco-destructive impacts on the environment, preserve biodiversity and combat climate change, protecting the health of ecosystems and the well-being of communities [1]. In addition, sustainable development promotes economic stability and resilience by encouraging innovation, resource efficiency and social justice, which are the foundations of a more prosperous and just society.

Classical economic growth focuses primarily on increasing production and consumption without considering the long-term impact on the environment and society. In contrast, sustainable (green) economic growth emphasizes the integration of environmental, social and economic factors so that development meets the needs of the present without compromising the ability of future generations to meet their own needs [2]. This involves prioritizing renewable resources, minimizing pollution and waste (in particular through the implementation of circular production principles), and promoting social justice.

Due to the complexity of socio-economic systems, understanding the key factors affecting sustainable economic growth has been and still is one of the main challenges for the scientific community. With the evolution of scientific thought, the approaches to determining the drivers of traditional economic growth also changed. Neoclassical economic theory is one of the most recognized among scientists. It emphasizes the role of capital and labor as input variables in models of production growth, which is reflected in the Cobb-Douglas production function. New theories of growth are endogenous and emphasize the role of technological progress in economic development [3]. Our research on the factors of sustainable growth will expand the neoclassical model of production by adding new factors, including digital and energy factors, as they play a significant role in the performance of the national economy and the transition to sustainable development.

The issue of classical economic growth is the object of research by many scientific schools (classical school, neoclassical, Keynesians, etc.), which have different approaches to its assessment and analysis. The concept of sustainable economic growth was reflected in the works of J. Hickel, G. Kallis, M. Jacobs, S. Derkon, T. Hansen, and others. However, the modern scientific discourse lacks a synergistic approach to the issue of sustainable growth, which must take into

account economic, social and ecological components. Thus, the significant actuality of the mentioned topic, its theoretical and practical significance determined the choice of the topic of the work.

There are many approaches to define the concept of sustainable economic growth. One of them is that sustainable economic growth is a long-term development strategy aimed at achieving a harmonious balance between economic expansion, environmental protection and social welfare [4]. The key factors of sustainable economic growth are innovation and efficient use of resources. In addition, some works point to the importance of global cooperation and policies aimed at supporting entrepreneurship to achieve sustainable economic growth. Some sources emphasize the importance of openness and competition in markets as the main incentives for sustainable development.

Recommendations are provided to public authorities and other stakeholders on accelerating the transition to sustainable growth. For example, the government should promote renewable energy sources through financial and non-financial incentives. In some cases, it may be useful to consider carbon pricing mechanisms, such as carbon taxes or cap-and-trade systems. In addition, by introducing green financing instruments (such as green bonds) into renewable energy projects and other environmentally sustainable initiatives, more opportunities can be created for their successful implementation. Public authorities must transform most public services (obtaining permits, licenses or documents) to make them available online.

A key finding of this abstract is that there are a variety of factors that influence sustainable economic growth and, accordingly, policymakers should use different tools (including the above) to promote it. Further research should focus on the analysis of the role of regional disparities in economic growth (for example, using spatial econometric methods).

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STIMULATING BIOGAS PRODUCTION: ECONOMIC JUSTIFICATION*

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Biogas plants are specialised facilities designed to produce biogas through organic waste processing. Organic materials such as plant residues, solid waste, manure, and other biomass undergo biological decomposition in specific conditions where oxygen is absent. This process produces biogas, the main components of which are methane, carbon dioxide, hydrogen, and other gases. More details on the biogas production process can be seen in Figure 1 [1].

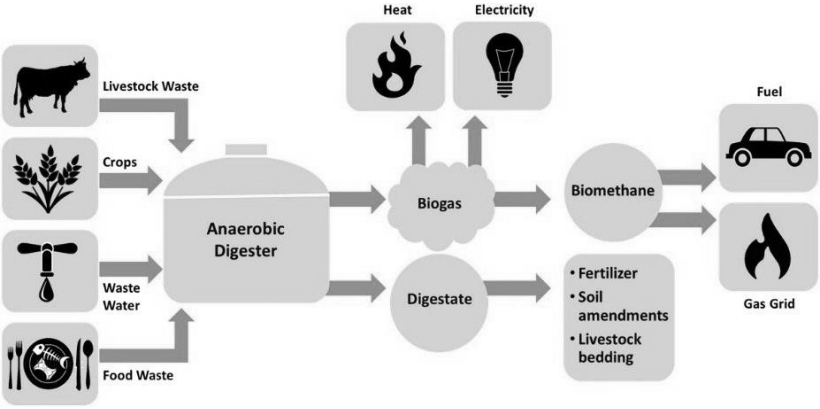

Fig. 1. The Process of Biogas Creation

The effective utilisation of organic waste in biogas plants enables its conversion into valuable fuel, which can be used for generating electricity and heat. This contributes to reducing costs associated with waste disposal, as they can be processed on-site. Biogas plants can have a significant impact on reducing greenhouse gas emissions. Utilising biogas as an energy source helps reduce methane emissions produced during the decomposition of organic waste. This makes biogas an effective tool in combating climate change.

The construction of biogas plants can also stimulate the development of the local economy by creating new job opportunities and promoting infrastructure development in the vicinity of the facilities. This can lead to attracting investments and fostering entrepreneurial activity in the region.

The efficiency of waste utilisation and the establishment of energy independence make constructing biogas plants a crucial step towards sustainable development and environmental resilience [2].

Additionally, the construction of such a plant reduces costs associated with waste disposal. Building a biogas plant allows the process of organic waste on-site,

enabling efficient utilisation of waste as an energy source and reducing the need for waste disposal to landfills or other disposal sites. Reducing waste disposal costs can significantly alleviate local governments' and businesses' financial and environmental burdens. This opens possibilities for reinvesting these funds into developing other sectors, such as infrastructure, education, and healthcare. Furthermore, reducing emissions through the efficient use of organic waste can also decrease environmental impact and improve air and soil quality in the region [4].

It can become a crucial step in implementing innovative waste management technologies and creating sustainable energy systems. By reducing waste disposal costs and simultaneously creating an efficient energy source, biogas plants can become a vital element in building a sustainable and environmentally friendly future.

Biogas plants play a crucial role in providing a sustainable renewable energy source. Utilising organic waste for biogas production allows for closing the loop of resource utilisation and reducing dependence on unstable energy sources such as coal or oil. Establishing a sustainable energy source is a crucial aspect of developing modern energy systems, which need to be environmentally clean and efficient [6].

The construction of biogas facilities can stimulate local economic development by creating new job opportunities and providing additional income for local businesses and service providers. Additionally, investments in the construction and operation of biogas plants can contribute to infrastructure development and improve the overall quality of life in the region.

The analysis of the economic viability of building a biogas plant can reveal its potential for generating profit and ensuring compliance with environmental standards. The reduction in costs associated with waste disposal and the utilisation of organic waste, along with creating a sustainable energy source, can make biogas plants economically viable investment projects.

Utilising biogas as an energy source can contribute to reducing greenhouse gas emissions and minimising the impact on the environment. Additionally, the efficient use of organic waste helps conserve natural resources and reduces the adverse effects on ecosystems [3].

In summary, constructing a biogas plant can offer significant economic and environmental advantages. From the perspectives of financial feasibility and job creation to reducing greenhouse gas emissions and preserving natural resources, these projects can represent a step towards sustainable development and environmental resilience. Integrating such technologies into production processes can improve the quality of life and ensure energy independence in various regions.

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DEVELOPMENT OF REMOTE EMPLOYMENT AS A RESPONSE TO MODERN SOCIAL CHALLENGES IN UKRAINE

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Remote work is becoming increasingly relevant for Ukraine amidst the challenges of recent years, such as the COVID-19 pandemic, full-scale war on the country's territory, and the resulting relocation of many businesses and workers. These factors have influenced the nature of labor processes and the interaction of their participants, prompting many domestic companies to reconsider their strategies and approaches to work.

The first impetus for remote work development in Ukraine was the COVID-19 pandemic, which started in 2020. Associated quarantine restrictions forced businesses to transition their employees to remote work, creating conditions for its rapid development. Workgroups that previously worked together in offices were now forced to communicate and coordinate their activities through video conferences and online platforms.

The second precondition for the activation of remote work was the beginning of Russia's full-scale invasion of Ukraine in February 2022. A large number of people who worked in conflict zones were forced to migrate and seek employment in other regions of the country or abroad; many businesses had to change their locations. Remote work allowed both employers and employees to preserve some jobs with or without the need to relocate companies.

In the conditions of martial law, remote work has numerous advantages. Firstly, it potentially increases the safety of workers, who have the opportunity to work in a secure location and organize their work environment based on individual needs. Additionally, remote work enhances schedule flexibility and allows people to work from anywhere in the world, making it particularly convenient for individuals who need to relocate due to war or other life circumstances.

Remote work also increases the level of inclusivity in society by allowing veterans and people with disabilities to find employment and provide themselves with a decent standard of living. It contributes to the development of social and solidarity economy by creating opportunities for building local businesses in cities and villages, overcoming any territorial restrictions.

