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PRIORITIES AND CHALLENGES OF ECONOMIC DEVELOPMENT

INTERNATIONAL CONFERENCE MATERIALS

MAY 11–12, YEREVAN, 2023

YEREVAN 2024

UDC 338(082)   *Published by the approval of ASUE Scientific Council*

Internatiomal conference "PRIORITIES AND CHALLENGES OF ECONOMIC DEVELOPMENT"
The countries of the world are faced with global and regional challenges more often, which increases the level of uncertainty in the economy. Furthermore, it complicates and even make it impossible for sustainable economic development and improvement of the quality of life. Such challenges often force governments to review their development priorities, the implementation of which implies the use of new tools in economic policy, new methods and approaches in transforming the economy. In order to identify the above-mentioned challenges and their consequences, as well as to find effective ways to overcome them Armenian State University of Economics and ASECU organized 19th ASECU international conference entitled "PRIORITIES AND CHALLENGES OF ECONOMIC DEVELOPMENT".

C O N T E N T

GRIGORIS ZAROTIADIS
Aristotle University of Thessaloniki
DIMITRA GIANNOPOULOU
Aristotle University of Thessaloniki

GLOBAL CHALLENGES RESULTING FROM DIGITAL AND VIRTUAL ECONOMY

The present paper is a conceptual contribution for an issue that necessitates the vigilance of theoretical and applied research and the consequent debate on the necessary adaptation of the legal and regulatory framework, as well as the moral order. Social and technological evolution always precedes the institutional and political one. Nevertheless, in our time, the exponential evolution of technological change makes this even more outstanding.

In the first part we provide an overview of the evolution of digital and virtual economy till the present along with the more or less visible further development in the field. Next, we reveal the general socioeconomic challenges – opportunities and threats – that are the results of the enhanced relevant technological progress. Moreover, we focus specifically on the way how competition – local and international - will be affected, both from the supply as well as the demand side. In the third part we proceed with policy implications and recommendations at the national, regional and global level and we conclude with specific proposal for further research.

Introduction. The present paper is a conceptual contribution for an issue that necessitates the vigilance of theoretical and applied research and the consequent debate on the necessary adaptation of the legal and regulatory framework, as well as the moral order. Social and technological evolution always precedes the institutional and political one. Nevertheless, in our time, the exponential evolution of technological change makes this even more outstanding.

Digitalization of relations generates a fast evolving, new, socioeconomic reality and reshaped competitive dynamics in the economy, creating new markets and transforming existing ones. Therefore, it presents a series of challenges for economic actors, policymakers and competition authorities. As OECD specialists argue (OECD 2022a and 2022b)[1], they must grapple with uncertainty in rapidly evolving markets, address new forms of misconduct, and examine markets whose precise boundaries are unclear. At the same time, mounting concerns about digital

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[1] OECD Competition Division, G7 inventory of new rules for digital markets – OECD submission to the G7 Joint Competition Policy Makers and Enforcers Summit, OECD, https://www.oecd.org/competition/g7-inventory-of-new-rules-for-digital-markets-2022.pdf 2022 and OECD, OECD Handbook on Competition Policy in the Digital Age, https://www.oecd.org/daf/competition/oecd-handbook-on-competition-policy-in-the-digital-age.pdf, 2022.

economic activities and signs of growing market power have led to calls for new normative approaches, policy interventions and new competition policy tools, as well as a more active use of existing ones.

In the following part we start with discussing the basic terms and related questions in the literature, along with an overview of the evolution of digital and virtual economy till the present, as well as the more or less visible further development in the field. Next, we reveal the significance of digital and virtual economy for the socioeconomic routine and the systemic evolution. Based on this, in the fourth chapter we expose the general socioeconomic challenges – opportunities and threats – that result out of the enhanced relevant technological progress. Moreover, we focus specifically in the way how competition – local and international - will be affected, both from the supply as well as the demand side. Based upon this challenges, we proceed with policy implications and recommendations at the national, regional and global level and we conclude with specific proposal for further research.

Basic terms and questions. The term "digital economy" dates back to the 1990s, when the internet was still an add-on to analog products and services. The focus then was on how emerging digital channels might impact the behavior of economic actors staying either on the demand or on the supply side. Today, we understand that digitalization, beyond the behavioral effects, it generates a new economic order (Deloitte, 2022)[1].

Starting from a data-driven economy based on the ability to collect, use, and analyze massive amounts of machine-readable information, digital economy signifies the possibility for economic activities to occur online, allowing companies to create new business models and economic value in ways we couldn't imagine 3 decades ago.

There are several contributions in the relevant literature reviling the different aspects of digital economy that results from billions of everyday online connections among people, businesses, devices and processes. The backbone of the whole process is hyperconnectivity which means growing interconnectedness of natural (physical) and juridical persons and machines utilized the possibilities from the technology related to the Internet, mobile communication and the internet of things (IoT).

Digital economy redetermines the way how businesses are structured, how economic actors (natural and/or juridical) interact, how consumers obtain services, information, and goods. Pratt (2017)[2] provides the following definition: the digital economy is the worldwide network of economic activities, commercial transactions and professional interactions that are enabled by information and communications technologies (ICT). It can be understood as an umbrella term describing how traditional brick-and-mortar economic activities are being

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[1] Deloitte – Financial Institution, What is the digital economy? Definition, importance, and examples, World Economic Forum, https://www.weforum.org/agenda/2022/05/digital-economy-transforming-business/, 2022.

[2] Pratt Mary K., Digital Economy Definition, TechTarget, https://www.techtarget.com/searchcio/definition/digital-economy, 2017.

transformed by Internet, World Wide Web, and blockchain technologies, any economic activity that results from billions of everyday online connections.

Considering the existing relevant discussion, lead us to the following definition: **digital economy is the remote, digital processing of aspects of socio-economic relationships with a direct or indirect economic impact**. Distance working, distance using, distance setting and realization of settlements (blockchain), distance controlling (internet of things), all of these refers to the digital transformation of the socio-economic reality, at all levels and all different sectors. This approach implies not only the installation of modern equipment or software, but also fundamental changes in the way how basic processes are being understood and accomplished. Nevertheless this is by far not the end of the story. The continuous, accelerating relevant technological progress and the resulting changes in the behavior lead us to the newly arising, related actuality of the "virtual economy", where, in the beginning people can perform economic activities and transactions in exchange for virtual or real assets, till the generalization of digitalizing more and more economic goods themselves. It involves the exchange of virtual goods, services, and currencies, which, in the beginning, can be used within the virtual environment, having more and more real economic benefits.

Virtual economy emerged in the early 1990s within a Multi-User Dungeon (MUD) gaming environment. It has since grown significantly in the online marketplace. The virtual economy functions using a platform or system that enables the trade of virtual currencies or goods. Activities such as gaming, socializing, working, and trading happens on these virtual platforms. Users can earn or purchase virtual goods and currencies from online marketplaces, then use them for trading or buying other virtual commodities or services. Occasionally, virtual items can also be transformed into real-world currency, although this is not always permitted by the platforms involved.

According to Krati Joshi (2023)[1] virtual economy is often supported by the platform operator, who may take a commission or transaction fee for the services rendered. The worth of virtual currencies and goods can also be affected by their supply and demand, with some items becoming more valuable over time. In that sense, virtual economy includes an agglomeration of sophisticated platforms, fledgling and often dubious marketplaces, skilled nixers, volatile assets, and ambitious pioneers that exist or operate uniquely in virtual. Starting from gambling, emotional needs services, gaming currency and crypto-currency up to virtual financial services, reality evolves into the so-called metaverse economy referring to real value that has been placed upon virtual assets, motivated by the illusion of digital scarcity.

Based on the above, we can also proceed with a definition of **virtual economy, meaning the production and use of virtual economic goods, in the first phase and as a start majorly virtual financial products, which cover real needs**.

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[1] Krati Joshi, What is a Virtual Economy? A Comprehensive Guide with Examples, Emeritus, https://emeritus.org/blog/ai-and-ml-what-is-virtual-economy/, 2023.

The significance of digital and virtual economy for the socioeconomic routine and the systemic evolution. As we easily understand, the evolution in the financial sphere takes the leading position for the broadening of digital and the emergence of virtual economy. In that sense it is worth it to take a closer look on the historical transformation of money including the latest developments in it.

There are two main mutations of money in the current, internationalized capitalist reality: the first concerns the unprecedented expansion of the function of money as a commodity for speculative exploitation. This becomes even more evident if we consider money in its broader context including all forms of expression of exchange value with an obvious prospect of liquidation and the possibility of becoming an object of transaction (derivatives). This particular evolution, from facilitating the mobility of capital and the consequent functioning of capitalist reality, became a process of "autonomation" of financial capital and its expanded self-reproduction, beyond and outside the actual production of economic goods.

The second mutation concerns the nature of money itself. The ever-expanding volume of transactions, as a result of (1) the intensification of the division of labor and the resulting commodification, (2) the expansion of capitalist relations of ownership and production (privatization of public goods), (3) the spatial expansion of transactions (internationalization), (4) the development of "outsourcing" in the context of a horizontal concentration of capital, as well as (5) the aforementioned financialization, led to the necessary gradual expansion of the potential monetary base. As we moved from the different forms of commodity money to those of tangible representative (FIAT) and then to the current version of digital representative money, we managed to "break" the boundaries of money's physical existence. Today, a further revolutionary mutation is taking place (still in its early phase) with the development of virtual money (cryptocurrencies) which (may) overcome the limitation of exchange reserves of central banks and the banking system in general. This specific development, apart from being part of the historical course of expansion of the potential monetary base, is at the same time a mutation of deep structural importance for the operating conditions of late capitalism, where a basic authority of the bourgeois state (not the only one) is detached and handed over to other centers of power.

Obviously, the importance of technological development and the consequent emergence of the digital and virtual economy (where, in terms of time of appearance and functionality "digital" precedes "virtual") is particular to both mutations. Yet, also in this aspect of socio-economic thinking the frequently arising type of "egg / chicken" question comes to the surface: is it systemic evolution that caused these technological changes or the other way around? Venturing an answer, I argue that deeper socio-economic processes are the ones that determine the course of development of knowledge and its applications. Nevertheless, we cannot exclude – quite the opposite – that technological achievements affect dramatically socio-economic becoming and its evolution in the following.

Challenges, opportunities, risks and relevant responses

As already mentioned, social and technological evolution always precedes the institutional and political one, but, in our time, the exponential evolution of technological change makes this even more outstanding.

In the following table we bring together the four major socioeconomic effects and the related challenges resulting out of the evolution of digital and virtual economy.

Table 1

Effects and Challenges of Digital and Virtual Economy

Socioeconomic Effects	*Relevant Challenges*
Acceleration of advancements in know-how and technology provokes an exponential increase in labor productivity and, therefore, the decommercialization (socialization from a different point of view) of economic goods (Zarotiadis, 2016)[1].	• Ecumenic reduction of working time with a simultaneous increase in wages. • Given the naturally evolving decommercialization (because of the ratio Fix Costs to Marginal Costs rising to infinity), for the moment, we have the artificial preservation of commercial character, but, • sooner or later, we have to proceed towards the development and the institutionalization of non-market decision-making processes about what, how much and for whom is produced.
Change of individual and collective preferences.	• On the one hand we have inter-industry and spatial displacements of productive activity, given the alteration of consumer preferences and behavioral patterns. • On the other, there is a new "architecture" of international division of labor, patterns of specialization and international trade, especially in a vertical sense (having on the one hand organizational centralization of capital and oligopolies, while on the other the evolution of global production chains).
Social distancing, simultaneously with the development of more effective and "cheap" control methods (ala Norbert Elias) – for more details check the contribution of Zarotiadis (2023)[2].	• As it is always the case, following deep dramatic transformations of socioeconomic environment, we have the uprise of emotional (at the individual level) and social disorders, • which also provokes new forms of "anti-social" behavior. • In general, in times like that the ethics and the limits of control are being questioned. This is even more the case in the frame of digitalization and virtualization, as the new technological achievements additionally open new forms of control.

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[1] Zarotiadis G., Technological Change, Public Goods and New Insights into the Socialization of Production, Proceedings of ASECU 12th International Conference, http://www.asecu.gr/files/12th_conf_proceedings.pdf, 2016.

[2] Zarotiadis G., Guilt Economics - Rediscovering the Civilizing Process, in the collective volume "Handbook of Research on Socio-Economic Sustainability in the Post-Pandemic Era" edited by Jozef Oleński, Jeffrey Sachs, Masayuki Susai, Yannis Tsekouras, Arjan Gjonça, IGI Global, DOI: 10.4018/978-1-7998-9760-6, 2023.

At the same time, we have an exacerbation of systemic instability, yet also the rise of technological and procedural possibilities for a progressive systemic, socio economic transformation	• As one of the major cases in this respect, we can refer to the possibility of changing the problematic overaccumulation of financial capital from a risk into an opportunity: **Controlled, coordinated (corrective) inflation to finance socially and environmentally sustainable development** (Zarotiadis, 2014)[1].

Whenever social and technological evolution precedes the institutional and political one, which appears often in the course of human history, it is the time for relevant modifications and amendments of systemic importance, or in other words, the time when objective historical development meets subjective social choice and vice versa.

Given the above shortly described, resulting challenges and risks, global political discussion has to deal with the following questions, yet addressed in a way which is according to the contemporary state of the art and conditions:

(i) Re-establishing of labor relations, working time and employment conditions in the frame of the new possibilities provided by digitalization and, similarly, dealing with the evolution of related services in the sphere of education;

(ii) Managing de-commercialization, instead of "denying" and "over-coming" it, as, sooner or later, this will not be possible;

(iii) Prevention and treatment of causing individual disorders, as well as of new forms of anti-social behavior, but,

(iv) at the same time restating the moral order and limits with respect to the control of individual and collective action;

(v) Utilization of developments in commercial and financial transactions and their limits. As an example, the process of "autonomization" of finance capital and its expanded self-reproduction, beyond and outside the actual production of economic goods, although it is a source for deep disequilibria (otherwise the "financial bubble") and resulting contradictions, it can become the basis for a controlled, inflationary, internationally coordinated, progressive usage of the self-expanding money supply.

(vi) Utilization of the automation of institutional processes and its limits.

Conclusions and proposals for further research

Digital and virtual economy is the basis for the arising, forthcoming major evolution systemic, socioeconomic change. We have already significant developments in this direction, as well as plentiful literature contributions – empirical and theoretical. Therefore, it is already the time for having the socioeconomic effects and challenges further analyzed and conceptualized.

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[1] Zarotiadis G., Relieving Infation or Palliative Self-destruction?, Journal of Stock Forex Trading 3: 133. doi:10.4172/2168-9458.1000133, 2014.

In the present paper we presented the main categories of them and its main attributes. This is a good basis to start with, but it needs further and detailed analysis. Based upon this, we have also to open and advance the discussion for necessary institutional and political transformation. From a positive point of view, know-how and technology can be understood as the unlimited evolution of human knowledge and its applications. Yet, from a normative one, judging the way how it contributes to the individual and collective well-being, is subject to two major subjectivities:

(i) it depends on the moral values and particular perspectives of the different epochs and

(ii) it varies according to who and for which causes is possessing and using technology!

In the following versions of the present paper we will work in this direction and we will also incorporate the relevant discussion we had when presenting the study in the 19th International Conference of ASECU in Yerevan.

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TATUL MKRTCHYAN
Doctor of Sciences (Economics), Associate Professor, Vice-rector for Science of Armenian State University of Economics
GAYANE TOVMASYAN
PhD in Economics, Associate Professor, SeniorResearcher at AMBERD Research Center of Armenian State University of Economics

SMART SOLUTIONS TOWARDS SUSTAINABLE DEVELOPMENT OF CITIES. ANALYSIS OF INTERNATIONAL AND LOCAL EXPERIENCE

The high emergence of IT technologies has changed not only the life of humans, but also the way of planning and managing world economies. The rapid development of IT technologies has changed not only human existence but also international economic planning and management. IT technologies are in every sphere of our lives and they have high impact on future development.

Meanwhile, with the growth of world population many problems have raised: high rates of urbanization, climate change, pollution, use of scarce resources, etc.

Considering the above-mentioned, the world began to think about the necessity of sustainable development.

The article presents the essence of sustainable and smart cities, main pillars of sustainable cities, some examples from the best international experience towards sustainable development, also the main directions of future technologies, which may be used for providing sustainable development. A SWOT analysis of Armenia was conducted, which helped identify the country's key problems and led to the development of several recommendations for making cities smart and sustainable by the following directions: sustainable and smart management system; smart citizens and e-participation mechanisms; sustainable construction of buildings, materials and infrastructure; sustainable use of water, energy and other resources; conservation of natural resources, ecosystems, landscapes; pollution reduction and prevention of climate change; cybersecurity and data protection policies; smart and sustainable transportation; waste management, etc.

Introduction. According to United Nations data, nowadays the current world population is 8 billion and it is expected to increase up to 9.7 billion in 2050 and up to 10.4 billion in the mid-2080s.

China (1.4 billion) and India (1.4 billion) are the two most populous countries of the world, as each represents nearly 18 percent of the world's population, respectively. Around 2023, India is expected to surpass China as the most populated nation in the world. More than half of global population growth between now and 2050 is expected to occur in Africa. And in contrast, the populations of 61 countries or areas in the world are expected to decrease by 2050, mainly in Europe[1].

The increase of world population will surely have its negative impact on environment and social-economic sphere. So, the concept of sustainable development is a need today. The world must employ smart and sustainable solutions to meet the needs of the growing population by reducing their negative impact, which may be achieved by utilizing smart technology and solutions in a variety of fields.

The paper presents the essence of sustainable and smart cities, main pillars of sustainable cities, some examples from the best international experience towards sustainable development, It also outlines the main technological paths that will likely be employed in the future to support sustainable development. SWOT analysis was done for Armenia, based on which the main issues were revealed and several suggestions were done for making cities smart and sustainable.

Literature review. With the growth of world population many problems have raised: high rates of urbanization, climate change, pollution, use of scarce resources, etc.

Taking into account the above-mentioned, the world began to think about the necessity of sustainable development.

In 1987 the World Commission on Environment and Development published a report entitled «Our common future», where the following definition was given: ''Humanity has the ability to make development sustainable to ensure that it meets the current needs without compromising the ability of future generations to meet their own needs. …Sustainable development is a process of change rather than a static state of harmony, whereby institutional reform, investments, resource exploitation, and technical advancement are all oriented to meet both present and future demands.

In 2015 UN Member States adopted the 17 Sustainable Development Goals[2] (SDGs) which have 169 targets that countries are attempting to reach by 2030 at the latest. All countries resolved to undertake "bold and transformative steps which are urgently needed to shift the world onto a sustainable and resilient path". Reaching the goals requires action on all fronts - governments, businesses, civil society, and people everywhere have a role to play[3].

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[1] Population, https://www.un.org/en/global-issues/population

[2] The 17 Goals, https://sdgs.un.org/goals

[3] Sustainable Development Goals, International Institute for Sustainable Development, https://www.iisd.org/topics/sustainable-development-goals

In recent years many researchers have analyzed the issues of sustainable development (Tovmasyan[1], Silvestre and Țîrcă[2],Klarin[3], Thacker et al.[4], Goralski and Tan[5], Sanchez[6]etc.).

Smart city is an application of Internet of things (IoT) notion[7]. Many researchers have analyzed also the issue of smart cities (Ahvenniemi et al.[8], Kummitha and Crutzen[9], Peris-Ortiz et al.[10], Ahad et al.[11], Sanches-Corcuera et al.[12], Trinidade et al.[13], Talari et al.[14], Tovmasyan[15], etc).