The growth of inclusivity in Ukrainian society, considering the increase in the scale of disabilities among the civilian population and military personnel, as well as the rising number of veterans due to the war, is a pressing demand of today. Therefore, the development of remote employment for these vulnerable social categories will increase their involvement in public life, provide them with job opportunities for learning and retraining, and sources of stable income. The development of a social and solidarity economy based on digital technologies is

essential in this regard, as its entities, addressing local development issues, best meet the needs of an inclusive society.

In this context, firstly, an important step is the state and local support for the creation of specialized social enterprises and cooperatives that involve people with disabilities and veterans in employment. Thanks to this, these population groups can play an active role in production processes and receive stable income through remote employment mechanisms. Such enterprises can specialize in the production of goods or the provision of services that meet the needs of the target audience and allow them to realize their potential.

Secondly, an important element of local development of social and solidarity economy is the creation of special programs and initiatives for the professional training and support of people with disabilities and veterans, primarily involving information technologies and distance education. This may include training in skills necessary for work in specific economic sectors, as well as providing consultations and financial support for the creation of own businesses or social projects.

Thirdly, it is important to develop mechanisms of social entrepreneurship that contribute to solving social problems and supporting vulnerable population groups, including people with disabilities and veterans. This can be achieved through the establishment of funds or crowdfunding platforms that provide financial and informational support to social enterprises and projects aimed at supporting the target audience, including the use of distance technologies.

Overall, the development of the social and solidarity economy in regions, cities, and towns of Ukraine depends on the effective implementation of various measures aimed at supporting and integrating people with disabilities and veterans. This will contribute to the creation of a more inclusive and fair society, where every person has the opportunity to realize her/his potential and participate in the economic and social life of the community. In this case, physical or mental disabilities will not be a sentence but rather a different opportunity to realize personal potential in activities that will be beneficial both to the individual and to society as a whole.

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SHAPING THE DECARBONIZED FUTURE OF THE ELECTRICITY INDUSTRY IN UKRAINE

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Today, the primary goal for many nations is to attain carbon neutrality by transitioning to green power. Since technologies using renewable energy sources convert energy mostly into electric power, the national electricity sectors are expected to be the locomotive of the green energy transformation. Therefore, numerous recent research studies delve into renewable energy sources matters within the electricity sector, aiming to establish a carbon-neutral blueprint for this industry across various nations.

Ukraine urgently needs to transition to green power due to its heavy reliance on energy imports, high energy and carbon intensity of the gross domestic product, and mounting challenges with electricity supply exacerbated by the destruction of domestic electricity infrastructure because of the ongoing Russian-Ukrainian war. Within its international commitments [1; 2], Ukraine should achieve carbon neutrality by 2060 and has formulated a national strategy to address this objective.

Amid the ongoing hostilities, the future of the United Energy System of Ukraine is becoming increasingly uncertain. This casts doubt on the viability of current energy system models and strategies [3; 4], necessitating updated solutions for rebuilding the United Energy System of Ukraine in the post-war era. Consequently, the research endeavors to propose cost-effective scenarios for the development of the electricity sector of Ukraine by 2035, considering various constraints on the available electricity technologies in the market. These scenarios aim to align with national decarbonization targets.

In our research, we simulated the United Energy System of Ukraine in 2035 using the spatial and regional EXPANSE model, which was customized for Ukraine [5; 6; 7]. Previous studies that modeled the national electricity industry typically employed macro models like TIMES-UKRAINE and constructed scenarios for the entire national economy and its key sectors [3; 4]. In contrast, the UKRAINE_EXPANSE model diverges from TIMES-UKRAINE by capturing the regional distribution of the facilities of the United Energy System of Ukraine. This enables a regional examination of generation, storage, and transmission technologies, along with an evaluation of their social, economic, and environmental repercussions.

Besides Ukraine, the newly built model encompasses five neighboring countries (Poland, Romania, Slovakia, Moldova, and Hungary), represented as single-country nodes, and 24 administrative regions of Ukraine (excluding Crimea and the territories in Donbas occupied by Russia in 2014), connected to 11 nodes.

Within the model, we involved 17 electricity generation technologies (including onshore and offshore wind, solar power, biogas, wood biomass, agricultural and municipal waste, energy crops, small hydro, run-of-the-river, hydro dams, geothermal, gas, coal, lignite, oil, and nuclear energy), along with three storage technologies (pumped hydro storage, hydrogen, and batteries), and two transmission technologies (direct current for neighboring countries and alternating current for Ukraine's domestic lines).

12 cost-optimal scenarios for the United Energy System of Ukraine and five neighboring countries in 2035 were developed. These scenarios used combinations of constraints on the utilization of nuclear, coal, renewable energy resources (solar and wind), hydro dam, and pumped hydro storage technologies, as well as greenhouse gas emissions, as outlined in the country's commitments [1; 2].

For each scenario, there were computed the total installed capacities of electricity generation, storage and transmission technologies in 2035, considering the projected power demand for Ukraine and neighboring countries. Subsequently, we determined the annual electricity volumes generated by these technologies in 2035, along with the composition of the annual electricity technology mix, export and import flows for Ukraine. Additionally, we evaluated overall air pollution emissions, annualized direct electricity sector jobs, direct land use, and total system costs associated with each scenario.

The examination reveals a decrease in the total installed capacity across all scenarios in 2035, attributable to the rationalization of capacity structure, despite the growth of domestic electricity demand by 25%. While the combination of nuclear and coal capacities prevails, solar, onshore wind, hydro dam, and pumped hydro storage facilities play a significant role too, along with gas and offshore wind having less weight. Choosing any scenario will keep a large share (46-75%) of fossil fuels in the domestic electricity industry in 2035, including nuclear, coal, and gas in different proportions.

All scenarios adhere to the current pattern of the electricity generation mix, predominantly featuring nuclear and coal. Consequently, by 2035, Ukraine will persist in prioritizing nuclear power while scaling back coal capacity in alignment with national decarbonization objectives. Disregarding these targets would perpetuate coal as the primary resource for electricity generation due to its economic viability, even amidst some renewable energy sources development in line with established green power objectives. However, fulfilling national decarbonization plans necessitates embracing an alternative ecologically optimal option and allocating up to 14% more funds.

In addition to coal and nuclear, the notable components in the electricity generation mix will be hydro dams, solar, onshore wind, gas, and pumped hydro storage. However, their contribution is significantly lower compared to the combined outputs of coal and nuclear power. Scenarios featuring a decreased share of coal necessitate higher costs and larger land areas for accommodating electricity

installations. Nonetheless, they are expected to generate more employment opportunities in the sector and lead to reduced greenhouse gas emissions.

The rise in electricity demand projected for 2035 requires expanding domestic grids primarily in central regions of Ukraine across all scenarios. The expanded nuclear and renewable power generation leads to increased export volumes in the respective scenarios, driven by the reduced flexibility of energy production with these technologies. Consequently, to maintain balance in the United Energy System of Ukraine, electricity imports will also increase, albeit to a lesser degree than exports. As a result, all scenarios call for an expansion of the capacity of transborder transmission grids connecting Western Ukraine with its five neighboring countries.

Overall, the UKRAINE_EXPANSE model introduces a novel methodology for analyzing regional energy systems, with a particular emphasis on the electricity sector, its sustainable development, and the transition to green power. However, the focus on the electricity sector is an advantage of the study and, at the same time, its limitation. Other restraints include pre-war data used to build the model and the time horizon limited by 2035 that should be acknowledged when considering policy implications.

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COST-EFFICIENT AND GREEN: TRANSFORMING HOUSEHOLD HEATING IN UKRAINE FOR A SUSTAINABLE FUTURE

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Heating costs present a significant portion of household expenditures in Ukraine, exacerbating energy poverty, particularly in wartime conditions. Moreover, the residential sector consumes approximately 40% of the country's power resources, with the majority being allocated to heating processes. Given the low energy efficiency of residential buildings, the relatively long heating season of 5-6 months, and the predominant use of fossil fuels in private heating systems, the potential for decarbonizing Ukrainian households' heating processes is significant [2; 3]. From this perspective, a pressing task is to research and develop cost-optimal and environmentally friendly strategies for residential heating systems to promote sustainable development and enhance energy efficiency in the sector.

To determine cost-optimal household heating strategies, we evaluated the total operating costs of a private home heating system using a typical Ukrainian household located in Sumy, in the northeast of Ukraine. This region experiences the lowest ambient air temperatures during the coldest five-day period within the heating season in the country. We considered a private house with autonomous heating, covering an area of 120 m2 and having a heat load of 8.4 kW. We explored the possibilities of heating using various energy carriers, including natural gas (a gas boiler), coal, firewood, wood pellets, wood briquettes (a solid fuel boiler) and electricity (a heat pump and an electric boiler). We assumed that application of every energy carrier does not require essential modernization of the heating system. In our assessment, we factored in the running costs of different energy carriers for heating, as well as expenses related to purchasing, transportation, installation, and maintenance of equipment, electricity supply connection fees, and additional fixed costs for powering the equipment. Additionally, we considered the influence of climatic zones and their ambient air temperature fluctuations during a heating season, multi-zone electricity tariffs, and the potential for heating automation when determining hating options.

The calculations conducted revealed that the most cost-effective option, aimed at minimizing total household expenses, is utilizing firewood for heating throughout the entire heating season, primarily due to the affordability of this resource. The second most economical choice (with costs 47% higher) is natural gas, attributed to the preferential pricing for this power source offered to the population in Ukraine. Conversely, the most expensive heating option, surpassing the costs of firewood usage by 3.3 times, is the utilization of wood pellets, primarily due to their higher purchase price and equipment costs (wood pellet boilers). Comparatively, expenses are lower for employing electricity (-6% for

electric boilers and -8% for heat pumps) and coal (-7%). The elevated expenditures for these energy sources stem from factors such as high coal and electricity prices (for electric boilers) and equipment costs (for heat pumps).

Consequently, under prevailing market conditions, the cost-optimal strategies for households in the northeastern region of Ukraine involve giving preference to firewood heating or natural gas (particularly favored for its potential automation of the heating process). In instances where there are constraints on gas supply, alternative albeit pricier options include electricity or coal. As a result, the existing state policy regarding power supply for the private residential sector incentivizes maximum utilization of firewood and natural gas by the population for heating purposes. Given that firewood is a renewable resource, its household use does not result in additional CO2 emissions. However, the inability to automate the heating process at affordable investment costs while using firewood often leads homes to favor natural gas, despite its limited domestic reserves in Ukraine. This cost disparity slows down the decarbonization processes within the residential sector.

Continuing the current state policy will maintain a heavy reliance of the residential sector on natural gas for heating, while also leading to an increased use of firewood due to declining incomes among Ukrainians. However, amidst the ongoing war, centralized gas networks frequently become targets for shelling, heightening the security risks associated with gas supply for households. Hence, expediting the transition to renewable energy sources that offer full autonomy for home heating systems and contribute to the decarbonization of the residential sector is imperative. Achieving this goal will necessitate significant changes in economic policy within the sector.

Given the high cost of pellet boilers, which are domestically manufactured in Ukraine using imported components, it is advisable to provide state economic support to local boiler equipment manufacturers. Additionally, introducing partial reimbursement schemes for households adopting pellet boilers, akin to the pre-war "warm credit" program [1], combined with compensations at both state and local levels, is recommended. To overcome financial barriers, an important aspect of policy should involve implementing subsidies for low-income households that utilize wood pellets and briquettes for heating.

Considering the current high expenses associated with heat pump systems, it is pertinent to renew and expand state investment support for such initiatives through partial compensation mechanisms for heat pump installation costs. Since electricity is essential for operating heat pumps, developing of distributed electricity generation, including regional grids of small-scale power plants utilizing green energy sources, is necessary. Addressing the escalating electricity demand for heating purposes requires the concurrent development of industrial wind power generation and household thermal energy storage systems. Hence, partial state compensations for procuring and installing these technologies are essential.

A crucial step to promote heat pumps in Ukraine is to maintain a two-rate electricity tariff for homes, effectively reducing their current electricity expenses for heating and incentivizing the adoption of green energy technologies. Conversely, it is imperative to reassess the state-subsidized gas prices for the population, elevating them to economically justified levels to remove gas from the roster of the most cost-effective energy sources for heating private residences. However, considering the prevalent energy poverty among a significant portion of Ukrainian households, exacerbated by the ongoing conflict, any increase in gas prices should be accompanied by state economic support schemes for the utilization of green energy technologies in heating. Given that certain types of energy-efficient heating equipment or their components, such as heat pumps, are not domestically manufactured or lack domestic counterparts in Ukraine, introducing customs privileges to incentivize the import of such products is advisable.

While the conducted research provides essential insights for refining energy policy in the residential heating sector, it does have certain limitations. The latter are associated with the potential opportunities for the combined use of various types of energy carriers in household heating systems. Therefore, conducting further research to broaden the spectrum of utilized energy carriers is needed. Additionally, promising avenues for research include the integration of domestic solar and wind energy systems for generating green electricity and their utilization for heating purposes, modernization of residential buildings based on the principle of zero energy consumption, etc.

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FROM THE LANGUAGE THAT SUSTAINS TO THE LANGUAGE OF SUSTAINABLE DEVELOPMENT

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Sustainable development is about the future, which starts now. It is about the preservation of resources, tangible (nature, mineral resources) and intangible (cultural heritage, language). Just as in the general sustainability framework we think and act in ways intended not to destroy the biospheric context and intended to save the natural resources we depend on. We want to develop ourselves and intercommunicate with each other without destroying the linguistic and cultural resources that identify us.

As far as sustainable development has three dimensions – environmental sustainability, economic sustainability, and social sustainability, all three dimensions must implement the principles of intergenerational justice (WCED). The pursuit of a sustainable future should encourage joint efforts. It shouldn't just be about using "pitiful pictures of polar bears" and faceless statistics from scientific reports. There is a need to spread the word that climate change catastrophes and related tragedies are humanitarian issues. In this context, language itself is a way to overcome the gap between accumulated knowledge and humanity [6].

The concept of sustainability comes from the tradition of referring to economic development that almost totally overlooks other spheres of life, in particular, linguistics. Recognizing the need for synergy, we need to transfer ideas of sustainability into the language field and combine economic, environmental, cultural, and linguistic competencies, that is to sketch a newly emerging branch of linguistics – sustainable linguistics. Though, some questions arise. What should it deal with? Is it about language preservation or the role of language in promoting sustainable development?

First, let's consider the significance of language in sustaining nations, communities, and linguacultural groups in times of multilingualism. Language is important for the formation of a sense of belonging, it shapes the thinking, beliefs, and thoughts of both an individual and a community, it also enables the exchange of information by members of society and helps them express their collective identity.

In Ukraine, we know it better than any other nation as the language is what unites and sustains us in times of war. Thus, the war became the trigger for language sustainability. Since the end of February 2022, the Ukrainian language has become the language of the united Ukrainian people, the language of national and civil unity, the language of identity, the language of resistance to Russian aggression, the language that is a marker of "friend", a secret code, incomprehensible to the enemy.

Thus, 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. The sustainability of the language in generations depends on the motivation of parents to pass on the language to their children, that is, to communicate with them in this language from birth [3].

The formation of a sustainable language should be a process of gradual transformation from the current model of the linguistic organization of the human species, the purpose of which was that the collective bilingualism or polyglotism of people required the abandonment of their languages by various cultural groups [1].

Another point I would like to consider is the meta-language of sustainable development. From a linguistic perspective, the study of the terminology of sustainable development (S-terms) and ways of its translation into other languages (in my case, Ukrainian) is becoming more and more relevant.

In the context of Ukraine's integration into the world economic community and joining the strategy of sustainable development, the number of texts on economic issues and issues of sustainability, which are of great interest to Ukrainian-speaking readers, is constantly increasing. Therefore, from a linguistic perspective, the study of the English terminology of sustainable development (S-terms) and ways of its translation into the Ukrainian language is becoming more and more relevant. The dynamics of the development of the world economy and the international digital market are reflected at the linguistic level, forming incomparable terminological units that are either a completely new phenomenon in the Ukrainian language or have not yet been sufficiently developed and described by scientists.

The adjective “sustainable” («*сталий*») (fixed in about 1727) and the noun “sustainability” («*сталість*») is derived from the verb "to sustain" («*підтримувати*»), which is interpreted as 1) to cause or allow something to continue for some time; 2) to keep alive (4). Only the first meaning can be used in this context.

The term “sustainable development” («*сталий розвиток*») was coined after the UN commission headed by Gro Harlem Brundtland (former Prime Minister of Norway) published the report “Our Common Future” in 1987, in which this concept was defined as the development of a society that satisfies needs of the present without sacrificing the ability of future generations to meet their own needs. The concept of “sustainable development” means the development of society without growth or qualitative improvement without quantitative increase.

Many Ukrainian scientists, educators, and experts also use the term “balanced development” («*збалансований розвиток*») as something that better corresponds to the essentiality of development as a process of change with the maintenance of an ecological, economic, and social balance. However, the translation of the term “sustainable development” as «*сталий*» is a linguistic

nonsense because there simply cannot be stable, balanced, or sustainable development – if there is development, then there is no sustainability or balance. It should be noted that the search for exact equivalents of these English terms is a problem not only for Ukrainian but also for other languages.

The expression “sustainable development” is difficult to briefly translate into the Ukrainian language – it means acceptable development or by the state of Nature and its laws (literally, it is sustainable development, that is, the development of society, which can last as long as you like). Its authors had this content in mind. It is the term *«сталий розвиток»* that is officially recognized in Ukraine as the equivalent of the English term. Even the state concept of sustainable development appeared [4].

Localization of S-terms is needed as cultural nuances of language are important for different approaches and attitudes toward sustainable development to be compatible in another country. Thus, there are more than a dozen Ukrainian words and phrases equivalent to "sustainable development" used in different spheres. The diversity lies in the variety of translations of the word "sustainable". However, none of the options is adequate for the English "sustainable development".