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Methodology. The main purpose of the article is to explore how future technologies and smart solutions are used to ensure sustainable development of cities and to analyze the opportunities of making cities smart and sustainable in Armenia.

The main methods used in the paper are: analysis and synthesis, document analysis, benchmarking, SWOT.

The method of benchmarking is used to analyze the best international experience of sustainable smart cities, smart city technologies, for finding the main possibilities of using them in local context for Armenia.

SWOT analysis was done for revealing the strengths, weaknesses, opportunities and threats and evaluating the main issues in using smart solutions for sustainable development of cities in Armenia.

Several data were collected from official sources; different reports and publications were used. Existing programs of Yerevan connected with sustainable development and smart cities were explored.

Analysis. A smart sustainable city is an innovative city that uses ICTs and other means to improve life quality, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects[1].

The main pillars of smart city are: smart economy (competitiveness), smart living (quality of live), smart mobility (transport and ICT), smart governance (participation), smart environment (natural resources), smart people (social/human capital)[2].

Forbes Technology Council presents new and developing ***smart city technologies that will genuinely improve the way urban areas function***:

1. **Smart Parking Spots, which** will allow people to book parking reservations via a mobile app, reducing the time spent searching for parking spots, minimizing urban traffic, lowering our carbon footprint and saving fuel.
2. **Automated Order Fulfillment.** There will be more automation for the fulfillment of last-mile delivery, from e-commerce to food delivery to pharmaceuticals.
3. **Water Conservation Technology.**
4. **Self-Driving Cars** with which smart cities will be able to automate all aspects of transportation, which will have profound effects on access to food, medicine, shelter and other necessities.

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5. **Alternative Transportation.** Today, people use alternative modes of transportation like electric vehicles and e-bikes. They also benefit from the use of 4G, 5G and IoT sensors to better understand traffic patterns, trends and impacts through artificial intelligence (AI), shortening commute time, mitigating wasteful idling and reducing climate impact overall. **Smart Traffic System Management.** Leveraging cloud-based software can reduce operational silos between traffic systems and emergency personnel, integrate centralized command centers and allow us to implement smart sensors. This will allow quicker emergency response times, which could be the difference between life and death.

6. **Environmental Management.** Innovative climate and geospatial technologies driven by AI and data analytics have the potential to improve our response to climate change and the overall environmental quality in smart cities.

7. **Internet Mesh Nets.** The whole population of a smart city needs to be connected. In cities such as New York, mesh nets are making connectivity available to all. Buildings throughout the city form a series of connected router nodes and internet exchange points. Highly secure and decentralized, these systems can maintain communication when the broader internet infrastructure fails.

8. **5G** is not only a new wireless standard; it also has the potential to transform the future of communications, powering the next generation of augmented and virtual realities and the metaverse, which lead us to richer, more connected and collaborative digital lives.

9. **Proptech.** Property technology - specifically, remote property management, will play an integral role in improving the way we work and live. With digital property management systems comes a better overall tenant experience, which is the key in the era of hybrid work, as people are spending more and more time at home. The administrative side of things will become more efficient thanks to this technology.

10. **Adaptable Buildings** -Digital solutions to increase accessibility or ease of living and working - for example, touch-free elevator calls or robot service deliveries.

11. **Pollution and Noise Control Technology.** Megacities are beginning to suffocate from smog, and it is important that smart city technologies make it possible to start sounding the alarm in time and apply measures to stabilize the environmental situation. To do this, cities will use automated sensor networks and data centers everywhere[1].

Arcadis, a leading global design & consultancy firm for natural and built assets, composed a list of 100 Sustainable Cities around the World. According to the list, Zurich takes first place

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[1] Smart City Technologies That Could Soon Change The Way We Live And Work, https://www.forbes.com/sites/forbestechcouncil/2022/07/27/smart-city-technologies-that-could-soon-change-the-way-we-live-and-work/?sh=3d793db91be0

with a total score of 87.9%. Zurich has initiated several projects that earned them first place such as their long-term goal to becoming a 2000-watt society by 2050. Another project was the Green City Zurich project that aims to preserve and increase all green spaces. Then come Stockholm, Geneva, Vienna, Frankfurt, Wellington, Rome, Sydney, London, Hamburg, etc[1].

Singapore, Zurich and Oslo have top positions in the 2021 IMD-SUTD Smart City Index Report[2].

Some steps were taken also in Yerevan towards making the city smart and sustainable. Yerevan Green City Action Plan was worked out within the framework of cooperation with the European Bank for Reconstruction and Development (EBRD). This program is based on the "Action plan for sustainable energetic development of the city of Yerevan". Yerevan Green City Action Plan is a strategic document for the period till 2030. The aim of Yerevan green City program is assistance in economic and social development of the city by means of solving environmental problems of the capital[3].

There are also other programs discussed in previous studies[4].

SWOT analysis of smart sustainable cities was done for Armenia. The analysis is based on authors' investigations, studies, also benchmarking of international best experience, some of which were presented in the article.

Table 1

SWOT analysis of making cities smart and sustainable in Armenia

Strengths	Weaknesses	Opportunities	Threats
Existence of Active citizen and E-citizen web portals	Little area of green spaces	Use of solar energy plants	Air pollution in cities
Existence of some programs of the sphere	Absence of waste recycling and management system	Raising awareness about sustainable development and sustainable behavior among the population	Climate change
IT sphere is developingin Armenia	Little awareness of people about sustainability issues	Investment of a waste recycling and management system	Exploitation of mines
Existence of Technology Management Center of Yerevan City CJSC	Little participation of citizens in the city government	Using sustainable construction mechanisms	Many types of biodiversity are threatened

[1] From Sustainable to Smart Cities, https://www.greenmatch.co.uk/blog/2017/04/sustainable-and-smart-cities-around-the-world

[2] Smart city observatory, https://www.imd.org/smart-city-observatory/home/

[3] Yerevan Green City Action Plan, https://www.yerevan.am/en/yerevan-green-city-action-plan/, https://www.yerevan.am/uploads/ media/default/0001/72/e7224f93ad7096478f9aaddb96ba61ea0ca693c9.pdf

[4] Tovmasyan G., Smart and Sustainable Cities: Thinking about the future. Examples from the best International Experiences, AMBERD Bulletin, 2021/6, pp. 23-35, DOI: 10.52174/2579-2989_2021_6_23

Existence of e-Governance infrastructure implementation agency	Low level of environmental sustainability	Increasing green spaces in cities	Deforestation and forest fires
Existence of State electronic payment system (e-payments.am)	Low level of energy efficiency	Addition of hybrid cars	Degradation of natural resources
Existence of e-gov.am (electronic government of the RA)	Lack of water recycling mechanism	Applying smart technologies in transport and traffic system	Lack of investments
Cooperation with international organizations	Lack of relevant professional human resources	Applying urban agriculture systems in cities	Cyber security issues
	Low level of infrastructures' development in cities		Personal data protection issues

Source: Compiledbyauthorsbasedonanalysis.

Thus, taking into account the SWOT analysis results, here are some suggestions towards making cities smart and sustainable:

- rational use of natural resources,
- implementation of water conservation mechanisms,
- implementation of waste recycling mechanisms,
- application of smart solutions in transport system and in traffic management, constructing smart parking spots,
- increase of green areas in cities,
- prevention of deforestation and forest fires,
- infrastructure development in cities,
- ensuring energy efficiency, use of renewable energy sources, solar energy plants,
- increasing the level of awareness of the population about sustainable consumption and sustainable production,
- use of sustainable construction mechanisms,
- providing smart urban agriculture using hydroponics, aquaponics, vertical farming, etc.,
- stimulate the participation of citizens in the city government mechanisms,
- preparation of professional staff in IT, data sciences, data protection, etc.,
- apply mechanisms of stimulationfor buying hybrid cars,
- apply air pollution and noise control technologies,
- elaborate policies for preventing climate change,
- implement nature conservation projects,
- implement policies of cybersecurity and dataprotection.

Conclusion. Recent changes in climate and environment require sustainable development approaches, so the whole world is committed to implement 17 SDGs. The 11th goal requires to

make cities and human settlements inclusive, safe, resilient and sustainable. Smart sustainable cities are very necessary today in fast changing world. Use of future technologies in organizing and managing cities and economies is vital in 21st century.

Based on the analysis, the main steps towards making cities smart and sustainable by the following directions were mentioned: sustainable and smart management system; smart citizens and e-participation mechanisms; sustainable construction of buildings, materials and infrastructure; sustainable use of water, energy and other resources; conservation of natural resources, ecosystems, landscapes; pollution reduction and prevention of climate change; cybersecurity and dataprotection policies; smart and sustainable transport; waste management, etc.

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DAVIT HAKHVERDYAN
Doctor of Sciences (in Economics), Professor,
Research Center "AMBERD"
Chair of International Economic Relations,
Armenian State University of Economics (ASUE)
ANNA PAKHLYAN
PhD in Economics, Associate Professor,
Research Center "AMBERD"
Chair of International Economic Relations,
Armenian State University of Economics (ASUE)

COORDINATED SANCTIONS IN THE ORBIT OF TRANSFORMATION OF THE GLOBAL ECONOMY

Key words: *sanctions, restrictions, global economy, oil prices, Russia, Ukraine*

In the recent year's sanctions have become a key element of modern international relations. Despite the fact that international sanctions are interpreted as coercive measures applied against states, non-state entities or individuals who pose a threat to international peace and security, experience shows that their true, mainly geopolitical reasons are often hidden "under the guise" of humanitarian and pacifist slogans. Therefore, such a coordinated application of sanctions leads to structural shifts in the global economy, as the polarization of interests in an interconnected world ultimately drives fluctuations in raw materials prices and reshapes the direction of commodity flows.

Within the framework of the paper are highlighted and analyzed geopolitical transformations under the conditions of large-scale application of sanctions.

Following Russia's 2022 war on Ukraine, a broad multilateral coalition, including the US, EU, UK, Canada, Australia, and Japan, imposed unprecedented and coordinated sanctions on Russia. These sanctions targeted the overseas wealth and economic activity of Russia's elites and decision-makers, as well as the financial and energy sectors and access to western technology. The sanctions have not yet had the predicted economic impact due to Russia's significant integration in the global economy and its role as a supplier of key commodities. This means that the coordinated sanctions have important implications for the global economy, with many firms facing losses as they exit the Russian market.

During the studies, the authors identified four main directions of the impact of sanctions on the global economy and individual countries, justifying each of them with relevant arguments and analysis of statistical indicators.

Introduction. The implementation of sanctions has a long history, dating back to ancient times, where they were employed as a diplomatic tool to address conflicts. For example, in 432 BC, Athens imposed a trade embargo on Megara, which ultimately led to the Peloponnesian War. Similarly, the Romans utilized sanctions against the city of Rhodes in the 2nd century BC[1].

In modern times, the employment of sanctions has become increasingly frequent and sophisticated. One of the earliest instances of modern sanctions occurred in 1861, when the United States imposed an embargo on the Confederate States during the American Civil War. The League of Nations also imposed economic sanctions on Italy in response to its invasion of Ethiopia in 1935.

Subsequently, the use of sanctions has continued to evolve, with the United Nations Security Council playing a critical role in their implementation. The Security Council has imposed sanctions on several countries, including Iraq in the 1990s and North Korea in the 2000s and 2010s.

Recently, the application of sanctions is characterized by unprecedented volumes and their most profound impact on the world economy.

In recent years, sanctions have turned into serious tools of geo-economic and geo-political influence, transforming countries' foreign economic policies and influencing the nature and depth of relations. The coordinated efforts of a group of influential countries in the application of sanctions lead to a number of negative consequences in both targeted and targeting countries, and ultimately alter the role and influence of these and partner countries in the global economy. The need to study similar issues determines the topicality of the research.

The goal of the research is to identify the direction of the multi-faceted and multi-layered effects of the use of coordinated sanctions on the target countries and the world economy in general, based on studies of existing trends.

Literature review. Professional interest in sanctions within academic circles has increased dramatically since February 2022, when a number of countries responded to Russia's invasion of Ukraine.

In the peer-reviewed literature sanctions are defined as "restrictive policy measures that one or more countries take to limit their relations with a target country in order to persuade that country to change its policies or to address potential violations of international norms and conventions"[2]. There are various purposes and types of sanctions. They have been utilized to achieve diverse objectives such as advocating for democratic values, protecting human rights, fighting against terrorism and nuclear proliferation, undermining governments, and expediting the resolution of armed conflicts. While countries typically impose sanctions by limiting trade and foreign aid with the target state, they may also impose other restrictions such as limiting

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[1] Schott, J.J., Elliott, K.A., & Hufbauer, G.C. (1990). Economic Sanctions Reconsidered: History and Current Policy.

[2] Morgan, T. Clifton, Constantinos Syropoulos, and Yoto V. Yotov. 2023. "Economic Sanctions: Evolution, Consequences, and Challenges. Journal of Economic Perspectives, 37 (1): pp. 3-30. DOI: 10.1257/jep.37.1.3

travel, freezing assets, and preventing specified individuals or groups from accessing financial institutions.

Based on historical analysis, Lance Davis and Stanley Engerman discovered that the forms of sanctions that attract the most attention and have the greatest impact are composed of various restrictions on international trade, financial flows, or the movement of people[1]. Meanwhile, Ahn Daniel P. and Ludema, Rodney D. consider sanctions as "smart" if they target the responsible parties while minimizing collateral damage[2].

Since the 1930s, no economy has been subjected to such a wide range of commercial restrictions as those imposed to Russia in response to its invasion of Ukraine. However, unlike Italy and Japan in the 1930s, Russia is currently a major exporter of oil, grain, and other key commodities, and the global economy is much more integrated. Consequently, the current sanctions have global economic consequences far greater than anything seen before. The scale of these effects should prompt a reevaluation of sanctions as a potent policy instrument with significant global economic implications[3].

The imposition of sanctions on countries that violate international norms or standards can be a costly endeavor not only for the targeted nations (sanctioned countries) but also for the imposing states (sanctioning countries). Despite its intended objective, sanctions can have significant consequences for the foreign trade of the countries imposing them, leading to potential disruptions in aid or financial flows. Additionally, the targeted countries may counteract the impact of sanctions by seeking alternative sources or markets for their goods and services, or by restructuring their production[4]. Besides, sanctioning countries are supposed to be exposed to trade frictions arising from the conflict, due to exports to Russia.

Though the economic outcomes of sanctions are evident both for sanctioned and sanctioning countries, the economic consequences of sanctions are just a means to achieve political goals[5].

The analysis conducted by Mian Dai, Gabriel Felbermayr and others reveals that economic recovery from sanctions is not instantaneous, especially the negative impact of sanctions on trade is on average present for about seven to eight years down the road after sanctions are lifted. Besides, the effect of sanctions that last for more than five years is much stronger than

[1] Lance Davis & Stanley Engerman, 2003. History Lessons: Sanctions - Neither War nor Peace, Journal of Economic Perspectives, American Economic Association, vol. 17(2), pages 187-197, Spring.

[2] Ahn, Daniel P. and Ludema, Rodney D., The Sword and the Shield: The Economics of Targeted Sanctions (December 1, 2017). Available at SSRN: https://ssrn.com/abstract=3095325 or http://dx.doi.org/10.2139/ssrn.3095325

[3] Mulder N., The Sanctions Weapon: Economic sanctions deliver bigger global shocks than ever before and are easier to evade / Finance& Development, IMF, June 2022, p. 20-23.

[4] Khalid Sekkat, Wars, Sanctions and Exports: Is the MENA Singular? / International Journal of Development and Conflict, 12(2022) 81–103.

[5] Robert Gold, Julian Hinz and Michele Valsecchi, 2023. To Russia with Love? The Impact of Sanctions on Regime Support, Kiel working paper No. 2212, March 2023, p. 2.

that of shorter ones[1].

An analysis of the sanctions imposed during the years 1950-2019, made on the basis of an updated version of the GSDB (Global Sanctions Data Base), revealed that since 1950 the United States has been the most frequent sanctioning nation, averaging more than one third of all sanction cases in the world. Moreover, The Trump administration is notorious for its frequent use of sanctions as a tool of foreign policy, which is justified by a clear surge in the imposition of sanctions in 2017 under the Trump presidency, which by 2019 amounted to more than 40% of all sanctions in force in the world at that time. In addition, the increased sanction activities by the US are also accompanied by an increase in the implementation of "smart" sanctions, which are designed to target specific financial and travel activities[2].

IMF studies have shown that the war in Ukraine and the related international sanctions, aimed at pressuring Russia to end hostilities, are dividing the world economy into blocs and reinforcing earlier geopolitical tensions, such as those associated with the US-China trade dispute[3]. Leading to increased limitations on the movement of capital, labor, and international transactions, such fragmentation may escalate, impeding collaborative efforts for global public goods[4]. The immediate costs of such fragmentation are particularly significant, as it requires time to restore disrupted cross-border flows.

A rapid assessment conducted by UNCTAD on the impact of the conflict in Ukraine on trade and development has confirmed a rapidly deteriorating outlook for the global economy. This decline is attributed to rising prices of food, fuel, and fertilizer, heightened financial instability, reduced investment in sustainable development, complex restructuring of global supply chains, and increased trade expenses. A significant focus lies on the two essential "Fs" of commodity markets: food and fuels. Both the Russian Federation and Ukraine are prominent participants in agrifood markets globally. Collectively, these countries account for 53 percent of the global trade share in sunflower oil and seeds, and 27 percent of the global trade in wheat[5].

The consequences of sanctions can often have a deeper impact not so much at the level of countries, but at the level of specific industries and businesses. For instance, the imposition of sanctions can lead to the inability to fulfill international contracts, resulting in significant

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[1] Dai M., Felbermayr G., Kirilakha A., Syropoulos C., Yalcin E., and Yotov Y. V., Timing the impact of sanctions on trade. Research Handbook on Economic Sanctions (2021) / Drexel School of Economics Working Paper 2021-07, Drexel University, p. 34.

[2] Kirilakha A., Felbermayr G., Syropoulos C., Yalcin E., Yotov Y.V., The Global Sanctions Data Base: An Update that Includes the Years of the Trump Presidency / Drexel School of Economics Working Paper 2021-10, Drexel University, pp. 2-4.

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[4] Geo-Economic Fragmentation and the Future of Multilateralism, IMF Staff Discussion Note 2023/001.

[5] UNCTAD (2022). The Impact on Trade and Development of the War in Ukraine: UNCTAD Rapid Assessment, 16 March, 2022, https://unctad.org/system/files/official-document/osginf2022d1_en.pdf, pp. 2-3.

damage to specific subjects of international trade[1].

Regardless of the recent increase in the interest of researchers in the topic, the study of various directions and dimensions of the impact of sanctions in the modern, changing world remains highly relevant.

Research methodology. Observational, statistical, graphic, comparison and analysis methods were used in the framework of the research. Through the comparison of statistical data, the study of recorded trends, the main directions of the impact of the use of coordinated sanctions on individual target, targeting and mediator countries were highlighted, projecting them at the global level.

Within the analysis in addition to databases of international organizations, such as WTO, UNCTAD, the authors used recently developed and specialized data sources such as the Russia Sanctions Dashboard.

Russia Sanctions Dashboard is a database system that extracts and enriches information related to global sanctions from primary sources. The system standardizes, cleans, and enriches data by extracting essential details such as IDs and addresses from text blobs. The database covers over 900 watch lists from more than 200 countries and eight different categories (sanctions, export control, law enforcement most wanted, contract debarment, politically exposed persons, regulatory enforcement, delisted, and elevated risk).

Analysis. The historical implementation of sanctions reflects their usefulness as a diplomatic tool to address conflicts in different periods and cultures. As the global community continues to evolve, the use of sanctions is likely to remain a vital policy tool, highlighting the need for continued research and analysis to understand their effectiveness, limitations, and implications for the world economy and international relations.

In recent years, sanctions have emerged as an important policy instrument utilized by the international community, particularly in response to geopolitical crises and conflicts. While the primary objective of sanctions is often to induce behavioral changes in targeted countries, they also have significant global economic implications. Over the past decade, various countries, such as Russia, Iran, North Korea, and Venezuela, have been subjected to sanctions by the international community due to their perceived violations of international law or human rights abuses. These sanctions typically involve restrictions on trade, financial transactions, and the movement of goods and people and can have far-reaching effects on the global economy.

The economic impact of sanctions can be substantial, especially for countries heavily reliant on international trade or specific industries. For instance, the sanctions imposed on Iran in 2012 led to a sharp decline in its oil exports and a significant depreciation of its currency, resulting in higher inflation and reduced purchasing power for its citizens. However, it is crucial

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[1] Kazachenok O. P., Stepanova I.A. (2022). Legal Consequences of the Impact of Economic Sanctions on the Execution of Foreign Economic Contracts. Legal Concept. 2022. Vol. 21. No. 4,
DOI: https://doi.org/10.15688/lc.jvolsu.2022.4.10, pp. 77-82.

to acknowledge that the impact of sanctions on global markets should not be overlooked. The restrictions on trade and financial flows can disrupt supply chains, increase transaction costs, and cause market volatility, affecting not only the targeted countries but also their trading partners and investors.

Moreover, the interconnectivity of the modern global economy implies that the impact of sanctions can extend beyond mere economic consequences. They can also have significant geopolitical implications, potentially escalating tensions between nations and leading to unintended consequences. In this sense, it is critical to carefully consider the potential economic and geopolitical implications of imposing sanctions as a policy tool.

Before 2022, Iran was the sole leader in the world in terms of the number, severity and duration of sanctions imposed. Iran, as a country of 85 million people and the world's third largest proven oil reserves (after Venezuela and Saudi Arabia) in the amount of 13.4% of the world's reserves, has been living under economic sanctions for just over 40 years, including the last three years - actually in isolation[1].
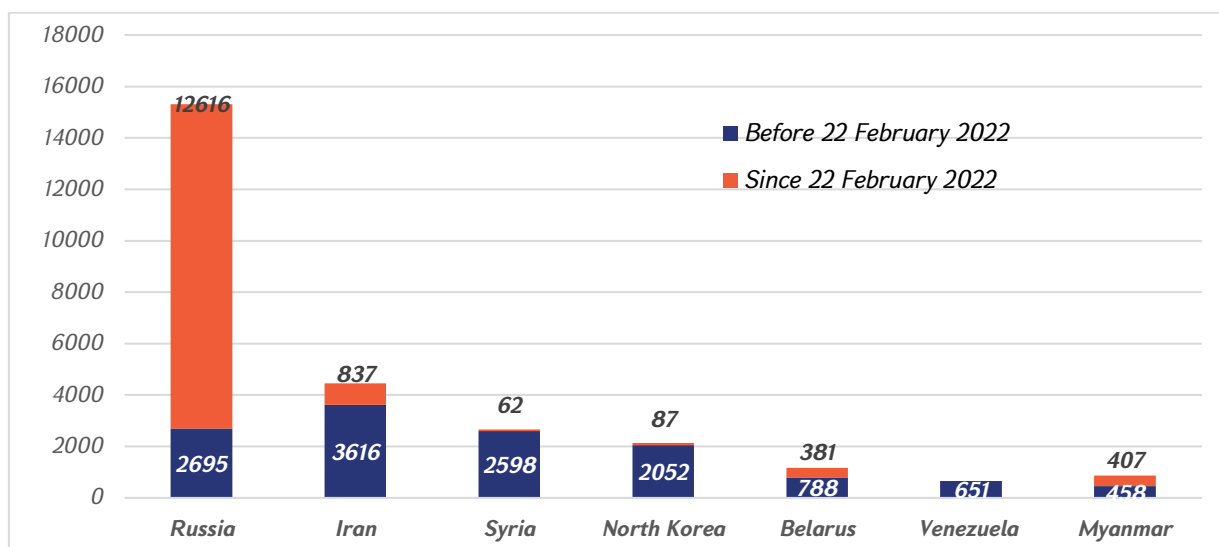
Figure 1. Countries affected by sanctions worldwide (as of April 5, 2023)[2]

Figure 1 shows the countries with the highest number of sanctions worldwide. Since the outbreak of the Russo-Ukrainian War, Russia has become the world leader in the number of sanctions imposed (with a total amount of 15,311 sanctions imposed, as of April 5, 2023), ahead of Iran, Syria, North Korea, Belarus, Venezuela and Myanmar combined, against which the total number of sanctions for the same period is amounted for 11,937. For the period from February

[1] Pakhlyan, A. (2022). Extremism in the World Economy: Life "Deep" in Sanctions. AMBERD BULLETIN, p. 78-89 / DOI: 10.52174/2579-2989_2022.5-78 (in Russian)

[2] Source - Russia Sanctions Dashboard / https://www.castellum.ai/russia-sanctions-dashboard (Date of access: 10.04.2023)

22, 2022 to February 22, 2023, the total number of sanctions against Russia amounted to as much as 11,327. Until April 5, 2023, the number of sanctions against Russia reached 12,616. Most of the sanctions imposed against Russia until February 22, 2022 (a total of 2,695 sanctions) are related to the Ukrainian events of 2014.

By comparison, the entities in Iran, the world's second-largest sanctioned country, are subject to 4,453 restrictions as of April 05, 2023. There are 2,660 sanctions against Syria, about 2,139 against North Korea, 1169 against Belarus, 651 against Venezuela, and 865 against Myanmar. Venezuela is the only one of the above mentioned countries that has not been a subject to new sanctions since the well-known events of February 2022.

Such large-scale application of sanctions ultimately provokes structural shifts in the global economy, especially when countries that are major global suppliers of a number of raw resources and strategic goods are targeted by coordinated restrictions.

And those consequences are multi-faceted and multi-layered, among which we will consider the following 4 manifestations:

1. Losses of the sanctioned country

A country under sanctions is deprived of traditional export markets in the initial period, there is a surplus and stagnation of exportable goods. In the long term, however, these losses can be mitigated or even neutralized at the expense of reorientation towards new export markets or an increase of the exports volume to available markets. This inevitably brings about structural and geographical changes in the world trade.

Russia is a significant producer and global supplier of a number of goods, including grain crops, forest and paper products, fertilizers, oil, gas, uranium, etc., which means that massive sanctions on Russian exports cannot remain without consequences.

The conflict between Russia and Ukraine has led to a significant increase in energy prices due to the resulting market volatility and the implementation of sanctions aimed at Russia's economy. This surge in energy prices has reached unprecedented levels.

After the 2020 COVID-19 global oil deflation, 2022 saw an unprecedented increase in the prices of all major types of oil: the average annual price of Brent oil (Brent is the world's leading price benchmark for Atlantic basin crude oils.) per barrel increased from 41.96 USD in 2020 to 100.93 USD in 2022. The same situation was observed with other brands of oil (see Figure 2.). The price of WTI oil (West Texas Intermediate crude oil) rose from 39.16 of 2020 to 94.9 in 2022. In 2022, the OPEC oil price averaged 100.08 U.S. dollars per barrel, which represents a significant increase from the previous year's average of 69.89 U.S. dollars[1]. The surge in oil

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[1] Statista, OPEC oil price annually 1960-2023: Published by Jessica Aizarani, Apr 18, 2023 / https://www.statista.com/statistics/262858/change-in-opec-crude-oil-prices-since-1960/;
West Texas Intermediate (WTI) crude oil annual average price from 1976 to 2023: Published by Jessica Aizarani, Apr 18, 2023 / https://www.statista.com/statistics/266659/west-texas-intermediate-oil-prices/;
Brent crude oil price annually 1976-2023: Published by Jessica Aizarani, Apr 18, 2023 / https://www.statista.com/statistics/262860/uk-brent-crude-oil-price-changes-since-1976/

prices can be attributed to a shortage in energy supply and the imposition of sanctions on Russia after the Russo-Ukraine war.
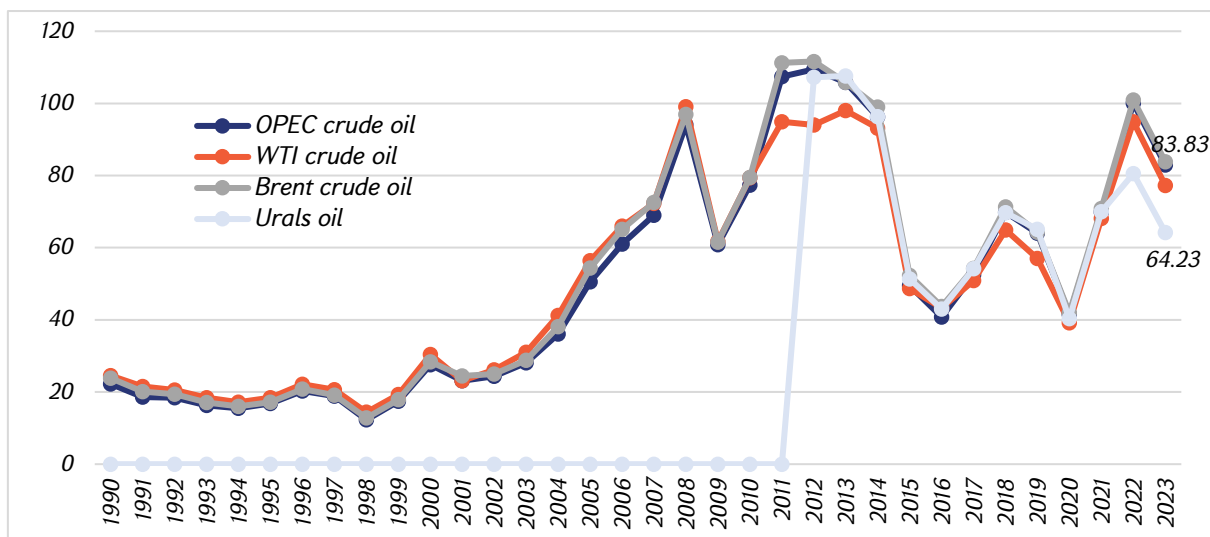
Figure 2. *Average annual price dynamics for OPEC, WTI, Brent crude and Urals[1] oil from 1990 to 2023 (in U.S. dollars per barrel)*

Figure 2 also includes Urals oil price dynamics, available since 2012. Urals oil serves as the standard reference oil used to determine the pricing of Russian oil exports. It comprises a mixture of heavy and sour oil sourced from the Urals and Volga regions, combined with lighter oil from Western Siberia. Its transportation routes include the Druzhba pipeline to Europe and the Novorossiysk pipeline to Baku.

Until 2021 Urals oil prices fluctuated in the orbit of global trends. In 2021, the average annual price of Urals was about 70 USD per barrel. In 2022, regardless of the efforts of countries applying sanctions, the price of Urals oil even increased to an average level of 80.6 USD, although it was significantly lower than the prices of other types of oil. In 2023, however, a drop in prices was recorded for all types of oil, and the sharpest drop was for Urals oil. But even in this case, the average annual price of the latter was higher than the upper limit set by the Western countries for Russian oil products.

Notably, since 2022, China and India have emerged as significant importers via seaborne routes. Urals Oil reached an all-time high of 117.65 in February of 2013[2]. Historically, its cost is determined based on North Sea Brent quotes - with a discount from one to several US dollars per barrel.

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[1] Since Urals oil prices are available in the databases on a daily, weekly or monthly basis, the annual average prices were calculated by the authors based on Trading Economics historical data – https://tradingeconomics.com/commodity/urals-oil (Date of Access: 14.10.2023).

[2] Trading Economics, Urals Oil, https://tradingeconomics.com/commodity/urals-oil (Date of Access: 15.10.2023).

Striving to reduce Russia's profits and restrict its ability to fund its war in Ukraine, European countries, along with the US and other major economies such as the UK, Japan, Canada, and Australia, have established a price cap of $60 per barrel on Russian seaborne oil. This means that anyone who wishes to purchase Russian oil must pay this price or less if they wish to transport it using operators or insurers located in the EU or other countries that have agreed to this price limit. However, regardless of the coordinated efforts of the sanctioning countries, in 2022-2023 the prices of Russian ESPO and Sokol brand oil on the world market are incomparably higher than the prices recorded in 2000-2021, as well as the established upper limit[1].

Although early 2023 sees some decline in global oil prices, the situation may change towards the end of the year. As of February 2023, the average yearly cost of West Texas Intermediate crude oil dropped to 77.47 U.S. dollars per barrel. This represents a significant decrease compared to the average of 94.9 U.S. dollars per barrel recorded in 2022. The decrease in oil prices follows a period of supply shortage in the energy market.

According to the IMF, even with the current oil price cap level set by the Group of Seven, Russian crude oil export volumes are not expected to be significantly affected. Russian trade is anticipated to continue redirecting from sanctioning to non-sanctioning countries[2].

For instance, in 2022, Russia was the leading exporter and producer of palladium globally, with exports valued at $5.3 billion and production of 88 metric tons. This accounted for an 18.1% share of global exports. Since 2018, global palladium exports have steadily increased. China had the highest demand for palladium in 2020, reaching 91.85 metric tons (3.1 million ounces). The automotive industry consumed the most palladium in 2022, using 241.9 metric tons[3]. Given the fact that palladium is an indispensable component for the automotive industry, and only China's annual demand exceeds Russia's production capacity, it is indisputable that sanctions cannot in any way limit the volume of palladium exports from Russia. However, the same cannot be said unequivocally about the rest of the products and resources.

At the same time, the analysis of the balance of payments of Russia revealed the size of capital flight from Russia in 2022, which was approximately $232 billion, mainly conditioned by capital flight from political and economic risks[4].

It is noteworthy that the approaches of countries subjecting Russia to sanctions are somewhat different. If the consolidated efforts of the US, the EU, the UK, Canada, Japan, Switzerland and Australia are noticeable in the case of such bans, as oil price cap and restrictions

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[1] Oil price charts / https://oilprice.com/oil-price-charts/67 (Date of access: 14.04.2023).

[2] IMF (2023). World Economic Outlook Update: Inflation Picking amid low Growth, October 2023, https://www.imf.org/en/Publications/WEO/Issues/2023/10/10/world-economic-outlook-october-2023, p. 4.

[3] Statista, Global leading exporting countries of palladium 2022, Dec 18, 2023, https://www.statista.com/statistics/1118273/global-leading-palladium-exporting-countries/

[4] Zhukov P.E. (2023). Capital Flight from Russia and Possible Sources of Financing Budget Expenditures. Financial Journal, 15 (6), 27–42 (In Russ.). https://doi.org/10.31107/2075-1990-2023-6-27-42.

on Russian oil and gold imports, restrictions on maritime services for Russian oil, there are certain differences in the application of import restrictions of Russian gas and metals.

2. Losses of countries applying sanctions

As contradictory as it may sound, countries that apply sanctions are not exempt from losses either. They are manifested in deficits and price increases caused by sanctions imposed on the exporting country by import-dependent countries of certain goods. There is a need to search for new suppliers of traditionally imported products, and the geographical structure of global exports and imports is changing as well.

The collective wheat trade of Russia and Ukraine represents approximately 30% of the global market[1]. Consequently, Russia's military invasion of Ukraine in 2022 caused a sharp increase in global wheat prices. Ukraine's capacity to produce wheat was hindered, leading numerous nations to impose restrictions or cease trade ties with Russia.

Russia has a serious underperformance in the global wheat market. Taking the 3rd position among the first five wheat-producing countries (China, India, Russian Federation, USA and Australia), Russia also leads the list of exporting countries. Although wheat is the second-most-produced cereal grain behind maize, the global trade of wheat is greater than all other crops combined.

In fact, not all leading wheat producing countries are also major exporters. In particular, China and India consume most of the wheat they produce. Moreover, China, the world's largest producer of wheat, in the last 20 years achieved full wheat self-sufficiency only in 2007-2008, and in recent years is also a major importer (annual average of 9-10 million tons). Meanwhile, the second biggest wheat producer India is completely self-sufficient and exports only a tiny 1% of its wheat production (about 1 million tons per year)[2]. In other words, the list of leading wheat exporting countries is different compared to the leading countries in production.

To ensure its own food security, the Russian Federation introduced a temporary ban on the export of grain crops from its territory from March 15, 2022, until June 30, 2022[3]. This ban extended to countries within the Eurasian Economic Union (EAEU), with the exception of Belarus. The result was not long in coming. In the Chicago Board of Trade (CBOT) wheat reached its all-time high price of 1350 USD per bushel in March 2022[4].

The surge in wheat prices has notably impacted the African continent, given that Ukraine and Russia collectively supply nearly 40% of its wheat imports. According to the UNCTAD data,

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[1] The impact of Russia's 2022 invasion of Ukraine on global wheat production,
https://worldpopulationreview.com/country-rankings/wheat-production-by-country

[2] Galoyan D., Mkrtchyan T. (2022). Export restrictions on Russian wheat and «issue of bread» in Armenia. "AMBERD" Bulletin № 2(15)/2022, pp. 38-46 [in Armenia], DOI: 10.52174/2579-2989_2022.2-38.

[3] Decree of the Government of the Russian Federation No. 362 of March 14, 2022, On the introduction of a temporary ban on the export of grain crops outside the territory of the Russian Federation /
http://static.government.ru/media/files/mFNyZAgGZoCX4NPnqgbhA9na3WsirKpb.pdf

[4] Trading Economics, Wheat, https://tradingeconomics.com/commodity/wheat (Date of Access: 15.10.2023).

during 2018-2020, Africa imported $3.7 billion worth of wheat (32% of total African wheat imports) from Russia and an additional $1.4 billion from Ukraine (12% of total African wheat imports)[1]. Moreover, as many as 25 African countries, including several least developed nations, import over one-third of their wheat from these two countries, with 15 of them relying on them for over half of their wheat imports.

A further study of global wheat price trends shows that such high trends, however, did not last long, with steady downward trends observed from the 4th quarter of 2022.

3. Slowing down of global economic growth

Due to the fact that the global economy is much more integrated, today's sanctions have a much greater global economic effect than anything before[2]. In today's interconnected world, fluctuations in a group of influential countries are capable of causing global shocks.

The IMF baseline forecast indicates a deceleration in global growth, with the rate expected to decline from 3.5 percent in 2022 to 3.0 percent in 2023 and further to 2.9 percent in 2024[3]. This trajectory falls considerably below the historical average of 3.8 percent observed between 2000 and 2019. The main reasons for such decline are considered to be the rise in central bank rates to fight inflation and Russia's war in Ukraine continue to weigh on economic activity.

Statistical data from the World Health Organization show that in 2022, a slowdown in world trade and global GDP growth rates was observed, which is justified by the war in Ukraine led to sharp rises in commodity. After an unprecedented -4.7 percent decline in 2020 as a result of the COVID-19 pandemic, global merchandise exports recorded growth of 8.4 percent in 2021, but slowed somewhat in 2022 to 2.3 percent, which is even lower than the 2010-2022 average growth rate (2.5 percent). A decline compared to the previous year was recorded simultaneously in all three major product groups: agricultural products (-4.7 percent), fuels and mining products (-3.1 percent) and manufactures (-3.5 percent). The percentage decline in agricultural, fuels and mining products in 2022 even exceeded the figures recorded under the conditions of global restrictions of COVID-19. The growth rate of global GDP has also slowed, falling from 6 percent last year to 3 percent in 2022 (see Table 1).