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GAMIFYING SUSTAINABILITY EDUCATION FOR CULTURALLY DIVERSE CLASSROOMS

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Sustainable development, while encompassing environmental and economic considerations, remains incomplete without addressing its social and cultural aspects. The entire issue of sustainable development centres around inter- and intergenerational equity anchored essentially on three-dimensional distinct but interconnected pillars, namely the environment, economy, and society. Decision-makers need to be constantly mindful of the relationships, complementarities, and trade-offs among these pillars and ensure responsible human behavior and actions at the international, national, community and individual levels in order to uphold and promote the tenets of this paradigm in the interest of human development [1]. That is why seventeen global Sustainable Development Goals were created. Among them, it is impossible to single out one or more of the most important ones, as they are interconnected and equally important for the well-being and prosperity of humanity.

Achieving the goals set in the scope of Sustainable Devepment Goals-4 is also of great importance in terms of achieving other Sustainable Development Goals. Along with literacy and access to primary education, higher educational institutions are considered to be highly infuential in achieving sustainable development, with a social responsibility to bring forth a setting that cultivates sustainable development amidst their students and communities [3]. The lack of educational opportunities in a particular region, the lack of professional and personal skills of people, has an impact on the further development of the region as a whole. So, investing in people is of great importance for faster economic developments. The contribution to the younger generation and their education about sustainable development is especially valuable, so that from an early age children understand the importance of achieving Sustainable Development Goals and learn to overcome difficulties during their school years to ensure the future of the entire planet.

Sustainable development issues are growing in importance in society. That is why every year an increasing number of people, including students and school children, are trying to draw attention to this topic. However, in culturally diverse environments, traditional teaching methods are often insufficient to engage students from different linguistic and cultural backgrounds. But it can be challenging to engage students with the usual lectures and traditional teaching methods. So, in this context, gamification, the application of game design

principles in non-game contexts, is gaining attention as a strategy to improve learning outcomes and motivation. This approach will help teachers keep their students' attention for much longer than usual, practice developing their own creativity, and build trusting relationships with students by becoming part of a team.

The gamification of sustainability education offers a unique opportunity for engaging learners through immersive and interactive experiences. By incorporating game elements such as challenges, rewards, and competition, educators can captivate the attention of participants and encourage them to actively participate in their own learning journey [2]. In addition, this type of learning will create a healthy spirit of competition among students, who for each completed task will be able to receive points, badges, or additional resources to use in order to create an ideal sustainable city or zone. Or create a classroom transformed into a virtual ecosystem, with students collaborating on challenges to conserve resources and earn "green points" for their team. When students feel that the future of the entire planet depends on their knowledge and decisions, it makes them more responsible for accepting those decisions, even if it only affects the course of the game proposed by the teacher. The very opportunity to feel like an adult, to be responsible for their own actions and deeds, gives students a sense of activity and involvement. In addition, in the form of a game, children gain life experience that they can draw on in their future life to make it more environmentally conscious and safe for the environment. The intrinsic motivation derived from gamified experiences can lead to prolonged engagement, making it a potent tool for instilling lasting behavioural changes towards more sustainable practices.

Or another version of the language game, where children have to imagine themselves as speakers at an international forum on sustainable development and present their report using all the necessary knowledge, vocabulary, public speaking skills and convince the audience (their classmates and teacher) of the importance of the topic. This game can be used both in foreign language classes with older and more confident students (to practice the necessary grammar and vocabulary and improve speaking and listening skills) and in native language classes with students of any age. Another variation of the game is debates, which are usually eagerly participated in by children.

To show students that environmental challenges exist in every region of the world, a good solution is to organize a virtual trip around the world where students will face challenges and scenarios related to sustainable development in different regions. First, it will provide additional background knowledge about countries and their cultures, which is important in today's world. Secondly, they will be able to visually assess the scale of the problem and realize that only by uniting people around the world will they have a chance to implement the Sustainable Development Goals. Thirdly, students have to express their own proposals for solving these challenges, which will develop their communication skills. If the game is incorporated into a foreign language lesson, it will additionally give

students the opportunity to practice grammatical structures, vocabulary, and speaking skills. While the teacher's goal is to expand students' knowledge, the game can be enhanced with an element of sustainability education by adding interesting facts about how each region is trying to solve the problem. This will encourage students to critically evaluate the ideas already available, choose the best ones, and perfect them with their own innovative ideas. This gamified approach encourages students to explore diverse perspectives on sustainability and fosters a sense of global citizenship.

In addition to gaming elements during lessons, school authorities can introduce a series of game challenges that can unite students throughout the school. This is a great opportunity not only to teach more students, but also to connect them around a common and important topic. In this way, we can demonstrate how the coordinated cooperation of different generations can yield incredible results for our planet and the environment. This approach fosters teamwork, healthy competition, and real-world application of sustainability principles.

Thus, more needs to be done in terms of policies, education and regulation on social, economicand environmental resource management to ensure that everyone is sustainable development aware, conscious, cultured and compliant. Lack of learning opportunities hinders social, economic and sustainable development, as well as long-term stability and peace. And gamification of the educational space is one of the instrument could be used to achive one of the seventeen goals of sustainable development good quality education. Since it aims to make learning more interesting for students regardless of the subject. Namely, the gamification of sustainable development education can draw the attention of students and young people of all ages to urgent and important problems of humanity and encourage them to use all the knowledge they have acquired during their studies to benefit their own future.

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KEY ELEMENTS OF SUCCESSFUL ESG POLICY: EUROPEAN EXPERIENCE

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The ESG (Environmental, Social, Governance) approach serves as a strategic response to contemporary social and environmental challenges, embodying a company's awareness, vision, and measures towards achieving sustainable development goals. Simultaneously, ESG policy is a communication tool with stakeholders and a determinant of the company's competitiveness.

Contemporary scholarly discourse predominantly centres on empirically substantiating the advantages inherent to ESG policies and strategies within business contexts. Scholars underscore the imperative and efficacy of integrating the ESG approach into corporate operations, highlighting its transformative influence on overall performance and its pivotal role in fostering sustainable development, enhancing risk mitigation, and bolstering long-term profitability. It is pertinent to underscore a notable lacuna: a need for more research that delves into the experiential insights garnered from specific companies in crafting and executing ESG strategies.

This study aims to delineate the principal components of ESG policy and strategy – namely, vision, values, and goals – through an in-depth examination (textual analysis) of successful ESG companies' practices. To this end, ten leading European companies were selected based on their ESG ratings by Sustainalytics (Table 1), and information regarding their sustainability vision, goals, and values was collected. Textual analysis was conducted using Voyant-tools.org v. 2.6.13 [1].

The textual analysis of ESG policies of successful European companies has unveiled key components integral to a robust ESG strategy. Companies leading in ESG performance consistently underscore sustainability goals, encompassing social and environmental aspects alongside related impacts, measures, policies, and internal commitments. These policies firmly align the company's activities with principles of sustainable development, emphasising the value of sustainability, business impact, carbon emissions, and climate change mitigation efforts. Moreover, companies articulate their role, responsibilities, and obligations while engaging stakeholders and prioritising employee welfare. Corporate culture and management practices also emerge as focal points within successful ESG policies. However, the analysis reveals the diverse and multifaceted nature of ESG policies, reflecting industry-specific nuances concerning responsibility, stakeholder engagement, impacts, and environmental and social goals. Counteracting climate change is also pivotal, impacting the strategy's industry-specific considerations and formulations.

Table 1 – Main characteristics of companies under the study

Company	Industry	Country	ESG risk rating
3i Group Plc https://www.3i.com/#	Diversified Financials	**United Kingdom**	10.4 (low)
ABANCA CB SA https://www.abancacorporacionbancaria.com/en	Banks	**Spain**	6.7 (Negligible)
Abertis Infraestructuras SA https://www.abertis.com/	Transportation Infrastructure	**Spain**	7.1 (Negligible)
Accenture Plc https://www.accenture.com/	Software & Services	Ireland	9.8 (Negligible)
Ackermans & van Haaren NV https://www.avh.be/en	Diversified Financials	Belgium	7.6 (Negligible)
Adecco Group AG https://www.adeccogroup.com	Commercial Services	Switzerland	9.1 (Negligible)
AEDAS Homes SA https://www.aedashomes.com/en/esg	Real Estate	**Spain**	10.9 (low)
Aedifica SA https://aedifica.eu/	Real Estate	Belgium	11.0 (low)
Aena S.M.E. SA https://www.aena.es/	Transportation Infrastructure	Spain	10.1 (low)
Amer Sports Oy https://www.amersports.com	Consumer Durables	Finland	10.4 (low)

Source: Sustainalytics Data [2]

Finally, the absence of a one-size-fits-all solution is evident, and it underscores the necessity for further research in this domain, particularly in identifying industry-specific aspects of ESG policies.