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[1] UNCTAD (2022). The Impact on Trade and Development of the War in Ukraine: UNCTAD Rapid Assessment, 16 March, 2022, https://unctad.org/system/files/official-document/osginf2022d1_en.pdf, p. 5.

[2] Pakhlyan A., Extremism in the World Economy: Life Deep in Sanctions, "Amberd" Bulletin № 5(18) – 2022, pp. 78-89, DOI: 10.52174/2579-2989_2022.5-78, https://asue.am/upload/files/amberd/2022-year-5/10.pdf

[3] IMF, Global recovery remains slow, with growing regional divergences and little margin for policy error, Overview, https://www.imf.org/en/Publications/WEO/Issues/2023/10/10/world-economic-outlook-october-2023

Table 1

World merchandise exports and production growth rates, 2010-2022[1]
(Annual percentage change)

Indicators		2010-2022	2020	2021	2022
World merchandise exports		**2.5**	**-4.7**	**8.4**	**2.3**
Agricultural products		2.2	-2.4	2.9	-4.7
Fuels and mining products		1.2	-1.7	4.2	-3.1
Manufactures		2.8	-4.9	13.9	-3.5
World GDP		**2.7**	**-3.3**	**6.0**	**3.0**

Exports			Regions and Country Groups	Imports		
2010-2022	2021	2022		2010-2022	2021	2022
2.5	**8.4**	**2.3**	**World**	**2.7**	**10.3**	**3.2**
2.5	6.5	4.2	North America	3.3	12.5	6.0
1.2	5.8	1.9	South and Central America and the Caribbean	2.1	25.6	4.2
1.7	8.1	2.7	Europe	1.8	8.5	5.2
0.3	3.5	0.7	Africa	1.8	6.4	5.6
2.4	-2.4	9.9	Middle East	2.9	8.3	9.4
4.0	13.1	0.6	Asia	3.7	10.5	-0.4
0.8	-3.1	-5.0	CIS countries[2]	0.4	9.0	-13.9

The growth of import volumes at the level of the world and individual regions has also slowed down. The growth of world exports decreased from 8.4 percent of the previous year to 2.3 percent in 2022, falling behind the average index of 2010-2022, and world imports decreased from 10.3 percent growth in 2021 to 3.2 percent in 2022, which is 0.5 percentage points higher than average level of 2010-2022.

Although the slowdown in export-import growth was observed in almost all regions of the world, except for the Middle East, where in 2021 compared to 2022, the export increased by 9.9 percent, and imports by 9.4 percent, significantly exceeding the average indicators of 2010-2022 (mainly due to the concentration of demand for oil product exports). The decline is more obvious and tangible especially in the CIS countries, where exports decreased by -5 percent and imports by -13.9 percent. The region's poor performance is perhaps legitimate, given that the group includes Russia and Ukraine, which are at active war since 2022.

4. Increasing the role of intermediary countries in order to circumvent sanctions

Third-party intermediaries and transshipment points play a crucial role in redirecting exports to destinations like Russia and Belarus. Some countries, including China, Turkey,

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[1] WTO (2023). World Trade Statistical Review, https://www.wto.org/english/res_e/booksp_e/wtsr_2023_e.pdf, p. 56.

[2] Commonwealth of Independent States (CIS), including certain associate and former member States. Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan and Uzbekistan are full members of the CIS. Georgia is a former member (withdrew since 2008), Ukraine is a former associate state (withdrew since 2014). Turkmenistan is an associate state and Moldova just an observer state.

Uzbekistan, and members of the Eurasian Economic Union - Belarus, Kazakhstan, Armenia, and Kyrgyzstan, have seen increased exports to Russia amid the Ukraine War.

The Financial Crimes Enforcement Network (FinCEN) and the U.S. Department of Commerce's Bureau of Industry and Security (BIS) identified certain common transshipment points, such as Armenia, Brazil, China, Georgia, India, Israel, Kazakhstan, Kyrgyzstan, Mexico, Nicaragua, Serbia, Singapore, South Africa, Taiwan, Tajikistan, Turkey, United Arab Emirates, and Uzbekistan, through which restricted or controlled exports reach destinations in Russia or Belarus[1].

The world's second-largest economy has emerged as a significant economic lifeline for Russia amidst the ongoing Russia-Ukraine war, despite Western sanctions. China-Russia trade reached $218.2 billion during January-November 2022, surpassing the goal set by the two countries in 2019 to increase trade to $200 billion by 2024 from $107 billion in 2018, achieving it a year ahead of schedule[2].

Thus, the conducted studies provide grounds for concluding that the use of systematic sanctions on a global scale and the efforts to resist and circumvent them in the countries under sanctions eventually lead to structural shifts, changing the dominant actors in the global commodity markets.

Conclusions. Developments in geo-economic relations have recently been characterized by the importance of the role of coordinated sanctions as a powerful political and economic level. The increasing scalability of such tools ultimately induces major shifts in the structure of the global economy, significantly altering the role of target countries while also altering the major players and their positions in the supply markets for the targeted goods.

Within the framework of the study, 4 main directions were distinguished from the multi-faceted and multi-layered consequences of the comprehensive application of sanctions, namely losses of the sanctioned country, losses of countries applying sanctions, slowing down of global economic growth and increasing the role of intermediary countries to circumvent sanctions.

As a result of the study of each of the directions of influence, the following generalizations can be made:

- Restrictions applied to countries targeted by sanctions do not always lead to the desired results. The impact of sanctions is largely determined by a number of factors, including the role of the targeted country in specific product markets, its share in global

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[1] FinCEN & BIS Joint Alert (2022). FinCEN and the U.S. Department of Commerce's Bureau of Industry and Security Urge Increased Vigilance for Potential Russian and Belarusian Export Control Evasion Attempts, FIN-2022-Alert003, June 28, 2022, https://www.fincen.gov/sites/default/files/2022-06/FinCEN%20and%20Bis%20Joint%20Alert%20FINAL.pdf, p. 5.

[2] Reuters, China-Russia trade hits $218 bln in Jan-Nov, completing goal planned to reach in 2024, December 7, 2023, https://www.reuters.com/markets/china-russia-trade-hits-218-bln-jan-nov-completing-goal-planned-reach-2024-2023-12-07/

production and export structures, the existence of alternative demand for the given product outside of the target countries, etc.

- Often, the impact of sanctions is directed against the target countries themselves, manifesting in the limitation of imported goods and resources and the increase in price levels.
- As a result of the coordinated application of sanctions, the losses incurred by influential countries that are targeted and are partners of the latter ultimately lead to a slowdown in the growth rates of GDP and foreign trade on a global scale.
- In the long term, the negative impact of sanctions is mitigated or neutralized at the expense of identifying new partners and reorienting to new export markets.
- As a result of all this, in the end, structural shifts occur on the scale of the global economy: the leaders and their shares in the export and import structure of individual products change.

The current sanctions on Russia are multilateral but not global (there are 46 countries implementing sanctions against Russia), leading Russia to seek deeper economic relationships with countries outside the sanctions coalition, such as Brazil, China, India, Turkey and others. At the same time, there are many countries, with the mediation and direct participation of which it is possible to mitigate the expected impact of sanctions or completely bypass them by finding new supply markets for stockpiled products. Only China and India, with their huge consumption potential, are sufficient to provide an alternative supply of a number of Russian products targeted by Western sanctions.

Despite facing losses of hundreds of billions of dollars, the Russian economy has weathered the sanctions better than expected. However, the sanctions hinder Russia's ability to engage in cross-border transactions. The new sanctions may cause lasting effects on the structure of the global economy, potentially creating fractures in the global economy. Sanctions may also accelerate efforts by countries, particularly China, to reduce their reliance on the US dollar in international transactions.

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MIKAYEL MELKUMYAN
*Head of the Chair of Microeconomics of the
Armenian State University of Economics, Doctor of
Economics, Professor*
ARTHUR ARAKELYAN
*Associate Professor at the Chair of Microeconomics
of the Armenian State Univeristy of Economics,
Candidate of Economic Sciences*

PROSPECTS OF ECONOMIC SECURITY AND ECONOMIC DEVELOPMENT IN THE CONTEXT OF QUALITATIVE IMPROVEMENT OF GDP STRUCTURE IN RA

Key Words: *economic security, economic crisis, industrial policy, export industry, information technologies, digital economy*

The global geopolitical shifts that took place in 2022 significantly changed the patterns and rules of global economic life, as a result of which problems of economic security also appeared in almost all states.

These vague prospects of economic development did not leave our country untouched either. On the one hand, separate elements of revitalization of economic life are created, on the other hand, new risks arise. Having a small economy, the Republic of Armenia bears to the maximum extent both positive and negative consequences of the above-mentioned economic changes.

One thing is clear that the main factor of sustainable economic development and security was and remains the industry. Therefore, in this article, analyzing the impact of global economic fluctuations on the macroeconomic indicators of our country, an attempt was made to assess their impact on the industry and especially the export industry, identify ways to emerge stronger from the crisis situation conditioning the prospects of our country's economic security with the vision of becoming a country that exports industrial products.

At the same time, taking into account the logistical problems of the Republic of Armenia in dealing with the outside world, as well as the availability of a qualified workforce, the basis of ensuring economic security is the need to develop a state policy aimed at the development of the information technology sector and the digital economy, as well as the digitalization of industry.

Introduction. The events of the past year 2022 showed that a sharp slowdown in economic growth is expected in the world already in the current year 2023. The latter is caused by various

factors, but the most important of them are the Russian-Ukrainian conflict and the sanctions applied by both sides.

In 2022, the global inflation rate was around 9 percent, in 2023 it is predicted to decrease to 6.6 percent, and in 2024 to 4.3 percent.

At the same time, the economic growth rate has decreased from 6 percent in 2021 to 3.4 percent in 2022. And in 2023, it is predicted to be 2.9 percent. This is the lowest economic growth rate since 2001, excluding the years of the global financial and economic crisis and the Covid-19 pandemic.

Meanwhile, it should be clearly stated that the economic life of the Republic of Armenia is essentially connected with the economy of the Russian Federation. Therefore, in one way or another, the economic events taking place in the Russian Federation will have a significant impact on the economic life of Armenia as well.

Taking into account the above, this article has studied and assessed the current trends in the development of the world economy, the existing challenges of economic security and the development of the problems of effective solution of the long-term security challenges of the economy of the Republic of Armenia.

Literature overview. Comprehensively, studying the dynamics of the changes that have been taking place in the Armenian economy for years, assessing the impact of the economic component of global geopolitical changes on the economy of the Republic of Armenia in 2022, as well as using the information obtained as a result of direct contacts in various enterprises of the Armenian industry, this article attempted to outline the prospective foundations of economic security of the Republic of Armenia.

Being the author of the industrial policy law adopted in 2014, we see the foundations of the security prospects of the RA economy in the development of the digital content, knowledge-based and export-oriented industry.

Perhaps, the main reason for the shortage of literature is that the current economic shifts are new in nature and fundamentally new approaches and non-standard solutions are needed for their analysis and evaluation.

Official information sources, statistical bulletins, as well as micro-level analyses of economic entities, financial and economic calculations, valuable and so-called "first-hand" information obtained as a result of direct contact with specialists were accepted as the information basis of this report.

As an information source, the bulletins published by the Statistical Committee of the Republic of Armenia, the Ministry of Finance, the National Statistical Office of Georgia, the International Monetary Fund, the provisions defined in the Laws on Industrial Policy and State Support of Information Technologies were used.

Research methodology. We strongly believe that studies aimed at identifying economic security and development prospects should be carried out on the so-called "top-down" and "bottom-up" principles: from the general macroeconomic level, that is, from the assessment of

the interaction of global economic phenomena, to the micro level, namely, analyses carried out at the scale of individual enterprises, as well as spread the scope of research horizontally.

The research methodology encompasses observation, analysis, synthesis, comparative analysis, deduction, generalization and forecast. Through the analytical method the research object has been split and each element has been studied. The research results have been synthesized and appropriate conclusions have been drawn.

The theoretical, methodological and informational basis of the research underlies Armenian and foreign literature as well as the decisions of state bodies of the Republic of Armenia, data submitted by Statistical Committee, State Revenue Committee of the Republic of Armenia, international data, international organization's reports, evaluations and reviews.

During the professional discussions, based on the collection of creative ideas, a "brainstorming" was also organized to identify the positive and negative aspects of the existence of special taxation systems and tax benefits discussed in this article, and to find the best solutions.

Analysis. The year 2022 will probably be remembered in world economic history as a year of geopolitical and economic tectonic upheavals and drastic shifts in long-standing rules and patterns of socio-economic life. The Russian-Ukrainian conflict, which in just one year managed to call into question the effectiveness of the existing economic-security structures of almost all states in the world, still does not seem to stop. Moreover, the scope of mutually applied sanctions is expanding both vertically and horizontally.

Thus, Global growth is projected to fall from an estimated 3.4 percent in 2022 to 2.9 percent in 2023, then rise to 3.1 percent in 2024. The forecast for 2023 is 0.2 percentage point higher than predicted in the October 2022 World Economic Outlook (WEO) but below the historical (2000–19) average of 3.8 percent. Global inflation is expected to fall from 8.8 percent in 2022 to 6.6 percent in 2023 and 4.3 percent in 2024, still above pre-pandemic (2017–19) levels of about 3.5 percent[1].

Despite the predictions made against the background of global economic shocks at the beginning of 2022, the economy of the Republic of Armenia passed 2022 with honor. The dram's appreciation against the dollar (see Figure 1) greatly contributed to curbing inflation and making imports cheaper.

The consumer price index in 2022 was 8.6 percent, which is 0.2 percentage points lower than the global inflation rate and is the lowest among EAEU member countries. Thus, in 2022, inflation in the Russian Federation was 11.9 percent, in Belarus 16.5 percent, in Kazakhstan - 11.3 percent, and in Kyrgyzstan - 17.5 percent[2].

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[1] Intarnational Monetary Fund, World Economic Outlook Update, Inflation Peaking amid Low Growth, 2023 JAN
https://www.imf.org/en/Publications/WEO/Issues/2023/01/31/world-economic-outlook-update-january-2023

[2] https://www.statista.com/statistics/271376/inflation-rate-in-russia/
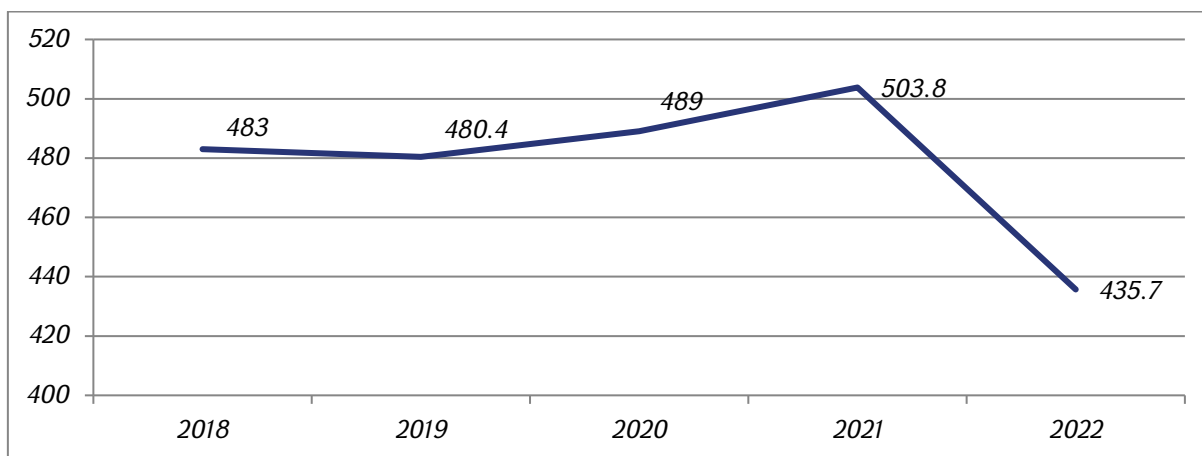
Figure 1. *The average exchange rate of the dram against the dollar in 2018-2022*

The rest of the macro-economic summary indicators characterizing the previous year are also good. Thus, in 2022, the GDP of the Republic of Armenia amounted to 8 trillion 496 billion drams (see Table 1), which exceeds the last year's indicator by around 1.5 trillion drams. In dollar terms, the GDP reached 19.5 billion in 2022, which is 5.6 billion more than last year's figure in dollars. At the same time, in order to draw objective conclusions about GDP growth, Table 1 also presents the dynamics of Georgia's GDP, also taking into account the fact that in terms of GDP per capita in 2022, Armenia and Georgia are almost equal. The GDP per capita in the Republic of Armenia increased from 4,196 dollars in 2018 to 6,569 dollars in 2022, and in Georgia it increased from 4,722 dollars to 6,671 dollars.

Table 1

The comparative trend of the GDP of the Republic of Armenia and Georgia[1]

	2015	2016	201	2018	2019	2020	2021	2022
Country				*Armenia*				
GDP, bln. AMD	5,043	5,067	5,564	6,017	6,543	6,181	6,982	8,496
GDP, bln. dollar	10.5	10.5	11.5	12.5	13.6	12.6	13,9	19,5
Average annual dollar exchange rate, drams	477.9	480.5	482.7	483.0	480.4	489.0	503.8	435.7
GDP per capita, thousand AMD	1,678	1,693	1,867	2,026	2,208	2,087	2,357	2,861
GDP per capita, dollars	3,512	3,524	3,869	4,196	4,597	4,269	4,679	6,569
Country				*Georgia*				
GDP, bln. Georgian lari	33.9	35.8	40.8	44.6	49.3	49.3	60.0	71.7
GDP, bln. dollar	14.9	15.1	16.2	17.6	17.5	15.8	18.6	24.6
GDP per capita, lari	9,109	9,613	10,933	11,968	13,239	13,234	16,179	19,452
GDP per capita, dollars	4,012	4,062	4,358	4,722	4,696	4,255	5,023	6,671

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[1] The table was compiled based on the data published by the Ministry of Finance of the Republic of Armenia and the data published by the National Statistical Office of Georgia. https://minfin.am/hy/page/_hy_chart_/ https://www.geostat.ge/en/modules/categories/23/gross-domestic-product-gdp

However, at the beginning of this article, we indicated that the export industry should be the basis of the economic security prospects of the Republic of Armenia. Studying the dynamics of the GDP structure of the Republic of Armenia in the years 2015-2022, we find out that the share of the manufacturing *industry* in the GDP has not changed significantly in those years. Compared to 9.2 percent in 2015, it reached only 11.7 percent in 2022. For comparison, it is necessary to state that the share of agriculture, forestry and fishing in the GDP decreased from 17.2 percent to 10.4 percent in the same period (see Table 2).

Table 2

The trend of the GDP structure of the Republic of Armenia in 2015-2022[1]

	2015	2016	2017	2018	2019	2020	2021	2022
Agriculture, forestry and fishing	17.2%	16.4%	15.0%	13.9%	11.5%	11.3%	11.3%	10.4%
Mining and quarrying	2.1%	2.6%	3.3%	2.8%	3.3%	3.9%	5.5%	3.8%
Manufacturing	9.2%	10.3%	10.6%	11.3%	11.7%	12.3%	11.4%	11.7%
Electricity, gas, steam and air conditioning supply	4.6%	4.5%	4.1%	3.5%	3.1%	3.3%	2.8%	2.9%
Water supply; sewerage, waste management and remediation activities	0.4%	0.5%	0.5%	0.5%	0.5%	0.4%	0.4%	0.4%
Construction	9.4%	7.8%	7.3%	6.6%	6.3%	6.9%	6.5%	6.8%
Wholesale and retail trade; repair of motor vehicles and motorcycles	10.9%	9.8%	11.1%	11.5%	11.7%	10.8%	11.2%	11.8%
Transportation and storage	2.5%	2.8%	3.0%	3.2%	3.2%	2.4%	2.8%	3.7%
Accommodation and food service activities	1.2%	1.2%	1.4%	1.6%	1.9%	1.1%	1.7%	1.9%
Information and communication	3.4%	3.5%	3.3%	3.2%	3.3%	3.8%	3.8%	4.5%
Financial and insurance activities	3.9%	4.4%	4.9%	5.5%	6.0%	7.0%	6.0%	8.0%
Real estate activities	8.7%	8.6%	7.8%	7.6%	7.8%	6.9%	7.4%	7.9%
Professional, scientific and technical activities	1.2%	1.2%	1.1%	1.2%	1.2%	1.1%	1.1%	1.1%
Administrative and support service activities	0.8%	0.9%	0.9%	0.9%	0.9%	0.6%	0.7%	0.7%
Public administration and defence; compulsory social security	4.8%	4.9%	4.7%	4.4%	4.5%	5.6%	4.9%	4.6%
Education	2.9%	3.0%	2.7%	2.6%	2.5%	2.8%	2.7%	2.4%
Human health and social work activities	3.9%	4.1%	4.2%	4.3%	4.6%	5.4%	6.7%	5.3%
Arts, entertainment and recreation	3.2%	4.6%	4.6%	5.6%	5.6%	4.9%	3.1%	2.7%
Other service activities	0.6%	0.7%	0.9%	0.9%	0.7%	0.7%	0.6%	0.6%

The share of retail trade in GDP has hardly changed and is 11.8 percent. It is noteworthy that despite the large flow of specialists in the information sector from Russia to Armenia, the share of the information and communication sector in GDP increased by only 0.7 percentage points from 3.8 percent in 2021, reaching 4.5 percent in 2022. And the share of the accommodation and public catering sector in the GDP increased by 0.2 percent to 1.9 percent.

The presentation of these indicators is not accidental. From the analysis of the dynamics of the GDP structure, we can state that the sharp changes in the world economy, which have both positive and negative effects on the current economy of our country, have not significantly

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[1] Official website of the Ministry of Finance of the Republic of Armenia https://minfin.am/hy/page/_hy_chart_/

changed the structure of the GDP. From all that, we can record that the basis of the economy remains the industry, as its share in the GDP has not changed during the studied years, and especially in 2022. Moreover, the large flow of newcomers from the Russian Federation to the Republic of Armenia should have significantly increased the shares of other sectors of the economy: information and communications, accommodation and public catering in the GDP structure, which did not happen either. The income and economic activity resulting from these flows are temporary. They cannot be the basis of long-term economic security without state support policy. Therefore, the economic security prospects of the Republic of Armenia should be based on the industry.

Comparing the GDP structures of the Republic of Armenia and Georgia in 2022 (see Table 3), we see that the share of the manufacturing industry in Georgia's GDP is almost 2 times higher than the similar indicator of our country. At the same time, the share of the information and communication sector in the GDP structure of the Republic of Armenia is higher than the similar indicator of Georgia, but only by 0.6 percentage points. From what has been said, we can conclude that there is a lot to be done in the development of the manufacturing industry of the Republic of Armenia, and the well-known advantages of our country in the field of information technology are not enough for the sharp development of the sector. A comparative analysis of GDP structure is presented in the table below.

Table 3

Republic of Armenia and Georgia in 2022. Comparison of GDP structure[1]

GDP	Armenia	Georgia
Agriculture, forestry and fishing	10.4%	6.1%
Mining and quarrying	3.8%	1.4%
Manufacturing	11.7%	20.2%
Electricity, gas, steam and air conditioning supply	2.9%	2.6%
Water supply; sewerage, waste management and remediation activities	0.4%	0.7%
Construction	6.8%	11.6%
Wholesale and retail trade; repair of motor vehicles and motorcycles	11.8%	12.6%
Transportation and storage	3.7%	6.9%
Accommodation and food service activities	1.9%	4.3%
Information and communication	4.5%	3.9%
Financial and insurance activities	8.0%	3.7%
Real estate activities	7.9%	6.3%
Professional, scientific and technical activities	1.1%	1.8%
Administrative and support service activities	0.7%	0.9%
Public administration and defence; compulsory social security	4.6%	4.9%
Education	2.4%	2.9%
Human health and social work activities	5.3%	4.0%
Arts, entertainment and recreation	2.7%	4.3%
Other service activities	0.6%	0.9%

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[1] Official website of the Ministry of Finance of the Republic of Armenia https://minfin.am/hy/page/_hy_chart_/

We also consider it necessary to mention that taking into account the logistical problems of the Republic of Armenia and the presence of a high professional potential already formed in the field of information technologies, the economic policy of the Republic of Armenia should include the development of a new concept aimed at the development of information technologies and the digital economy and the implementation of state support, with the aim of increasing the share of that sector in GDP to at least 10 percent.

Of course, certain changes and shifts have taken place in the industry sector in the Republic of Armenia in the last decade, as a result of which the branch structure of the industry has significantly changed, new sub-branches and productions have been formed, their technological elements and components have changed, the technical-technological level of a number of productions has been modernized, certain changes have occurred. The structure and geography of industrial exports has also been affected.

However, the weight of industry in the structure of the GDP of the Republic of Armenia is still insufficient, taking into account that the Republic of Armenia must become an industrial country again, high-tech industry, scientific branches of industry must be developed and expanded.

In the modern world, in order to revitalize the economic situation, various tools are used in many countries, including industrial zones and free economic zones. The launch and placement of each of them has a certain logic. However, they should also contain appropriate content, taking into account the size, place, position, quality of economic ties, membership in this or that union of the given country.

From that point of view, it is very important to argue the formation of such zones in the Republic of Armenia and to evaluate the possibilities of further development.

In RA, the relevant legislation regarding industrial zones and free economic zones has been in force for years. At the same time, we must evaluate how these laws serve the interests of our state within the framework of these new realities after RA's accession to EAEU.

Thus, as early as 2014 The RA National Assembly adopted the RA Law "On Industrial Policy", which at that time was considered the main law, that is, a completely newly developed law, proposed by the author of these lines.

The law provided for two important provisions: the first is that RA must have a five-year state industrial plan, where the main developing branches, sub-branches and products of the industry must be clearly recorded. At the same time, the main directions of industry and export branches should be clearly defined. The state budget with its program base should also reflect the basis of implementation of these programs.

It was also important that years ago, in 2012 the concept of "Export Oriented Industrial Development" was adopted, where relevant sectors such as brandy, winemaking, precision engineering, etc. were already recorded.

The next important provision of the Act was the formation of industrial zones with proper infrastructure, governing body etc. The functions of state administration bodies and local self-government bodies were also defined in that context.

As for the implementation of the requirements of the two main provisions of the law, it should be critically noted that they were not, in fact, fulfilled. The five-year state industrial program does not work, we do not have any industrial zone formed. The question arises, why?

Let us also record that the article 3, paragraph 3 of the RA Law "On Industrial Policy" defines that an industrial zone is a separate area that meets the requirements set by the law and where exclusively industrial activities are carried out. An industrial zone may have the status of a free economic zone (note that it may also not). So the law must work.

For example, looking at the industrial map of the republic, we should record which industrial geographical areas can claim to form industrial zones. These areas must have adequate infrastructure (roads, railway lines, production areas, tool manufacturing workshops, etc.). At first glance, for example, the cities of Charentsavan or Hrazdan can claim it. At this stage, we would prefer Charentsavan. The distance from the capital Yerevan is also important.

The above should be followed by the identification of the components of the industrial zone, namely infrastructure, production areas, state and non-state owned facilities by the relevant government agencies.

But first, it is necessary to form a field of appropriate favorable legal and economic regulations: tax benefits, state co-ownership, as well as the introduction of a new system of so-called industrial mortgage lending.

As for the field of information technology, in 2022, the turnover of the field was 294 billion drams, which is 75.7 percent higher than last year's index[1]. Of course, this growth is largely due to the large flow of IT workers from Russia to Armenia. But are the necessary steps being taken to turn the temporary extensive growth recorded in the sector into a qualitative long-term growth? Whether the sector is given the necessary care at the state level, and whether the Republic of Armenia can provide a competitive business environment for the sector in the long term. This is especially important in the sense that business entities in the field of information technology have high mobility and can easily be relocated to a convenient location in the presence of more favorable regimes in neighboring countries.

In this regard, we consider it necessary to state that one of the favorable tax regimes according to the Law of the Republic of Armenia on December 1, 2014 on State Support of the Information Technology Sector is the 10 percent income tax rate instead of the general 20 percent and the exemption from profit tax. However, only business entities that have received a certificate can use it. Article 8 of the same law defines the requirements for obtaining a certificate. The most significant requirement is that the number of their employees cannot

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[1] RA Statistical Committee, Interesting statistics, p 327, https://armstat.am/file/article/sv_12_22a_6200.pdf

exceed 30[1]. For comparison, let us note that in neighboring Georgia, two preferential regimes are defined for enterprises in the field of information technologies: "International Organization" and "Virtual Zone Person". In the first case, the business entity can pay 5 percent income tax (instead of 15 percent), 0 percent dividend tax (instead of 5 percent), and in the second case, 0 percent profit tax, 20 percent income tax.[2] It is obvious that such favorable tax regimes in the long term may deprive Armenia of the current attractiveness of conducting activities in the field of information technologies. For this reason, we believe that it is necessary to develop a fundamentally new structure of state support for the information technology sector, which will be aimed not only at the support of startups and small organizations with up to 30 employees, but at the state support of the entire sector.

The development of the information technology sector will also contribute to the integration of digital technologies into the industry, the release of industrial products with knowledge-based content, ensuring the competitiveness of the sector and, as a result, the sustainable development of the industry sector.

Conclusions. In summary, we can state that the global geopolitical shifts that began in 2022 have created new risks for the states, which were sometimes not defined in the previous concepts of economic security of the states.

Although the Republic of Armenia ended 2022 with positive macroeconomic indicators, the economic security risks have not been neutralized.

The study of the dynamics of the GDP structure of the Republic of Armenia shows that the change in the specific weight of the industry during the last 8 years is not enough to ensure the future security of the economy.

We see the development of the industrial sector with an increase in productivity, an increase in the share of industrial products with digital content, an increase in the volume of production of knowledge-based and export-oriented industrial products.

In order to achieve these goals, it is necessary to implement a number of provisions established by the law on industrial policy. In particular, develop the five-year state industrial program and establish industrial zones.

It is necessary to emphasize and develop a concept for the implementation of the state program aimed at the technological re-equipment of the industrial export sector of the republic and the encouragement of new markets, developing a new structure for providing industrial mortgage loans.

It is necessary to develop and implement new structures of state support for the information technology sector, which will not be aimed at the support of small companies, but at the state support of the entire sector.

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[1] The Law of the Republic of Armenia on State Support in the Information Technology Sector, adopted on December 1, 2014.

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OLEG BODIAGIN
PhD, Associate Professor,
Rostov State University of Economics
ELENA MAKARENKO
Doctor of Science, Professor,
Rostov State University of Economics
INGA MEZINOVA
PhD, Associate Professor,
Rostov State University of Economics

SUSTAINABLE GLOBAL ENERGY TRANSITION: COMPETITIVENESS ISSUES FOR RUSSIA

Keywords: *energy transition, sustainable development, energy-intensive export, greenhouse gas emissions, competitiveness, Russia*

Climate change is one of the greatest challenges facing the world today, and it presents a wide range of problems across multiple sectors from rising global temperatures and sea level to loss of biodiversity, food and water insecurity and public health impacts. While green economy aims to achieve sustainable development by promoting environmental stewardship and reducing negative impacts on the natural environment, global energy transition is treated as its leading contributor. However, while energy-deficit countries welcome the shift in the structure

of global energy supply and demand towards renewables, many energy-abundant countries, including Russia, are facing significant challenges as the world transitions towards a low-carbon economy. Being heavily dependent on oil exports for their revenue, they need to diversify their economies by investing in other sectors to reduce their vulnerability to fluctuations in the oil market, invest in renewable energy, develop a capture and storage (CCS) technology, and increase energy efficiency.

However, Russia until 2020s barely treated global energy shift as a challenge for its exports. The change occurred only after the EU, then a major importer of Russian goods, adopted the Clean Energy Package and the Green Deal which threatened the prospects of country's exports. The authors consider major drivers for energy shift in Russian economy, including changes in global energy market since 2022.

Introduction. The global energy transition refers to the ongoing shift from fossil fuels to renewable energy sources and a more sustainable energy system. This transition is driven by a combination of environmental concerns, such as climate change and air pollution, as well as economic and technological factors[1].

The goal of the global energy transition is to reduce greenhouse gas emissions, increase energy efficiency, and ensure a more sustainable and reliable energy supply. This transition involves phasing out the use of fossil fuels and increasing the use of renewable energy sources such as solar, wind, hydro, geothermal, and biomass. The transition is also characterized by a move towards decentralized energy systems, with greater emphasis on local production and consumption of energy. This is facilitated by advances in energy storage technologies and the development of smart grids that allow for more efficient distribution of energy[2].

The global energy transition presents significant challenges, including the need for significant investment in renewable energy infrastructure, the development of new technologies, and the management of the social and economic impacts of the transition, especially for energy-abundant countries like Russia.

Literature review. Russia is engaged in the majority of international climate initiatives. Starting with UN Framework Convention on Climate Change (UNFCCC) in 1992 (ratified in 1994) to Kyoto Protocol in 1999 (ratified in 2004), which came into force only due to Russia's ratification as the required level of 55% of global emissions was overcome, and Paris Climate Agreement of 2015 (ratified in 2016)[3]. Within the Paris Agreement, Russia has a target to limit

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[3] Federal Law *On Ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change* of November 4, 2004, No 128-FZ. (2004). http://www.kremlin.ru/acts/bank/21599;

greenhouse gas emissions to 70% by 2030 relative to the 1990 level[1].

At the same time, however, climate and "green" issues are barely presented in country's national legislation, including national projects, e.g. in the National Project "Ecology", National Goals of the Government of the Russian Federation until 20242.

The first real integration of climate-change issues into the national agenda were presented in 2009 in the Climate Doctrine of the Russian Federation until 2020[3]. Later on, during 2009-2021 the following legislative measures were adopted:

- Federal law "On Energy Saving and on Increasing Energy Efficiency and on Amendments to Certain Legislative Acts of the Russian Federation" (2009)[4];
- Decree "On reducing greenhouse gas emissions" (2013)[5];
- Concept for the formation of a monitoring, reporting and verification system for greenhouse gas emissions with methodological recommendations for conducting a voluntary inventory of greenhouse gas emissions in the Russian regions (2015)[6]; and Methodological guidelines and guidelines for the quantitative determination of greenhouse gas emissions by organizations engaged in economic and other activities in Russia (2015)[7];

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[2] National Project Ecology. (n.d.). https://www.mnr.gov.ru/upload/medialibrary/0bd/NP_EkologiyaPasport.pdf;
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[3] Climate Doctrine of the Russian Federation, decree of December 17, 2009 No. 86-rp. (2009).
http://kremlin.ru/events/president/news/6365

[4] Federal law *On Energy Saving and on Increasing Energy Efficiency and on Amendments to Certain Legislative Acts of the Russian Federation* of November 23, 2009 No. 261-FZ. (2009)

[5] Decree *On reducing greenhouse gas emissions* of September 30, 2013 No. 752. (2013).
http://kremlin.ru/acts/news/19344

[6] Order of the Ministry of Natural Resources and Ecology of the Russian Federation. (2015a). *On approval of methodological recommendations for conducting a voluntary inventory of greenhouse gas emissions in the regions of the Russian Federation* of April 16, 2015 No. 15-r. https://docs.cntd.ru/document/420278225;
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[7] Order of the Ministry of Natural Resources and Ecology of the Russian Federation. (2015b). *On approval of methodological guidelines and guidelines for the quantitative determination of greenhouse gas emissions by organizations Engaged in Economic and other activities in the Russian Federation* of June 30, 2015 No.300.
https://docs.cntd.ru/document/420287801

- Guidelines for quantifying the volume of indirect energy emissions of greenhouse gases, carried out by regional and market methods (2017)[1];
- Guidelines for the quantitative determination of greenhouse gas uptake volumes (2017)[2i];
- Comprehensive action plan to improve the energy efficiency of the Russian economy (2018)[3];
- Plan for the first stage of measures to adapt the economy and the population to climate change until 2022 (2019)[4];
- interim version of the Russian low-carbon development strategy (published for public comment in March 2020)[5];
- national standardization system in the field of management of greenhouse gas emissions at the level of organizations (2021)[6];

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[4] Order of the Government of the Russian Federation of December No. 3183-r. (2019, December 25). http://static.government.ru/media/files/OTrFMr1ZlsORh5NIx4gLUsdgGHyWIAqy.pdf

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- goals and main directions of sustainable (including green) development of Russia (2021)[1];
- Strategy for socio-economic development with low greenhouse gas emissions until 2050 (2021)[2];
- Federal Law "On Limiting Greenhouse Gas Emissions" (2021)[3].

Strategy for socio-economic development with low greenhouse gas emissions until 2050 assumes two scenarios. The target one describes gradual introduction of technologies to reduce emissions and improve energy efficiency, which leads to a slight increase in emissions by 2030 and then a reduction by 60 percent compared to 2019 levels and by 80 percent compared to 1990 levels by 2050[4].

Federal Law of 2021 "On Limiting Greenhouse Gas Emissions" became the first national decree regulating CO_2 emissions with a system of collecting fees for emissions *("carbon pricing")*.

Research methodology. The study uses a mixed-methods approach, combining quantitative data analysis with qualitative one. We start with a comprehensive review of existing literature to gain insights into sustainable energy transition, competitiveness issues, and the specific context of the Russian Federation. The literature review includes scholarly articles, reports, and relevant policy documents to establish a solid theoretical foundation for the study.

Further on we mainly focus on a secondary data collected from reputable sources, including government reports, statistical databases, energy sector publications, and international organizations such as the International Energy Agency. This data encompass indicators related to energy production, consumption, renewable energy deployment, policy frameworks, and competitiveness metrics.

Qualitative data was analyzed using thematic analysis to identify patterns and themes related to competitiveness issues.

The findings are interpreted and discussed in relation to the research objective and existing literature in order to generate insights that can inform policymakers, industry stakeholders, and other relevant parties in their efforts to navigate the challenges and opportunities of energy transition.

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[2] Order of the Government of the Russian Federation. (2021b). *Strategy for socio-economic development of Russia with low greenhouse gas emissions until 2050* of October 29, 2021 No 3052-r. http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf

[3] Federal Law *On Limiting Greenhouse Gas Emissions* of July 02, 2021 No. 296. (2021). http://publication.pravo.gov.ru/Document/View/0001202107020031

[4] Order of the Government of the Russian Federation. (2021b). *Strategy for socio-economic development of Russia with low greenhouse gas emissions until 2050* of October 29, 2021 No 3052-r., pp. 24-25. http://static.government.ru/media/files/ADKkCzp3fWO32e2yA0BhtIpyzWfHaiUa.pdf

Energy transition for russia: competitive challenges. For the sake of this study, we start with the basic figures, describing the energy intensity of Russia.

Russia's share in the global greenhouse gas emissions is about 5%. The country stands among the biggest greenhouse gas-emitting countries. According to the International Energy Agency, which provides data on global carbon emissions, Russia's fossil CO_2 emissions in 2020 were approximately 1.7 billion metric tons. This represents a decrease of about 8% compared to 2019 levels, which may be attributed to the COVID-19 pandemic and associated economic slowdown. However, it is important to mention, that this figure is more than 6 times less than in China, 2.5 times less than in the USA, 1.5 times less than in the EU and India[1].