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THE IMPACT OF DIGITAL ECONOMY ON THE EFFICIENCY OF GREEN TRANSFORMATION IN CHINESE CITIES

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With the continuous promotion of China's ecological civilization construction, green development has become a key focus of overall work. Promoting green and low-carbon economic and social development is a key link to achieving high-quality development. With the tightening of resource and environmental constraints, the problems of imbalanced, uncoordinated, and unsustainable development in China have become prominent. Traditional development models are no longer able to adapt to the current development situation. Under the pressure of continuously strengthening resource constraints and increasing environmental protection requirements, cities urgently need to solve the problem of coordinated development of economy, resources, and environment. Obtaining maximum economic and social benefits with minimal resource and environmental costs, forming a green production and lifestyle, establishing a sound green circular development economic system, and promoting comprehensive green transformation of economic and social development are the fundamental strategies to solve China's ecological and environmental problems. On this basis, the efficiency of green transformation has become a key indicator for evaluating the impact of economic growth on the ecological environment, reflecting the dynamic balance between the ecological environment and human development, providing quantifiable new standards for green development, indicating that economic growth is no longer at the cost of consuming a large amount of resources and damaging the ecological environment, but is moving towards a stage of harmonious coexistence between humans and the natural environment.

The Asia Digital Economy Report released by the Boao Forum for Asia on December 21, 2023 shows that China's digital economy is far ahead, reaching $7.47 trillion in 2022, with a nominal year-on-year growth of 10.3% and accounting for 41.5% of China's GDP. Currently, the digital economy has become one of the important engines driving economic growth, and digital technologies such as big data, cloud computing, and blockchain are becoming key forces for transforming old and new driving forces and restructuring global factor resources. The National Data Administration has released the "Three Year Action Plan for Data Elements (2024-2026)", which proposes to fully tap into the value of data elements and activate their potential. Data elements are the core of the digital economy and an important foundation for digitization, networking, and intelligence. The launch of the Action Plan conforms to the inherent needs of China's booming digital economy and will shape a good development pattern for the digital economy. The digital economy has played a huge role in the high-

quality process of the economy, providing key support for green economic development by improving resource utilization efficiency, reducing carbon emissions, promoting renewable energy development, and promoting circular economy. It breaks the traditional high pollution economic growth model and is consistent with the emphasis on creating greater economic benefits with fewer resources and environment in the concept of green transformation. This indicates that the digital economy can play a positive role in shaping the path of sustainable development.

At present, China's digital economy is still in the process of continuous development, and there is no unified measurement standard for the efficiency of urban green transformation. The impact mechanism of the digital economy on the efficiency of urban green transformation is not yet unified, and related research is relatively lagging behind. There are mainly two limitations: first, existing literature mainly focuses on measuring the efficiency of urban green transformation in some regions, such as the Yangtze River Delta region [1] and the Beijing Tianjin Hebei urban agglomeration [2]. The research area of urban green transformation efficiency is relatively one-sided, lacking measurement and related analysis of the efficiency of urban green transformation nationwide. Secondly, the digital economy has a promoting effect on various aspects of urban green transformation and development. Existing literature mainly focuses on the digital economy's impact on urban green development [3; 5], urban green innovation and development [4; 6], and some studies have explored the relationship between the digital economy and urban green transformation [7; 8]. It is proposed that the digital economy can improve overall energy efficiency by promoting industrial production mode transformation (Li Guanghao et al., 2021), optimizing resource allocation, upgrading industries [9], and promoting energy conservation and emission reduction in the digital industry. Utilizing efficiency [10] to promote urban green transformation, but lacking research on the impact of the digital economy on the efficiency of urban green transformation. The mechanism of the relationship between the digital economy and the efficiency of urban green transformation needs to be further explored.

In this context, clarifying the inherent connection between the digital economy and the efficiency of urban green transformation, revealing the theoretical mechanism of the digital economy on the efficiency of urban green transformation, and exploring the transmission path of the digital economy on the efficiency of urban green transformation in China are conducive to exploring the research of the digital economy on the green development of Chinese cities. The potential marginal contributions of this article include: firstly, drawing on existing literature, this article constructs an evaluation index system using data from 284 cities in China from 2011 to 2021 to measure the development level of digital economy and urban green transformation efficiency in various cities in China, and analyzes the differences in urban green transformation efficiency between different regions; Secondly, empirical analysis is conducted to demonstrate the impact of the

digital economy on the efficiency of urban green transformation; Thirdly, this article introduces a moderating effect model within a unified framework to explore the path through which the digital economy affects the efficiency of urban green transformation, and tests the role of industrial structure upgrading in promoting the efficiency of urban green transformation through the digital economy, deepening existing literature.

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HARNESSING GENERATIVE ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE BUSINESS TRANSFORMATION

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One of the promising areas of digital transformation today is generative artificial intelligence with its significant potential for automation, personalization and optimization of business processes. It is important for companies that want to become leaders in their industries to start implementing it now, considering the goals of sustainable development. This will not only promote innovation, but also ensure long-term sustainability and responsible growth.

Analysis of current research and publications highlights the significant potential of generative artificial intelligence for both business advancement and sustainable initiatives. Researchers [1; 2; 3; 4] recognize GenAI as a strategic tool that can be used to create unique technologies for specific businesses, situations, and environments, solve complex problems, automate routine processes, and personalize products and services to promote sustainable consumption.

The study identifies and evaluates the potential advantages, challenges and opportunities of applying generative artificial intelligence in the context of digital business transformation, focusing on its adaptation to specific industry needs, which will contribute to increasing competitiveness and achieve the goals of sustainable development [5; 6].

Generative artificial intelligence plays an important role in sustainable development, offering new opportunities to solve the complex problems of the modern world. One of the key advantages of GenAI is its ability to think creatively and innovatively. It can generate new ideas, concepts and solutions that can contribute to the sustainable development. In particular, GenAI can help to achieve the goals of sustainable development through optimization of production processes, resource management and energy efficiency, as well as promote the development of new technologies with due regard to environmental and social aspects.

The implementation of GenAI can significantly affect the key goals of any company, which can be divided into two categories: those that are easily quantifiable and those that are more difficult to measure. GenAI can help companies increase revenue by personalizing marketing campaigns, developing new products and services, and optimizing prices. It can generate personalized marketing materials that meet the individual needs and preferences of each customer, new ideas for products and services that meet market needs and trends, analyze large amounts of data about the market and consumer behavior. GenAI is capable of saving the company money by automating routine tasks, increasing the

efficiency of supply chains, and reducing errors. Automating tasks such as data processing, information entry, and customer service will free up time and resources for more strategic tasks. Demand forecasting, production and distribution planning will help improve efficiency. The implementation of GenAI will reduce the number of errors that occur as a result of the human factor. GenAI analysis of data can reveal potential financial, security and reputational risks. It will help companies assess the likelihood and impact of risks, which will allow them to develop effective risk management strategies. Also, business can use GenAI capabilities to develop a risk mitigation strategy. Generative AI models can analyze data on the environmental impact of businesses and help make informed decisions about improving sustainability. For example, they can help in modeling the impact of different manufacturing processes or evaluating the effectiveness of energy conservation programs.

Prompts play a key role in AI text generation, providing models with direction and context to create relevant and meaningful content. In a business context, prompts can be used to generate sustainability reports, marketing materials, sustainability training materials, and other text formats. Increasing the amount of information used to train models may increase the cost of computing power and data storage, but it will also improve the quality and relevance of the results. Retrieval Augmented Generation is a methodology that combines generative AI models with information storage and retrieval systems. It allows AI models to access information from the real world, such as websites, documents, and databases, to improve the quality of the generated text. RAG accept AI models to use the latest and most reliable information, making the generated text more reliable and reasonable. Users can verify the validity of the model's claims by comparing them with the sources from which they were obtained. It helps reduce the likelihood of confidential information leakage because AI models are not trained on this data directly. This makes RAG a safer and more ethical approach to AI text generation. It can help reduce the need to constantly train an AI model on new data and update its parameters. This will save computational and financial resources and help reduce the carbon footprint associated with text generation through efficient use of the energy and resources typically spent on training and operating AI models. RAG allows AI models to use the latest and most reliable information, making the generated text more reliable and reasonable. Users can verify the validity of the model's claims by comparing them with the sources from which they were obtained. It helps reduce the likelihood of confidential information leakage because AI models are not trained on this data directly. This makes RAG a safer and more ethical approach to AI text generation. RAG can help reduce the need to constantly train an AI model on new data and update its parameters. This will save computational and financial resources and help reduce the carbon footprint associated with text generation through efficient use of the energy and resources typically spent on training and operating AI models. RAG uses data from the real world, so it's important to use it responsibly and ethically.

This includes protecting personal data and preventing data bias. It is important to make RAG algorithms transparent so that users can understand how the model arrived at certain conclusions and what factors influenced its decisions.

Along with the benefits, the implementation of GenAI in various business areas brings a number of challenges. GenAI models can generate text that is untrue or has no real-world validation. This phenomenon is called "hallucinations" and can lead to the spread of misinformation and errors. They can generate text that is grammatically correct and logical, but may not match the actual facts or context.

Generative artificial intelligence together with the technique of Retrieval-Augmented Generation is a powerful tool that can help companies transform their business, increase efficiency, optimize processes and promote sustainable development. In further research, it is important to focus on solving ethical issues related to the use of generative artificial intelligence in business, improving accuracy and expanding the possibilities of its application in economic activities.

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FUNCTIONING OF THE ENTERPRISE IN THE CONDITIONS OF WAR: SOCIO-ECONOMIC, ENERGY AND ENVIRONMENTAL CONSEQUENCES

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Entrepreneurship is one of the main driving forces of the modern economy, which contributes to the development of market relations, the creation of jobs and the stimulation of innovation. It covers a wide range of activities, from small and medium-sized businesses to large corporations, and plays a crucial role in ensuring economic growth and social stability. In the theoretical foundations of entrepreneurial activity, it is important to understand its essence, its importance for the economy, as well as success factors and risks that accompany this process [5; 6].

In today's conditions of globalization and digital transformation, entrepreneurial activity becomes even more significant, as it stimulates competitiveness and economic efficiency [7].

Management aspects of business in wartime include the need to quickly respond to external changes, adapt business processes, implement crisis management, and develop flexible strategies. In general, business management in wartime requires special approaches and strategies aimed at ensuring the stability and continuity of business operations.

War brings significant challenges to business that require special strategies and approaches to survive and function [1, 2, 3, 4]. Ukrainian businesses face challenges ranging from crumbling infrastructure to economic instability and declining purchasing power. In these conditions, it is important to understand how to adapt business activities to ensure its sustainability and development. War causes significant economic losses, social and ecological losses.

Managing a business in wartime is an extremely difficult task for entrepreneurs and managers. War creates numerous barriers that make it difficult for businesses to operate effectively, including political and economic instability, social and psychological problems for workers, infrastructure destruction, and a changing regulatory environment. Political and economic barriers, in particular, instability of the political situation (changes in legislation, introduction of economic sanctions, changes in tax restrictions). As a result, political instability also deters investors, limiting opportunities to raise capital. Economic barriers – loss of sales markets and suppliers, increase in production and logistics costs.

The social and psychological losses caused by the war are reflected in the morale of the workers. Constant stress, fear for one's life and that of loved ones, uncertainty about the future. In addition, the migration of the population, including

qualified personnel, who may leave dangerous areas or be mobilized into the army, which leads to a shortage of labor [2; 5; 6]

Physical and environmental losses, including destruction of infrastructure, damage to roads and bridges, destruction of power plants and damage to the environment.

To overcome these barriers, companies need to be flexible, quickly adapt to new conditions, invest in employee support and look for new sales markets and suppliers. Only under such conditions will the business be able to maintain viability and continue to develop in the extreme conditions of military operations.

Analysis of the problems of effective business management in wartime indicates the need for comprehensive management measures. The development of management measures is aimed at overcoming barriers to business functioning and ensuring its sustainability. The results of the study confirm the relevance of the topic and the importance of developing effective management strategies in conditions of war to ensure the stability and development of enterprises and can be used as a basis for further research.

Therefore, we proposed measures to improve the efficiency of enterprise management in order to eliminate or reduce losses that occur as a result of the war.

Businesses should systematically monitor any changes in legislation and regulatory requirements that may affect their operations. To do this, you can create a special department or use external consulting services and quickly respond to changes in the political environment, including by changing the business strategy or reorganizing activities. As well as the interaction of the enterprise with government structures and public organizations to influence political decisions related to their activities.

To eliminate the loss of key sales markets, we suggest considering the possibility of expanding the geography of your activity and attracting new sales markets. In addition, businesses may consider contracting with multiple suppliers for each type of raw material or material to cover themselves in the event of the loss of one of them.

Retention of qualified personnel is an important task for companies, as an insufficient number of employees and leading specialists can undermine the potential of the enterprise and complicate its operations. Therefore, we offer the following measures, in particular, firstly, to protect and motivate staff : the possibility of implementing staff retention and motivation programs that will allow you to retain key personnel and attract their participation in the company's activities; secondly, the development of internal potential : focus on the development of internal reserves and personnel potential to compensate for the loss of external personnel; thirdly, the creation of personnel reserves , which will allow to quickly replace lost employees and ensure the continuity of the enterprise.

The destruction of the infrastructure seriously complicates the functioning of the enterprise and leads to significant losses. Businesses must work with government agencies and other stakeholders to restore damaged infrastructure and

keep it functioning. Also, it is worth adding about overcoming ecological consequences in order to improve the environment. Enterprises, authorities and NGOs should act in cooperation, stimulate the use of modern technologies and innovations.

Overcoming barriers to business operation in military conditions requires a comprehensive approach and careful planning by the company's management. However, properly implemented measures can help businesses successfully cope with military conflicts and ensure the sustainability of their operations. It is advisable to systematically review and update contingency plans aimed at preventing the negative consequences of military actions on business.

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ECONOMIC, ECOLOGICAL AND RENEWABLE ENERGY ASPECTS OF PETROCHINA COMPANY ACTIVITY

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The world practice of managing enterprises, companies and corporations that have achieved significant economic indicators shows multiple examples of the application and use of business planning of economic processes. From the development of market relations and the influence of competitive forces, planning of economic processes of companies requires special attention [6; 7]. In today's conditions, China continues to develop rapidly and has a huge influence on the world market due to growing export volumes. The PRC exerts a significant influence on the development of foreign trade and the economies of other partner countries. That is why the pace and features of international cooperation determine and even more stimulate the development of business plans for companies.

Taking into account modern trends in the world environment, the term "Business planning" is quite popular and has relatively influential advantages. However, analyzing the economy of China, we can conclude that our country has its own views and differences in the process of developing business plans and organizing activities taking into account the requirements of a permanent BP. Yes, according to Carnegie Asia Program senior fellow Yukon Huang told FRONTLINE and NPR, *"The 'Chinese model' is a mixture of national control and ownership of resources and economic activity dominated by private entrepreneurs* ."[1]. Thus, the state has a substantial right to own and exercise control over energy resources and the financial system. However, taking into account the rapidly changing trends in the world and the external advantages of entering global markets, the Chinese government may delegate certain responsibilities in certain areas to other individuals or private companies. Here, attention should be paid to constant monitoring of the market, analysis and assessment of the state of the competitive environment, development of plans for the implementation of technical and innovative changes.

Taking into account the experience of European companies, domestic enterprises are trying to organize business planning, thus creating certain companies and even industries as national champions that begin to dominate the domestic economy. As a result, the prerequisites for the emergence of a specific Chinese economy with features of socialism or a socialist market economy are created.

According to the given international ranking among the countries of the world, which is published every year by the World Bank, the countries that have favorable conditions for business planning are listed. However, in some parameters

the countries do not occupy the first positions and sometimes not the best. Thus, China is above average (15 out of 28) for doing business, but below average (21 out of 28) in organizing and starting a business. This is primarily due to state control over certain spheres of business . Also, significant difficulties are observed in the payment of taxes, the value is 104 out of 190 of all countries participating in the survey. But the country has made significant progress in issuing building permits, with a value of 6 out of 28. However, taking into account the overall ranking of 190 countries, the value of China is considered the best. Therefore, it is to be hoped that the country's leadership will contribute to the development and improvement of business organization and increase the efficiency of business planning [2]

In the conditions of rapid economic development of Chinese companies, increasing the efficiency of operations and achieving competitiveness play a special role. However, it is important to consider that understanding what this efficiency and desired competitiveness depends on can lead to the achievement of the set goals. Therefore, a correctly chosen strategy of the company, corresponding volumes of production and provision of services ensure the maximum possible level of profitability. It is worth remembering that the company's activity is determined, first of all, by the economic situation, which can be influenced by macroeconomic factors, in particular, increased inflation, industry proportions and consumer demand, market conditions. It should also be added that increasing the efficiency of operations and achieving the company's competitiveness can be achieved by improving and/or expanding existing production facilities.

In this case, it is important to take into account the specifics of the production process and specialization for each specific company during business planning of companies.

Thus, in our work, we analyzed the activities of company in the oil refining industry in China. Special attention was paid to PetroChina , which was established in 1999. The main areas of the company's activities are focused on such areas as exploration, development and production of oil and natural gas, as well as processing, transportation and distribution of oil and oil products, petrochemical products and sale of natural gas. So, based on various qualifying areas of activity, the main divisions of PetroChina can be distinguished [3].

In addition, the company owns 22,800 gas stations, fuel sales for 2021 amounted to 163.3 million tons, of which 112.5 million tons — in China; the market share of the People's Republic of China is 35.3% [4]

This comparative dynamics was built on the basis of the financial data of the company. According to the diagram, it is clearly visible that the level of net profit and the level of the company's equity are independent values. Thus, the equity capital increases due to share contributions of shareholders and additional invested capital.