Russia's share in global greenhouse gas emissions is about 5%. As of 1990, total emissions amounted to 3 billion 352 million tons of carbon dioxide equivalent, of which about 70% accounted for energy, 9% - agriculture, 8% - industry (see Table 1).

Table 1

Distribution of greenhouse gas emissions in Russia by sector, %, and increments of greenhouse gas emissions 2020 to 1990, %

Year	Sector				Total, without LULUCF
	Energy*	*Industry*	*Agriculture*	*Waste*	
1990	81.3	9.0	7.8	1.9	100
2020	77.9	11.8	5.7	4.7	100
2020 to 1990 emissions increment ratio	-38.0	-15.2	-52.9	+80.3	-52.0

Note. Energy sector includes emissions from the combustion of all types of fossil fuels, as well as leakage and technological emissions of fuel products into the atmosphere, regardless to which sectors of the economy they belong

Source: Hydrometeorological Center of the Russian Federation

The total greenhouse gas emissions, excluding LULUCF, amounted to 2051.4 million tons of CO_2- in 2020 (see Figure 1). This value corresponded to 64.9% of 1990 emissions. However, in 2020 Russian GDP decreased by 2.7% (mainly due to the COVID-19 pandemic) while the reduction in total emissions excluding the LULUCF sector was 3.4%.

The main drivers of changes in greenhouse gas emissions in Russia over the last 30 years were general trends in economic development (GDP dynamics), shifts in the structure of GDP, changes in energy efficiency, as well as the overall efficiency of the national economy, changes in the structure of the fuel balance, general trend of air temperatures. These factors impacted mostly indirectly through changes in the consumption of fossil fuels, thus affecting the amount of emissions in the energy sector.

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[1] International Energy Agency. (n.d.). Data and Statistics. *Total CO2 emissions.* https://www.iea.org/data-and-statistics/data-browser?country=WORLD&fuel=CO2%20emissions&indicator=TotCO2
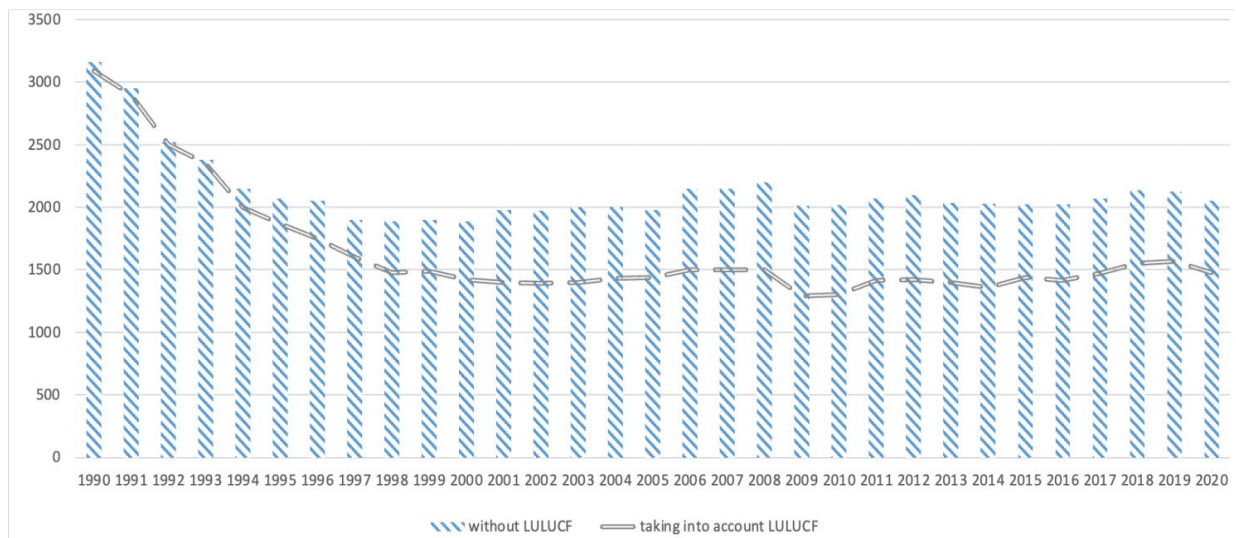
Source: Calculated with data from Hydrometeorological Center of the Russian Federation

Figure 1. ***Total anthropogenic greenhouse gas emissions in Russia, taking into account LULUCF in 1990-2020, in mln t CO2 equivalent***

The main drivers of changes in greenhouse gas emissions in Russia over the last 30 years were general trends in economic development (GDP dynamics), shifts in the structure of GDP, changes in energy efficiency, as well as the overall efficiency of the national economy, changes in the structure of the fuel balance, general trend of air temperatures. These factors impacted mostly indirectly through changes in the consumption of fossil fuels, thus affecting the amount of emissions in the energy sector.

In comparison to other energy-abundant countries, for Russia the contribution of LULUCF is much higher. Since 1990 greenhouse gas absorption prevailed over emissions in the LULUCF sector, e.g. compensating for 27% of total greenhouse gas emissions in other sectors in 2020. The overall dynamics of emissions in the LULUCF sector in 1990-2020 was determined by two main factors:

1) the increase in absorption in managed forests due to reducing logging and increasing the area of managed forests;
2) the accumulation of soil organic carbon on lands, transferred from arable to fodder land, due to the growth of their area[1].

But what do these figures mean for Russia's global competitiveness?

They matter a lot for the international trade and all the export-oriented industries of Russia. Russia is characterized by a high degree of carbon intensity of exports, see e.g. the

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[1] Hydrometeorological Center of the Russian Federation. (2022). *National report on the inventory of anthropogenic emissions from sources and removals by sinks of greenhouse gases not regulated by the Montreal Protocol for 1990-2020. Part 1.* https://unfccc.int/documents/461970

OECD study[1]. More than 50% of Russian exports traditionally account for oil, gas, coal and petroleum products (in 2022 the figure was 64.8%, in 2021 – 60.3%, in 2020 – 49.6%[ii], in 2019 – 66.9%), and the EU and Asian countries, leaders in the global "green" agenda, in recent years provided almost two thirds of export revenue (see Figure 2).
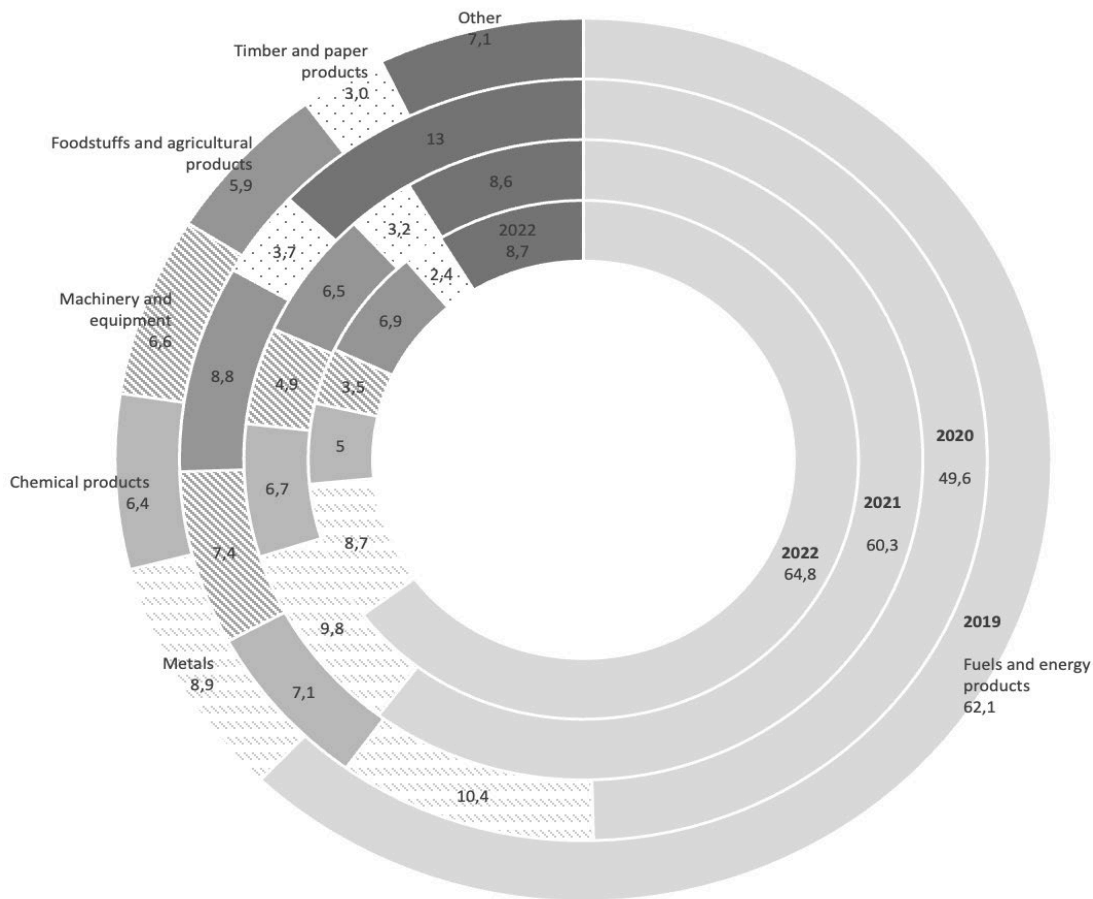
Source: calculated with data from Federal Customs Service of Russia
*Figure 2. **Structure of Russian exports in 2019-2022, %***

This puts forward some issues with the *regulatory pressure.* Since 2020s the majority of OECD countries started implementing policies that incentivize or mandate lower-carbon production processes or products. A good example would be the Carbon border adjustment

[1] Organization for Economic Co-operation and Development. (n.d.). Science, Technology and Industry Working Papers. *CO$_2$ emissions embodied in international trade and domestic final demand: Methodology and results using the OECD Inter- Country Input-Output Database.* https://dx.doi.org/10.1787/8f2963b8-en

mechanism (CBAM) adopted by the European Union[1]. Even after re-orientation of Russian exports from Europe (which traditionally accounted more than 30% of Russian exports (38,3% in 2021)) to Asia in 2022, the "green" risks are still high.

Moreover, this industry was severely sanctioned after the beginning of the 'special military operation' in Ukraine in 2022. Both the EU and the U.S. imposed restrictions against Russian oil industry: there is a ban on the export of technologies and equipment for oil and gas production, a ban on the supply of oil and petroleum products since the end of 2022, restrictions against banking operations in this field and price cap on crude oil of Russian origin[2].

The lengthening of delivery routes and logistical sanctions create additional pressure on the margin of Russian firms and may limit exports from Russia. High prices create significant risks of recession and reduction in demand, as well as accelerate energy transition in energy-deficit countries like EU.

Along with that *the global green agenda* enables the growth of the renewables' share in the global energy balance, accelerates the decarbonization of transport, construction and other typically energy-intensive industries, thus leading to a decrease in demand for traditional goods imported from Russia (see the structure of Russian exports in Figure 2). So, if a country's exports do not meet these new green standards, it may face trade barriers or other regulatory pressures that reduce its competitiveness in export markets.

We can add *changing consumer preferences* to the existing challenges. As consumers become more aware of environmental issues, they may prioritize products that are produced with lower environmental impacts. If a country's export goods are associated with high energy intensity or poor environmental practices, they may be less attractive to consumers and lose market share to competitors that offer more sustainable products.

In that sense climate risks are already in the agenda of a wide range of Russian public exporting companies, especially belonging to the extraction industries: Gazprom, Rosneft, Tatneft, Rusal, Polymetal, EVRAZ, Ilim Group, etc. The list of the best performers in the latest available ESG ranking of Russian companies by RAEX Europe is in the Table 2[3]. It includes 160 companies from more than 20 industries.

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[1] European Commission. (2021). *Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism.* 14.07.2021.
https://ec.europa.eu/info/sites/default/files/carbon_border_adjustment_mechanism_0.pdf

[2] Mezinova, I., Bodiagin, O., Balanova, M. Green challenges for Russian exports. *Logistics development under sanction restrictions and international economic intolerance : materials of the International Scientific and Practical Conference. XVIII South Russian Logistics Forum.* October 07-08, 2022 – Rostov-on-Don: Publishing and Printing complex of RSUE, 2022, pp. 445-449.

[3] RAEX Europe. (2023). *ESG ranking of Russian companies.*
https://raexrr.com/ESG/ESG_companies/ESG_rating_companies/2023.4/

Table 2

TOP-10 Russian companies by RAEX Europe ESG-ranking

Rank	Company	Industry	E rank	S rank	G rank	Last reporting period
1	NLMK	Ferrous metallurgy	2	2	21	2021
2	Polyus	Mining / Precious Metals	1	14	27	2021
3	Uralkali	Agrochemicals	6	1	6	2021
4	Enel Russia	Electric Power	9	9	2	2021
5	Polymetal International	Mining / Precious Metals	4	5	12	2021
6	FosAgro	Agrichemicals	8	11	5	2021
7	Moscow Credit Bank	Banking	5	15	8	2021
8	Nor Nickel	Mining / Precious Metals	12	18	4	2021
9	Severstal	Steel and mining	7	10	19	2021
10	LUKOIL	Integrated oil and gas companies	11	13	11	2021
11	MTS	Telecommunications	35	4	3	2021
12	AFK Systema	Finance	14	34	1	2021
13	Tatneft	Integrated oil and gas companies	17	12	7	2021
14	Yandex	Software and services	21	6	17	2021
15	Moscow Stock Exchange	Finance	3	43	10	2021

Source: RAEX Europe 2023

As of April 2023, 238 companies were included in the Register for non-financial-reporting, 1392 reports were registered, which were issued since 2000[1]. Among them: environmental reports – 110, social reports – 387, reports in the field of sustainable development – 531, integrated reports – 364. The regulation on how to fill and present data for these types of reports is practically absent in Russian legislation. However, this is still a challenge even for the companies from developed countries due to the fact that there is no globally accepted system for corporate disclosure of sustainability commitment[2].

Conclusions. Russia is one of the world's largest producers and exporters of fossil fuels, particularly oil and natural gas. As a result, the global energy transition towards renewable energy sources presents both challenges and opportunities for the country.

On the one hand, the transition to a low-carbon energy system may reduce demand for fossil fuels, and therefore impact Russia's economy, which heavily relies on energy exports. Additionally, the potential for increased regulation and carbon pricing may further impact the competitiveness of Russian fossil fuels on the global market. In a decade Russia might start facing a lag in the financial and technological spheres in "green" technologies if it ignores their importance today and stick only to traditional oil and gas.

On the other hand, Russia has significant potential for renewable energy, particularly in

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[1] Russian Union of Industrialists and Entrepreneurs. (n.d.). *National Register of Corporate Non-Financial Reports*. https://www.rspp.ru/activity/social/registr/

[2] Mezinova, I., Balanova, M., Bodiagin, O., Israilova, E., & Nazarova,E. (2022). Do Creators of New Markets Meet SDGs? Analysis of Platform Companies. *Sustainability*, *14,* 674. https://doi.org/10.3390/su14020674

the areas of hydropower and wind power. The country also has significant expertise in nuclear power and has been developing new nuclear technologies that could be deployed in the global energy transition. Additionally, Russia is well-positioned to develop and export green hydrogen, which is expected to play a significant role in the transition to a low-carbon energy system[1].

Furthermore, Russia's vast landmass and extreme climate present unique challenges for renewable energy deployment, but also provide opportunities for innovation and the development of new technologies that can withstand harsh conditions[2]. In any case energy efficiency will be a crucial component of country's sustainable development, as the global energy transfer as a process is absolutely imminent and can be only stretched over time.

Energy transfer is a non–linear and a contradictory process. And the contemporary energy policy is not only about security of supply and consumption and ensuring sustainability, the main factor is the availability of energy resources. So, for Russia, in order to keep up with the sustainable competitive development, it is necessary to invest in new decarbonized energy sources, however as today's energy is oil and gas, the country also needs to continue to invest in their production and at the same time reduce emissions from these sources.

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ABDALLAH MOHAMMED IDDRISU

Armenian State University of Economics

DIGITIZATION OF THE ECONOMY: CHALLENGES AND OPPORTUNITIES

The paper aims to introduce the findings of the survey conducted as well as a synopsis of the development of academic literature published between 2015 and 2023 with regards to the relationship between the digitalization of economies, challenges, and opportunities reviewed from peer articles. Offering comprehensive edging that seems to integrate the rising trends of digitalization of economies concerning its possible challenges with the primary purpose of making an informed decision on priorities that can lead to socio-economic development. The study aims to ascertain whether the influence of digitization in line with its numerous challenges can define the trend of socio-economic growth of an economy.

An electronic questionnaire was used to collect data, and respondents had sufficient time to answer the questions concerning the design, methodology, and approach. The paper presents a theoretical model that captures the connections between the variables analyzed.

The study also analyzes the challenges and opportunities of digitization in the economy, determining whether economies should commit to digital transformation despite any challenges. It suggests that managers should adjust their perceptions, decision-making culture, and institutional structures to fit digital transformation or maintain traditional economic engagement methods.

Coupled with these, this empirical study on economies further unveils whether economies have erratic behavior in terms of information and communication technology investments (ICT).

Introduction. In recent times, advances in information technology have become a pivotal point in the socio-economic development of every country, leading to the need for digitization. Digitizing an economy unveils new ways for both public and private sectors to exchange vital information and to transact business flexibly and in an acceptable manner. Digitizing an economy gives more avenues to changes and improvements upon the nature of the fiscal and other sectors of the economy effectively and efficiently[1]. The current economic environment characterized by globalization, uncertainty, and the pressure of competition has led many companies and public institutions to gear towards the adoption of solutions to socio-economic development. It can be assumed that governmental decisions on economic prospects and developmental policies are equally characterized by opportunities, challenges, and prioritization. Therefore, the roadmap to the socio-economic development of an economy is by making prudent decisions and prioritizing to create an operational environment for economic activities. Additionally, for the growth of the economy, a paradigm shift has become a necessity to transform governmental and private businesses to adjust to the global standard, which is digitization.

Literature review. For decades, there has been an effort by scholarly literature to clear up the concepts of transition from manual societies to information and communication technology societies around the globe. It is crucial to note that the transition from the manual economy to the digitized economy works profoundly and effectively toward economic growth. To commence with, the area of digitization is where many academics have thoroughly investigated. The term "digital economy" was devised in 1995 by an American programmer Nicholas Negroponte. Currently, the term is widely used by politicians, economists, journalists, and other professionals in their endeavors[2]. The World Bank is one of the first organizations to publish a report on the state of the global digital economy. For this study, which is the digitization of the economy: challenges and opportunities, clarification is therefore needed[3]. Digitization can be explained as the transition from analog information to an electronic alphanumeric set-up, such as changing a book from typewritten text into a digital form[4]. Digitization epitomizes

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[1] Rabetino, R., Kohtamäki, M., & Gebauer, H., (2017). Strategy map of servitization. International journal of production economics 192, 144–156)

[2] World Bank ("Digital Dividends", [1, 2], 2016).

[3] J. Scott Brennen, Daniel Kreiss, (23 October 2016). Digitalization, Wiley Online Library.

[4] J. Scott Brennen, Daniel Kreiss, (23 October 2016). Digitalization, Wiley Online Library.

an extensive sociotechnical process and suggests the amalgamation of multiple technologies into aspects of daily social life, examples are smart homes, e-healthcare, and smart cities.[1] It was suggested that "digitalization creates potent digital affordances that likely have a transformative effect upon the organization of economic activity by supporting radical business model innovation".[2] Grounded on this, almost the last two decades have been thoughtful with an expansion of new business models characterized by a high degree of digital innovations.