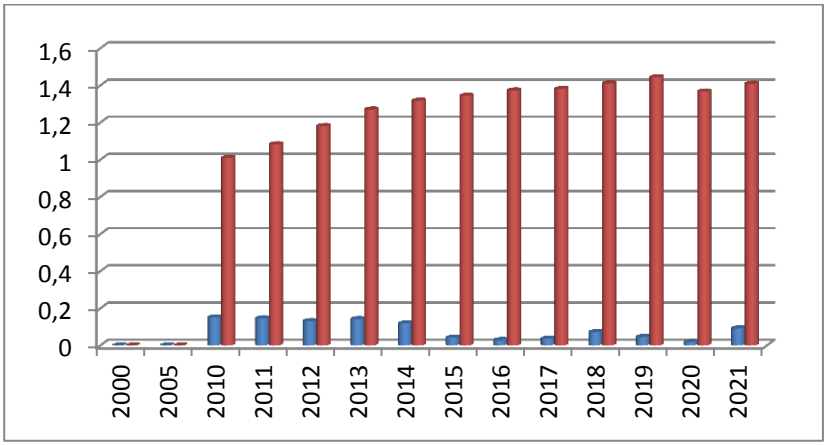

Figure 1 - Comparative dynamics of changes in net profit and equity indicators of the PetroChina company by year, billion yuan [3,4]

Having analyzed the Chinese company of the oil refining industry, it is worth noting that the development is in the direction of improvement and constant increase of profitability and efficiency of operations. PetroChina company have a strong potential for continuous economic growth and development, which creates for it economic stability and financial independence.

Thus, having strong economic potential, PetroChina directs significant investments for the development of environmentally-oriented projects with the aim of reducing carbon emissions to zero. It is planned to achieve the set goals by 2050. The management of the company directs significant capital investments in geothermal, wind and solar energy, as well as in pilot hydrogen projects. The company also plans to increase investments in solar and gas installations for electricity generation. During 2021-2025, the amount of investment was from 3-5 billion yuan per year to 10 billion yuan per year [5]

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RESTRUCTURING OF ECONOMIC SYSTEMS IN THE DIRECTION OF ENSURING SUSTAINABLE DEVELOPMENT

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From the announcement the concepts of sustainable development, especially after receiving independence Ukraine was actively involved in the process support and implementation given concepts into life. After carrying out conference in Rio de Janeiro, started an activation of soecific actions related to implementation ideas sustainable development in Ukraine. At first support ideas and principles of sustainable development took place at local levels through activity of non-governmental and public organizations. The process itself was not systematic and his activity was not small national coverage, however exactly thanks to hereby non-state organizations there was happening educational activities and familiarization population with ideas sustainable development.

If we talk about the problems of ensuring sustainable development at the level of regions, then we understand the socio-ecological-economic contradictions of social development that arise in the process of economic activity in specific territories. The main problems of ensuring the sustainable development of the regions of Ukraine depending on the sphere of their manifestation could be divided into three groups:

Economic nature: presence of significant socio-economic losses from environmental pollution; environmentally destructive activities of business entities; significant wear and tear of production assets; low efficiency of the economic mechanisms for providing SD;

Of a social nature: from the growth of ecologically caused morbidity of the population; territorial differences in the quality of life of the population according to ecological and economic indicators; low effectiveness of public organizations in providing SD ;

Environmental nature: increase in the number of emissions of harmful substances; reduction of biodiversity; rapid depletion of non-renewable natural resources.

Considering the complex economic, social and environmental problems faced by Ukrainian society in the conditions of a transitive economy, it is worth noting that they need to be solved simultaneously, without setting one or another preferential direction, depending on the degree of urgency of solving the problem. Postponing the solution of environmental problems and giving socio-economic development more advantages may lead to the fact that in the future all market

transformations and innovations may not be needed by anyone. A country that does not solve its environmental problems in the necessary way has no future, just as harmonious physical and spiritual development of a person in conditions of polluted air, water, and food is not possible.

Today, sustainable development is ensured by new achievements in social life, such as: horizontal distributed energy / digital networks, promotion of social economy, sustainable transportation systems, convergence technological processes, electrification of transport, cyberization of production, systematization of public institutions. The energy sector, in which 2/3 of the processes of harmful impact on the environment are generated, is a key area of solving the problems of sustainable transportation of the economy. Sustainable transportation of the energy complex is possible only if adequate transformations of the socio-economic system are carried out [1; 2]. The specified restructuring factors are called to improve the sustainable development of the energy system and start in general, achieving a general synergistic effect. The transition to renewable/alternative energy systems requires constant work and improvements.

The results of the conducted research allowed us to conclude that the need to implement the concept of sustainable development is determined by those prerequisites that have developed in modern business conditions. Among the main factors prompting a change in the forms of management can be named: the prevalence of the philosophy of consumption; demographic problems (reduction of population, also due to the war and migration) and deterioration of population health due to pollution; the predominance of the use of resource-destroying technologies in conditions of climate change; a decrease in biodiversity in nature, the emergence of new types of diseases; deterioration of food quality.

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TOURISM AS A WAY OF DEVELOPMENT AND INTEGRATION OF SUB-SAHARAN AFRICA

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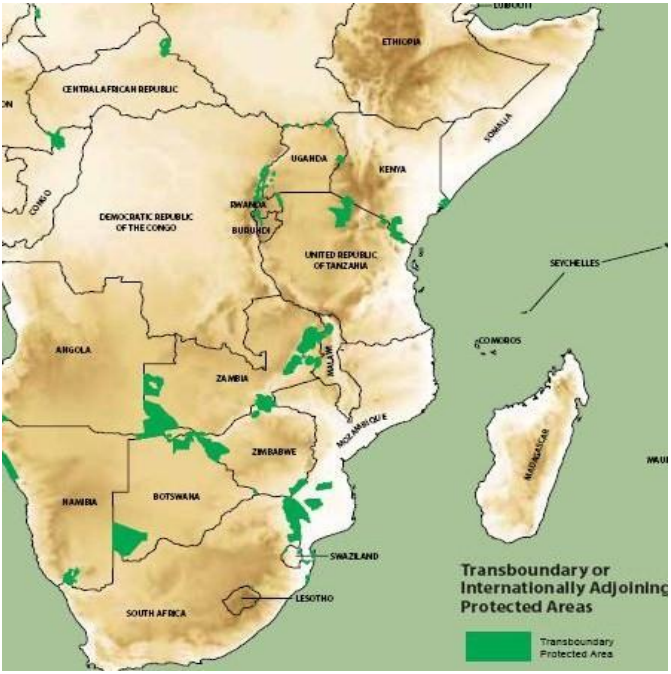
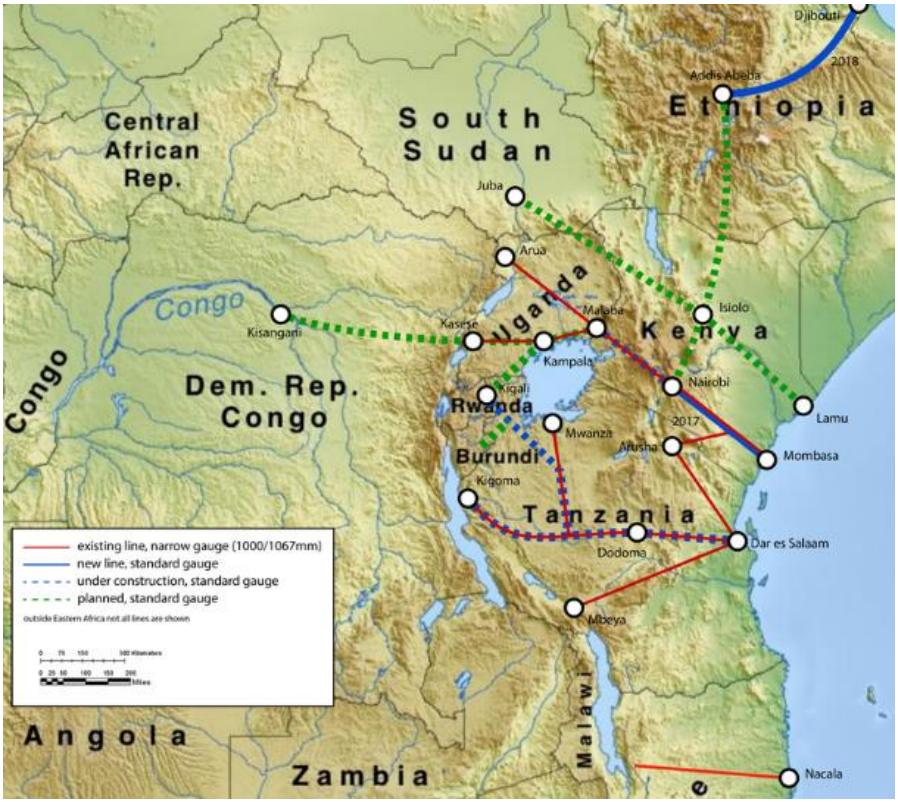
Africa is the least visited continent in terms of tourism movement. This is because of its poverty, poor tourist infrastructure, tropical diseases, insecurity and high prices of air tickets. However, despite of these factors, the interest in Africa is slowly growing. In Europe, during the last two decades, the number of tourist agencies specializing in so called exotic tours (including those to Africa) has grown, and the old ones still expand their offer. Because the European tourists visit mostly national parks and other protected areas, Africa should focus on the sustainable tourism and ecotourism. In my opinion Africa should expose the best it has – wildernesses – and facilitate an access to it for foreign tourists. One of the biggest obstacles in the virgin lands exploration is this that protected areas very often are located on the borders of two countries. Borders of the ecosystems do not overlap the political ones. Ideal solution would be to create transboundary parks.



Bilateral or multilateral agreements between countries in aim to minimize border-passing procedures would have an extremely positive effect on the future tourist's movement and integration of African countries. Such agreements would facilitate crossing the borders within transboundary protected areas, from one country to another, without any passport and visa formalities. I think that as the aftermath of solving this problem by involved countries, the number and the diversity of tourist offers would also increase. I am aware that this is a great enterprise and a great work to be done, but benefits would be much greater and it would speed up the regional integration. Another idea for African integration is the construction of transcontinental railways, which would lead to economic development, including tourism industry.



***Keywords*:** Tourism, transboundary parks, transcontinental railways, African integration.

ECOLOGICAL TRANSFORMATION: CURRENT TRENDS IN THE IMPLEMENTATION OF GREEN TECHNOLOGIES

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In today's world, the issue of sustainable development is becoming increasingly important in the context of global environmental challenges and limited resources. The purpose of this paper is to analyze the main trends in sustainable development that affect the economic, social and environmental aspects of society. The importance of this study lies in the need to identify effective strategies and practices that will help achieve balanced development, improve the quality of life and preserve natural resources for future generations. According to Solaris Market Research, in 2023 the global market for green technologies and sustainable development was estimated at USD 23.37 billion. It is projected to grow to USD 26.85 billion in 2024 and reach USD 121.05 billion by 2032. This indicates significant growth, showing a compound annual growth rate (CAGR) of 20.7% over the forecast period [1]. Given the projected growth in the size of the green technology and sustainability market, it becomes apparent that there is a need to closely monitor new trends in this area. Continuous tracking of these trends will allow business and policy strategies to be adapted, contributing to an effective response to changes in market conditions and consumer demands. This, in turn, will help to optimize resources and implement innovative solutions that meet the principles of sustainable development and environmental responsibility.

Renewable energy sources. Recent data from Climate Watch shows that total energy consumption is the main source of global greenhouse gas emissions, accounting for 73.2% of the total. This is the largest contributor to air pollution, while agriculture is second with 18.4% [2]. In this regard, it is clear that energy production is of high interest and shows significant progress in developing sustainable solutions. The goal of achieving zero net energy is to ensure that total energy consumption is offset by total renewable energy production [3]. This means that the total energy consumption does not exceed the amount of energy generated from environmentally friendly, renewable sources. According to the analytical company Ember, in 2022, global solar and wind energy production accounted for 12% of total energy consumption, which is 10% higher than in 2021 [4]. This indicates the possibility of further growth in both renewable energy production and this market.

Another technology that is seeing a rapid increase in interest is green hydrogen. This is a hydrogen fuel synthesized using energy from low-carbon sources such as wind and solar power when there is excess electricity production. In 2021, the global market for clean hydrogen was estimated at USD 3.2 billion. It is projected that from 2022 to 2030, this market will show an average annual growth rate of 39.5% [5].

The transportation industry is an important sub-sector of the energy industry, and according to Statista, it accounts for 20.7% of global carbon emissions [6]. Electric vehicles are leading the way in efforts to decarbonize the transportation sector. In 2022, the electric vehicle market included 34 models, while in the first quarter of 2023 this number increased to 42 models [7]. At the same time, there has been a significant increase in sales: in the first quarter of 2023, sales of electric vehicles increased by 44.9% compared to the same period in 2022 [8]. Today, electric vehicles account for 13% of the global automotive market, which indicates the growing popularity and importance of electric vehicles in the transition to more sustainable forms of mobility.

Data from the United Nations Environment Program indicate that construction and infrastructure contribute to nearly 39% of global carbon emissions. In 2021, this sector emitted 10 gigatons of carbon, which is 5% higher than in 2020 and 2% more than before the pandemic peak recorded in 2019 [9]. The Paris Agreement has set ambitious targets to reduce the energy intensity of buildings by 30% per square meter by 2030, and to achieve zero emissions for the entire construction industry by 2050 [10]. A McKinsey survey found that 53% of construction industry executives expect sustainability trends to accelerate in the coming years, while 10% said they have invested in sustainability solutions since the pandemic [11]. Greener construction methods, such as prefabrication, modularization, and digitalization (in particular, building information modeling), are driving these changes. These approaches allow structural elements to be manufactured separately off-site, resulting in a 30% reduction in carbon emissions. Modular construction also reduces material consumption and improves safety on the construction site. In addition, such buildings take 50% less time to build, which emphasizes the effectiveness of these new methods in the context of sustainable development [12]. Although modular construction in the US accounts for only 4% of residential construction and 5.5% of commercial construction, the popularity of this technology is much higher in other countries. For example, in Sweden, modular construction technology is used in 45% of projects, while in Japan this figure is 15% [13].

After energy consumption, packaging is one of the most harmful aspects of human activity that negatively affects the health and future of the planet [14]. However, over the past few years, the number of countries that have implemented strict regulations on single-use plastic has more than doubled. Canada and India are the latest countries to start phasing out this type of packaging. In total, 77 countries have implemented a full or partial ban on plastic bags, while 175 countries have committed to comply with the UN resolution to end plastic pollution by the end of 2024 [15]. These initiatives demonstrate a growing awareness of the environmental impact of plastic use and a commitment to sustainable development. In 2021, the market for environmentally friendly packaging was estimated at USD 229.46 billion. It is projected to grow by 7.5% annually, exceeding $409.2 billion by 2030 [16].

Summarizing, the above data shows that sustainable development is becoming critical in the face of global environmental challenges. The green technology market is showing significant growth, which requires close monitoring of new trends. Renewable energy sources, as well as green hydrogen, are becoming key elements in reducing greenhouse gas emissions. Transportation, including electric vehicles, and the construction sector are also undergoing a transformation, contributing to a shift towards more sustainable practices. In addition, the growing awareness of plastic pollution is leading to the introduction of strict regulations, creating new opportunities for companies to produce environmentally friendly products. All of this demonstrates the need to integrate sustainable solutions into various sectors of the economy to achieve the goals of environmental responsibility and ensure a sustainable future.

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THE ROLE OF VIRTUAL BUSINESS ENVIRONMENTS IN "GREEN ECONOMY" ENTITIES

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The modern world faces global challenges related to environmental changes, requiring a fundamental reconsideration of economic models. The "green economy," which focuses on sustainable development, environmental conservation, and efficient resource use, is becoming increasingly relevant. In this context, virtual business environments (VBEs) play a crucial role in ensuring the transformation of economic activities, reducing environmental impact, and supporting the principles of sustainable development.

Definition and Importance of Virtual Business Environments. Virtual business environments are digital platforms that enable companies to conduct their activities without physical presence. They include online communication and collaboration platforms, cloud solutions for data storage, supply chain management systems, and other digital tools that help optimize business processes. Using VBEs contributes to reducing energy consumption, resource use, and emissions, which are essential factors for the "green economy."

Benefits of Virtual Business Environments for the "Green Economy" Virtual business environments offer several advantages that support sustainable development:

1. Reducing Greenhouse Gas Emissions**. The absence of a need for physical offices and daily commuting significantly reduces CO_2 emissions. Remote work and online meetings minimize the need for transportation, positively impacting the environmental situation.

2. Optimizing Resource Use. Digital platforms and cloud technologies enable more efficient use of resources, reducing costs for energy, paper, and other materials. For example, process automation and the use of artificial intelligence increase productivity and reduce waste.

3. Improving Market Access. VBEs open opportunities for small and medium-sized businesses to enter international markets without significant financial costs for physical infrastructure. This promotes the development of environmentally friendly products and services.

Challenges of Implementing Virtual Business Environments. Despite numerous advantages, using virtual business environments presents challenges. First, there are issues of cybersecurity and data protection. Utilizing digital platforms requires implementing effective measures to protect information from cyberattacks and unauthorized access. Additionally, many traditional businesses

face difficulties adapting to new digital conditions, requiring staff training and updating technical infrastructure.

Ensuring equal access to digital technologies for all "green economy" entities, especially in remote regions and developing countries, is also crucial.

The Role of Governments and International Organizations. Governments and international organizations play a vital role in supporting the use of virtual business environments in the "green economy." They must create a favorable regulatory environment and develop incentives for implementing VBEs. For example, tax benefits for companies using green technologies or grants for developing innovative digital solutions.

International cooperation is also essential for sharing knowledge and technologies, which will promote the faster integration of VBEs into the "green economy."

Virtual business environments have significant potential to support the "green economy." They ensure efficient resource use, reduce emissions, and create new business opportunities. However, to fully realize their potential, challenges related to security, adaptation, and accessibility must be overcome. Governments, international organizations, and business entities must work together to create conditions for developing virtual business environments that promote sustainable economic growth.

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