Some of these instances are the ATMs for cash deposits and drawings, cash wiring systems within and across nations, the introduction and improvement of telecommunication systems, artificial intelligence (AI) for national security, and many more. Experience in developments through digitization shows how vital and indispensable digitization is in this modern dispensation. Digitization of the economy provides competitive advantages to the various sectors of the economy[3]. Digitization is considered a significant tool that increases people's living standards. It is evident, one can identify the significant part that digitization plays when it comes to the economic growth of the developing countries. Concerning developed countries, it played a pivotal role in attaining that height but they keep upgrading their systems to comply with the relative advantage and competitive nature of modern global economy. Therefore, digitization of the economy could impact business models in several situations. Countries across the globe are now paying further attention to the development of new technologies to effectively acclimatize their development programs and policies to seize the new trend of global openings. [4]In recent times, the trend has been prompted by the preface of new novelties, such as the Internet of Things (IoTs) and Artificial Intelligence (AI)[5].

Digitization goes further by suggesting how economies should engage in e-governance for proper diversification. Concerning globalization, the digitization of every economy plays an integral part in integrating them into the rest of the world and exposure to available opportunities. Currently, the only platform that provides chances for countries to hinge on and grow speedily is the digital networking structure, gauging from social life, research and development (RD), economic activities, and healthcare, just to mention a few.[6]

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[1] Erkko Autio, Satish Nambisan, Llewellyn D. W. Thomas, Mike Wright (March 2018). Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems, strategic entrepreneurship journal Volume12, Issue1.

[2] Alberto Ferraris, Alberto Mazzoleni, Alain Devalle, Jerome Couturier, (20 September 2019). Big data analytics capabilities and knowledge management: impact on firm performance.

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[5] Mahmudov Baxriddin Jurayevich1, Mullabayev Baxtiyarjon Bulturbayevich2,(August 2020). THE IMPACT OF THE DIGITAL ECONOMY ON ECONOMIC GROWTH, International Journal of Business, Law, and Education Volume 01, Number 01.

[6] Olga Novikova 1, Olena Khandii 2, Larisa Shamileva 3, Oleksandr Olshanskyi 4, (09. 01 .2022).THE IMPACT OF DIGITALIZATION ON ENSURING ECONOMIC GROWTH. Management Theory and Studies for Rural Business and Infrastructure Development eISSN 2345-0355. 2022. Vol. 44. No. 2: 223-234.

Some of the opportunities associated with the digitization of the economy are the creation of avenues for expanding the productive capacities of economies, increasing the investment attractiveness and efficiency, a platform for significant transformations of the labour market, training systems, creation of innovative strategic treaties around the world for complex problems.

However, there is an indication that the digitization of economies comes with its concomitant challenges such as unstable political administration and policy prioritization on digitization of economy of developing economies, lack of national agenda on digital infrastructure for successive administrations in most developing countries, and the labour market's disruptions because of the need for highly qualified workers. [1]Digitization has been delayed by inadequate e-literacy and e-skills, particularly in developing nations. Namely, theories have shown that merging technologies with the manual nature of work are some of the factors clouding the lines between the opportunities and challenges of digitalization in many developing countries.

Research methodology. Both empirical and theoretical works published in English language journals between 2015 and 2022 were reviewed. To follow a translucent approach and secure the legitimacy of the data used, the review process considered only formal literature by focusing on titles, abstracts, and keywords to acquire the final sample of articles. Search terms used to extract articles were Digitization and Economy, Digitization and Challenges, and Digitization and Opportunities. Databases and journals referred to for articles and data included Science Direct, Scopus, World Bank Database, EBSCOhost Databases, and ProQuest, because they are internationally renowned.

Furthermore, a three-step screening process was used to acquire the final sample of articles:

Step one: A broad search of literature to identify abstracts that met the
              inclusion/exclusion criteria.
Step two: Titles and abstracts were read and duplicates were eliminated.
Step Three: Full articles from the retained abstracts were considered and read carefully
              for reference.

Regarding data analysis, many authors have agreed that a gold standard for completing integrative review data analysis does not exist. The objective of this data analysis was to determine the state of knowledge associated with economic growth concerning digitization, opportunities, and challenges within the sample. In consideration of the quality of articles assessed, being they theoretical or research-based, reliable screening assessment tools were adapted for this review[2]. The quality of the research articles was highly centered on design,

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[1] I Felix Wortmann, Kristina Flu¨chter, (2015). Internet of Things Technology and Value Added International Telecommunications Union, 2015b).

[2] Robin Whittemore and Knafl,(2005). The integrative review: updated methodology Volume 52, Issue 5.Wiley online library.

sample characteristics, measurement, statistical analysis, and relevance to knowledge development.

Coupled with these, an electronic questionnaire was also created with a "research monkey" and administered. It provided respondents with alternative answers and ranges to choose from.

With regards to Sampling and sampling techniques on the questionnaire:

The sample target was one hundred (100).

Purposive and simple random sampling was used to obtain responses from the general public. The allotments were; thirty (30) in Western Europe, thirty in Armenia (30), and forty (40) in Ghana, of which ninety-seven (97) of the whole were filled and returned through the same medium. Germany, Armenia, and Ghana were selected for the study because the goal was to establish the effect of digitization on developed and developing economies from different continents.

However, I am confident that this work has captured the available thrust of matters related to the digitization of an economy during this period.

Findings and Analysis. Research has shown that the digital economy is a complex and comprehensive system designed to undertake the activities of organizing, planning, managing, and interpreting for informed decision-making with the main aim of ensuring sustainable economic growth. Digitization and digital innovation in the world have a significant impact on economies' GDP.

Let us take a glance at statistics on digital developments of countries like Germany, Armenia, and Ghana as of 2021 provided by the World Bank Data Base. Germany with a total population of 83,196,078 in 2021 had 75,708,431 individuals using the internet, representing 91% of the total population, fixed broadband subscription was 44.2 per 100 people, and mobile cellular subscription stood at 128 per 100 people. Armenia with a total population of 2,790,974, out of which 2,149,050 representing 77% of the total population were using the internet, fixed broadband subscription was 16.72 per 100 people and mobile cellular subscription was 129 per 100 people. Ghana had a total population of 32,833,031, out of which 22,654,791 people representing 69% of the total population use the internet, fixed broadband subscriptions were 0.35 per 100 people and mobile cellular subscriptions were 123 per 100 people. Meanwhile, in 2015, Germany had a total population of 81,686,611 with 88% of individuals using the internet, meaning the percentage increment from 2015 up to 2021 is 3% with annual GDP growth of 2.6 in 2021 after the effect of COVID-19 which dropped their annual GDP performance in 2020 to 3.7, affirming the fact noted in the literature review that even those economies perceived to have attained a developed status with robust economies still make investments in their systems to be able to comply with the evolving society. Armenia in 2015 had a total population of 2,878,595 with 59% of individuals using the internet giving a percentage increment of 18% within a period of seven years which is a very significant development and gives a reason for the rate of GDP growth of the Armenian economy over a while although it got hurt by the COVID-

19 in 2019 which as a result fell to -7.2% in 2020 and rose at the fastest rate in 2021 to 5.7%. Ghana in 2015 had a total population of 28,870,939 with 23% of individuals using the internet giving a percentage increment of 46% from 2015 to 2021 (seven years), also making it a huge investment in digitizing the Ghanaian economy to be able to catch up with the prevailing global opportunities as a lower middle-income country. A comparative analysis of these three countries shows that though Germany is by far advanced in the digital world, the Armenian economy is also making significant headway in digitization as an upper-middle-income country toward sustainable economic growth. Should they continue the pace of 18% in digital development within the next five years, all things being equal, their economy would be likely to hit 95% with regards to the digitization and it would give them a very robust economy and competitive advantage within their region. Concerning Ghana, its digital development based on the statistics of the World Bank, indisputably effort is exerted to catch up with the digital development agenda considering the 46% increment within the period of seven years but there is more room for improvement. The comparative analysis of these countries is to figure out the degree of impact of digitization on the socio-economic growth of an economy as per the 2017 declaration of the G - 20 Economic Ministers, the International Monetary Fund, and the OECD who agreed on the necessity to study the impact of digitization on GDP.
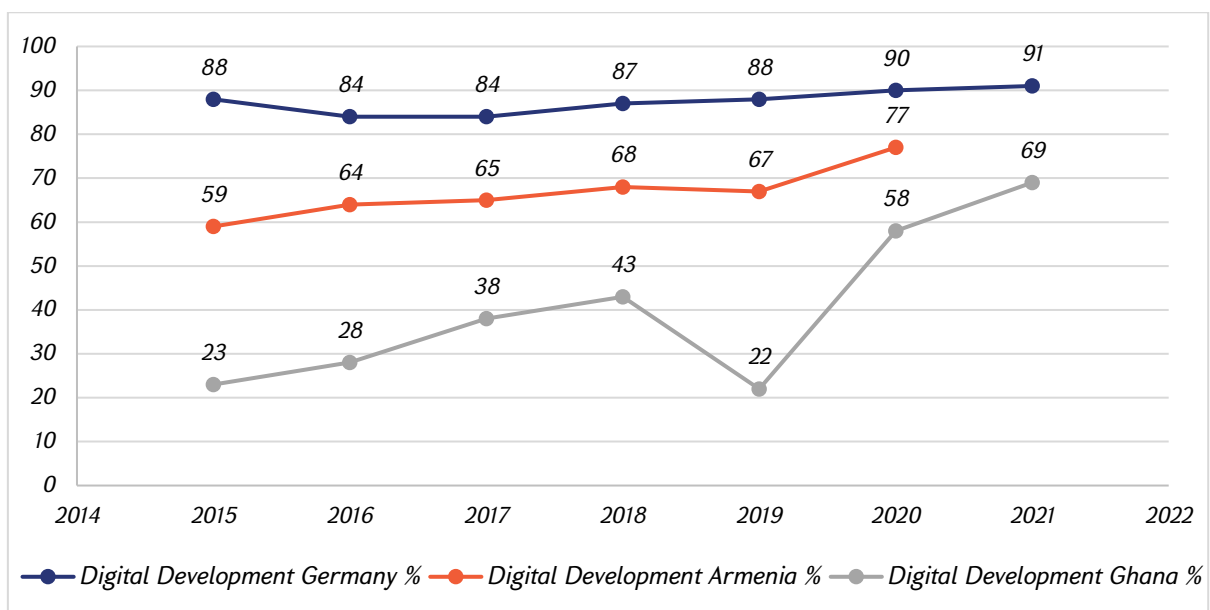
Figure 1. This is the graphical representation of the statistical trend of individuals using the internet in Germany, Armenia, and Ghana[1]

Figure 2. *This is the graphical representation of the statistical trend in Mobile cellular subscriptions in Germany, Armenia, and Ghana[1]*

Figure 3. *The graphical representation of the statistical trend on fixed broadband subscriptions in Germany, Armenia, and Ghana[2]*

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[1] The chart was prepared by the author based on the World Bank Database figures.
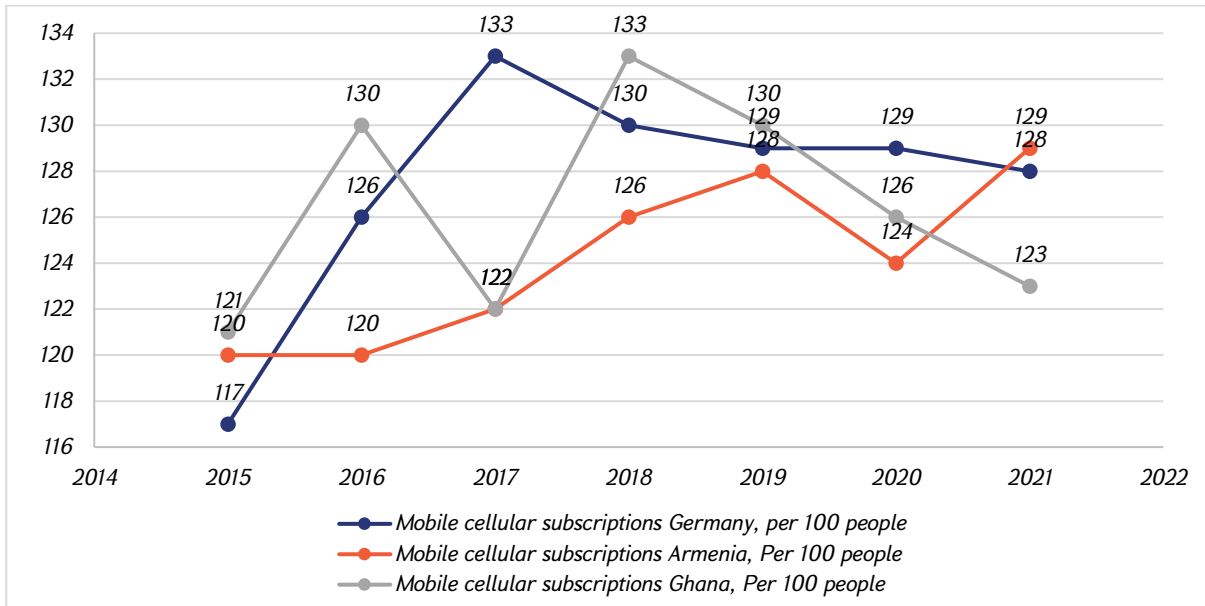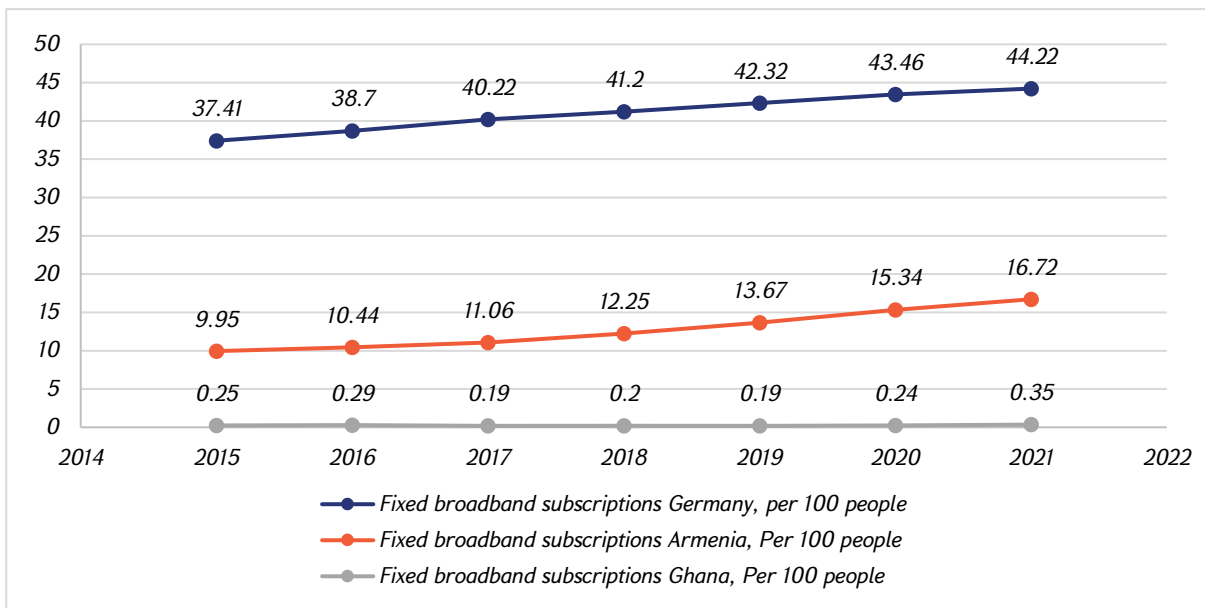(Date of access: 5.4.2023)

[2] The chart was prepared by the author based on the World Bank Database figures.
(Date of access: 5.4.2023)

Furthermore, based on the acquired results of primary data of the research done by administering an electronic questionnaire in Germany, Armenia, and Ghana, 88% of the respondents have tertiary education, 12% of them have secondary education, and 0% have basic education. Respondents who know digitization are 70%, 24% for respondents whose knowledge on digitization is somehow and 6% of the respondents indicated they do not know digitization at all. Respondents believing in digitization comprised 94%, and 6% did not believe in digitization. Responses assisted in the following established hypotheses: firstly, digitizing an economy can meaningfully contribute to the socio-economic growth of the economy in question, most especially developing countries because 42% of the respondents extremely agreed to that point of view and 54% concerted to that fact, giving a total positive indicator of 96% with 2% disagreement as well as 2% strong disagreement. We can conclude that digitization of an economy plays significant or pivotal role in the overall growth of an economy vies avid its associated challenges; secondly, all forms of technologies and its innovations, if implemented well have a positive and significant impact on the economic growth of an economy substantially, on the bases that when it comes to efficiency of economic activities, 48% of respondents strongly agreed and 50% agreed giving an efficiency in digitizing an economy, a total positive indication of 98% against 2% disagreement; thirdly, sustaining and improving upon the pace of acceptable economic indicators toward higher growth is likely to be the hallmark of an economy that embraces digitization as a tool for economic growth, this was ascertained and suggested on the bases that 64.5% of the respondents believe it is always true for an economy to increase its productivity with a reliable digitization in place while 18% have unstable mind on that, 14.1% say it is rarely true and 3.4% believe it is never true but all in all having 64.5% as a solid indicator is enough to duel a suggestion on; fourthly, an economy's adoption and advancement of technology have positive impact on its economic growth in the regions characterized by a higher degree of digitization, again this is on the bases that 70.6% of the respondents believe it is always true that digitizing an economy bridges the gap between the developed and developing economies with job market opportunities of 61.2% and access to global market business of 96%; and finally, an economy that explores and adapts digitization as an early bird is likely to grow rapidly and have a dominant role in economic growth in the regions with lower levels of digitization on the bases that respondents gave 66.3% comparative advantage, 92% sustainable growth, 92.8% added value to an existing capital of an economy and 98% strength of responsiveness when it comes to economic activities and growth. Notwithstanding these positive indicators, it is also imperative to take into account some serious challenges by any economy, be it advanced in digitization or introducing digitization into an economy. According to the survey responses, 27.8% strongly believe it could increase the rate of unemployment, 25.9% agreed to that, 18.5% disagreed and 27.8% strongly disagreed, making it a serious and dicey factor for managers of any economy to consider. The challenge of posing a threat to small businesses in an economy had 29.3% as always true, 39.7% - sometimes true, 19.5 - rarely true, and 11.6% - never true, making this challenge an equal factor to be considered. Above all, studies from both

primary and secondary sources have indicated that it is an indisputable fact that digitizing an economy by far has numerous opportunities and comparative advantages for economic growth against its challenges.
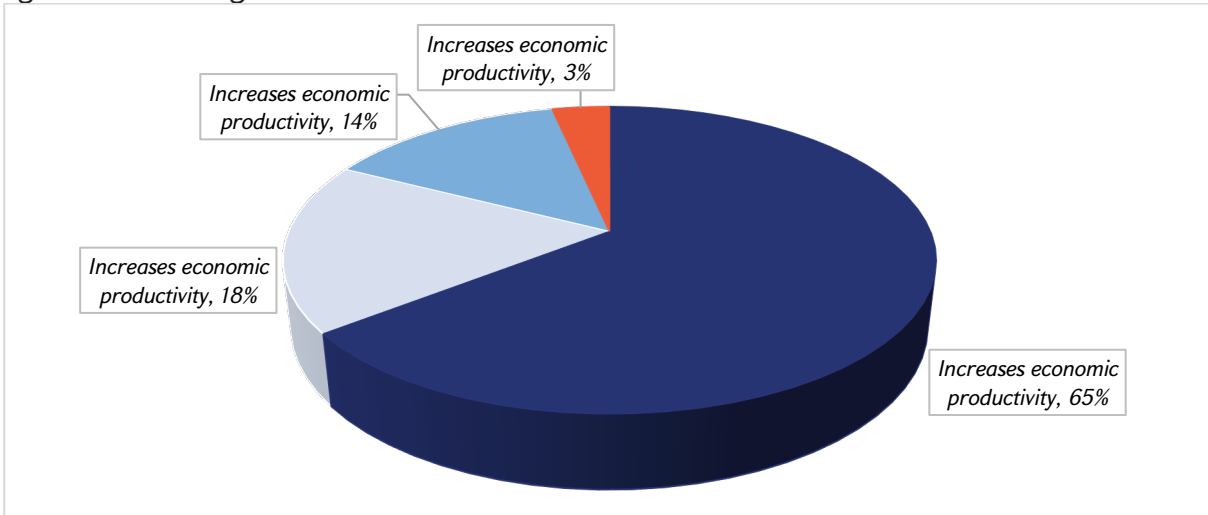
Figure 4. ***Increases economic productivity***

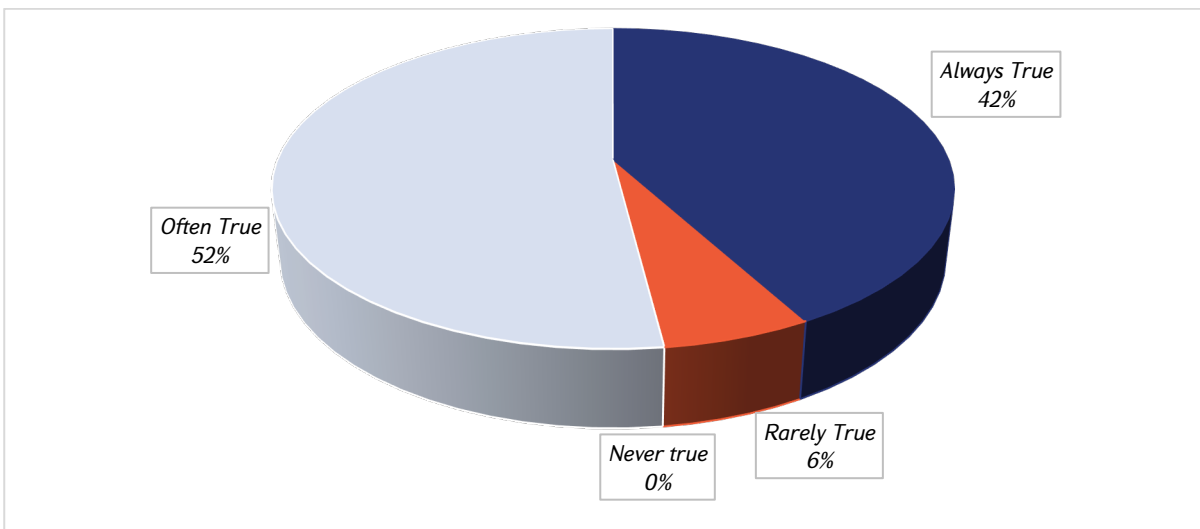*Figure 5.* ***Tool for sustainable economic growth***

Some opportunities and challenges. Unquestionably, the study depicts that digitization presents some unique opportunities and challenges for both developed and developing economies.

In developed economies, opportunities for digitization include some level of certainty about increasing productivity, creativity, and a predictable and acceptable level of economic

growth. Its associated challenges include equal access, data security issues, and keeping up with the rapid pace of technological advancement.

In the case of developing economies, opportunities for digitization stem from advancing beyond conventional stages of development, providing more convenient access to services, and promoting economic inclusivity via technology. The secret is to take advantage of chances for sustainable growth while simultaneously resolving obstacles. On the other hand, skill shortages, the digital divide, and inadequate infrastructure are some of the challenges facing developing economies.

Conclusion. In conclusion, the digitization of an economy is very significant for economic growth. The intensified digitization in the last two decades in many developing countries stimulated development in many sectors of their economies and in turn, contributed largely to their economic growth. Therefore, realistic studies investigating the impact of digitization on economic growth are vital. Hence, the main objective of the paper is to test whether digitization really and truly affects the contribution of both micro and macroeconomic activities positively to enhance economic growth, which has proven to be positive regardless of its challenges. It is also to identify the measures and phases of digitization that must be considered and adopted by an economy within a given time and with a limited amount of resources at its disposal, which has also proven positive regardless of its challenges. With these findings, one can confidently note that the results of this study have contributed to filling the gap in the literature regarding the digitization of an economy; opportunities, and its associated challenges, especially by taking into account the digitization of developing countries. Undoubtedly, understanding and adoption of digitization by the developed countries are what stimulated their individual and regional economic growth, talking of some continents like the European continent, the North American continent, the galloping growth of the Asian continent, just to mention a few.

Recommendation. Overall, we can conclude that though digitization, in general, should not be regarded as a universal solution to solving the problem of economic growth, since its opportunities by far outweigh its challenges, there should be deliberate policies by developing countries to embark on massive digitization of their economies for substantial growth. Besides, further research should consider focusing on the impact of some segments of digitization on the economy that has the potency of mitigating the associated challenges of digitization as well as the factors that could influence the development of those digital segments.

Limitations. This integrative literature review delivers an overview and evaluation of the digitization of the economy. This review is limited by the key phrases used for searching, the databases accessed, the frame and method of searching for literature, and time constraints. This review is also grounded on a broader scope of opportunities and challenges that are associated with the digitization of an economy representing numerous economies instead of focusing on a selected or particular economy. Therefore the framework presented above may not apply to every economy.

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NADEZHDA AFYAN
*Chair of Environmental Economics, Lecturer,
Ph.D. in Economics, Armenian State University
of Economics*
HRANUSH ALEKSANYAN
*Master student of the Department of mining and
mineral extraction, National Polytechnic University
of Armenia*

GREEN ECONOMY AND ENVIRONMENTAL IMPACT ASSESSMENT

The official doctrine of the development of modern civilization is the theory of sustainable development. Application of green economy principles in various spheres of economic activity ensures sustainable green production and consumption. The EIA process prevents or reduces the negative effects of economic activity on the environment. Moreover, it is carried out in different countries with different procedures. Finally, it is also considered as a complex legal, economic, and environmental process of relations between interested parties in any activity.

In the article, the theoretical foundations of the Green Economy and EIA tools were purposefully introduced, and then their principle and sectoral commonalities were given. The progress and problems of green economy development in the EIA processes were analyzed and highlighted by the methodical approaches of comparison and induction of statistical secondary research data. Based on the results of the study, conclusions were made that for the harmonious implementation of EIA and green economic processes, it is necessary to develop typical models of green production in accordance with the transition of the green economy and the development priorities of the regions of Armenia in the EIA or SEA documents and provide access to scientific analytical platforms.

Introduction. In modern conditions, the primary steps of the transition to the green economy have already been taken, from the reinterpretation of macroeconomic and environmental indicators to the implementation of practical steps, which required extensive theoretical and long-term work. And in that period, the aggravation of global ecological problems required new transformations. The principles of sustainable development and green economy targets are inevitably expressed in decision-making related to strategic and economic projects, that is, in EIA and SEA documents.

The purpose of the research is to present the role of EIA processes in the various stages of the formation and development of the green economy, as well as to identify the legal and practical problems of the implementation of these processes, and to propose ways to solve these problems.

The implementation of the green economy in Armenia and the development of the EIA and SEA processes were most facilitated by the research guidelines and practical programs implemented within the framework of the Eastern Partnership of the EU, which helped to increase the level of environmental well-being of the public and developed effective tools for the prevention of environmental risks and impacts.

Literature Review. Although the concept of green economy has only recently received significant international attention since the term "green economy" was first used in 1989, green economy policies have been discussed and analyzed by economists and other scholars for several decades[1]. Green economy policy was widely discussed in international conferences, for example, the "Rio Declaration" adopted at the 1992 conference "Environment and Development", includes provisions on environmental and economic instruments for sustainable development and principles of prevention or reduction of environmental impact. And the "Agenda 21" document adopted at the same conference further developed these principles and called for the development of national strategies for sustainable development, which will promote the use of economic, market, and administrative instruments, as well as the implementation of EIA processes[2].

In 2009, the UNEP consolidated the definitions of the concept of "green economy" as economic activities that lead to improved human well-being and social equity, while significantly reducing environmental risks and ecological constraints [3]. Meanwhile, already in 1991, within the framework of the Espoo Convention, separate provisions of this definition had already received a legal basis during the approval of the EIA instrument [4]. The EIA process is considered a legal, economic, and environmental process of interaction between interested parties in any activity. In a group of countries, it appears as a process of a scientific, technical, and engineering nature, which is characterized by the predictive assessment of the impact and the regulation and development of design decisions following this. In other state legal norms, the EIA process is a state regulatory process and is called environmental expertise [5].

Later, the concept of "green economy" was revived in the context of discussions on the rethinking of various policies, for example, in the context of the financial and global recession,

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UNEP advocated the idea of promoting "green projects" and identified specific areas where it could be developed on a large scale[1], such as

- Renewable energy and energy savings
- Low carbon production
- Sustainable agriculture and forest management
- Sustainable cities
- Sustainable waste management[2].

These areas are also included in the law on "Environmental Impact Assessment and Expertise" as types of economic activities or project categories subject to EIA and expertise[3]. Among the variety of theoretical literature published by the UN, we consider the work "Working towards a balanced and inclusive green economy" to be the most practical, which defines and clarifies the importance of the regulatory tool of the green economy, the EIA processes [4]. A. Atkisson argued in his report "Life Beyond Growth" that public investment can lay the foundation for a "green economy" that can lead to "green promotion" projects at the state level [5]. In order to promote close cooperation between the public and private sectors, significant (1.8 trillion) investments were made in Armenia in order to move from theory to action as a result of research studies[6].

Studies of international experience are widely included in the works of researchers from Russia, Belarus, and EU Eastern Partnership countries. In particular, O Cherp[7], M Buzaeva[8], I. Buks, S. Fomin[9] et al.'s papers analyze the features of the effective use of EIA tools, the assessment of ecological risks in the context of green economy development, etc. The sustainable green economy development reports and guidelines published by UNEP more fully present the theoretical definitions and sectoral priorities of the green economy, as well as the features of the implementation of the essence, principles, and functions of the green economy,

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green growth, low-carbon production, and EIA processes[1].

Research methodology. Based on the purpose of the work, theoretical research, descriptive and comparative analysis of statistical secondary data, comparison, systematic, and inductive methodical approaches were mainly used in the article.

With the methodological approach of theoretical research, the literature, features of the formulation of concepts and principles of sustainable development, green economy, and environmental impact assessment were discussed. With the methodological approach of comparison, parallels were drawn between the legal and economic manifestations of the green economy and EIA processes, excluding other tools for the implementation of sustainable development, because this tool is preventive.

The reports on the current and summary activities of the "EU for the Environment" program, the information provided by the "Environmental Impact Expertise Center" served as the basis for extracting statistical secondary descriptive data, which, as a result of a comparative analysis, were grouped in the work as the primary green economy sectors and project categories specified in the Law on "Environmental Impact Assessment and Expertise" in 3 sections:

- Low carbon production
- Energy saving
- Waste processing

The choice of these three areas is due to the availability of secondary statistical data and the implementation of more programs in this direction in RA. As a result, the importance of EIA tools contributing to the development of the green economy in Armenia was pointed out, and with the systematic and inductive methodical approach, the dynamics of the development of the primary individual sectors of the green economy were observed as the result of the complex cooperation of the interrelated EIA tools, and by combining these results, we reached certain conclusions.

Analysis. The development of the economy leads mainly to quantitative growth, the branch expansion of the economy implies a multiplication of the number of projects of economic activity, which in turn increases the burden of negative impacts on the environment. The majority of global greenhouse gas emissions come from activities related to the burning of oil, gas, and coal, contributing to the increase in the "carbon footprint" or amount of greenhouse gas emissions [2]. And in the context of the development of the green economy, separate branches of the innovative resource-saving economy are developing that involve projects that prevent or reduce the negative impact, for example, production with low-waste technologies or energy-saving plants. Moreover, in the case of a green economy, it is possible to ensure energy

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[1] Tanasie, A.V., N astase, L.L., Vochita, L.L., Manda, A.M., Bototeanu, G.I., Sitnikov, C.S., Green Economy—Green Jobs in the Context of Sustainable Development. Sustainability, 2022.

[2] Towards a green economy with the EU for Environment Program in Armenia, 2021-2022 Achievements Report, EU4Environment

efficiency up to 40%, water savings up to 50%, and waste reuse up to 90% [1]. In other words, in the case of the development of the green economy, the quantitative growth of production will increase the quality of productions, which will be confirmed to be implemented through the positive conclusion of the environmental expertise given to the EIA document or through the decision of admissibility.

Let us present below the global emissions of carbon dioxide in 2015-2019. It is clear from Figure 1 that the majority of emissions fall in North American countries. And the decrease in carbon emissions in Europe in 2019 is due to the increase in energy efficiency improvement projects. Countries in the Middle East and Africa, although having relatively low emissions, have exceeded total carbon emissions due to per capita GDP and population growth, which shows that there is still much to do to implement green economy principles.
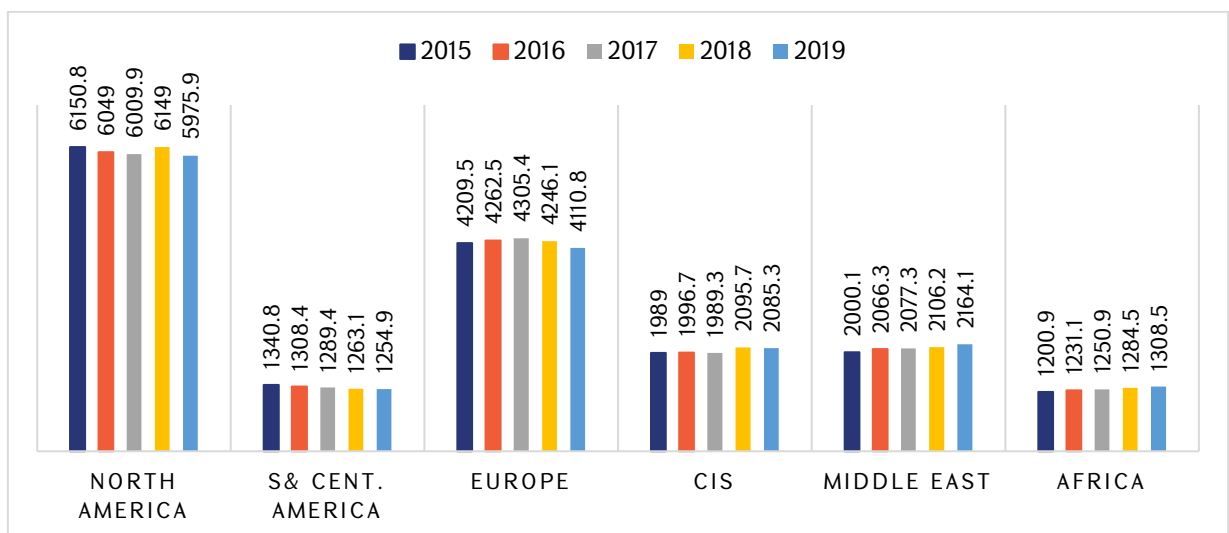
Figure 1. Carbon dioxide emissions 2015-2019, million tons[2]

Among the sources of carbon emissions in Armenia, emissions from motor transport dominate the share of the total amount, and the energy sector dominates from stationary sources. Figure 2 shows that emissions increased by 67.6% in 2016-2021.

According to the estimates in the 2021-2022 achievements report, 3 trillion drams should be invested for climate action in Armenia by 2030 and beyond. However, Armenia is committed to taking mitigation measures in all sectors of the economy, aiming to reach 2.07 tons of net emissions per capita by 2050[3].

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[1] K. Danielyan, L. Sargsyan, T. Sargsyan, "Sustainable Development Theory and Practice", UNDP, 2013, p. 24
[2] The graph is compiled by the author, the data source is bp Statistical Review of World Energy 2020, p. 13
[3] Strategic plan for the development of the energy sector of the Republic of Armenia (until 2040) Yerevan 2020, Resolution of the Government of the Republic of Armenia N 48-l of January 14, 2021
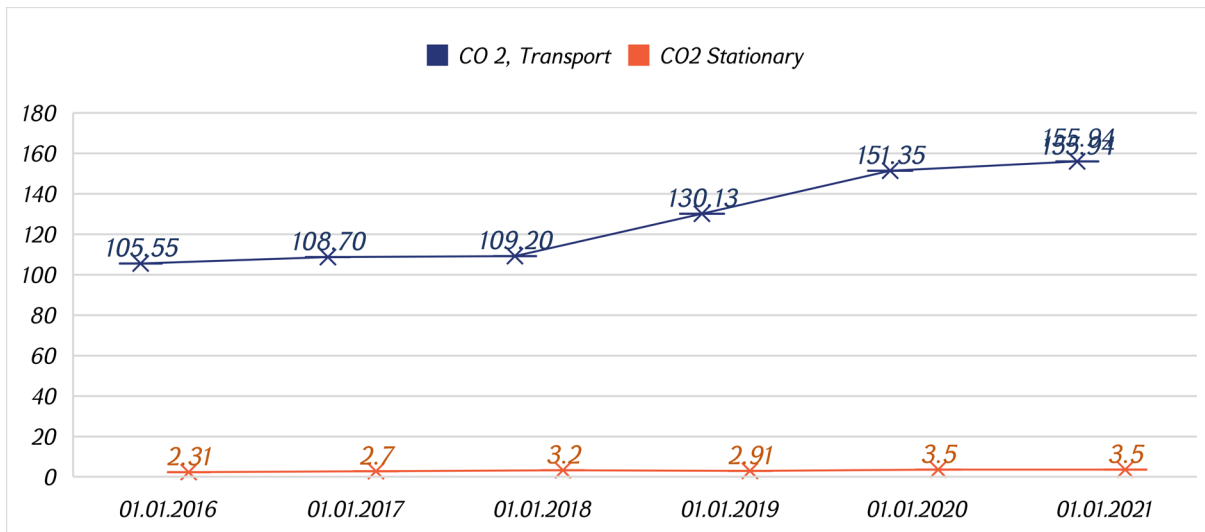
Figure 2. *Amount of carbon monoxide from motor transport and stationary sources, 2016-2021[1]*

Shifting from coal and oil to nuclear power and renewables to reduce greenhouse gases, the global R/P (Reserves-to-production) ratio shows that oil reserves in 2019 amounted to 50 years of current production. South and Central America have the highest R/P ratio (144 years), while Europe has the lowest (12 years). A number of European countries still rely on fossil fuels to produce 75.1% of their electricity[2]. Moreover, they even have generous fossil fuel subsidies. This makes the transition to a low-carbon future difficult, as energy prices do not reflect environmental costs and hinder the investment of green funds.

The transition to a green economy will only be successful if the private sector or companies can improve the environmental behavior of their operations through "green" management. There has been significant change in green management practices in our region. These positive changes are based on foreign investments or subsidies, which, however, may have a temporary role in the transition to a green economy. This indicates that there is a demand for targeted government subsidies and stricter legal regulation or control, particularly for small and medium-sized entrepreneurs. We think that it is preferable to prevent environmental problems at the state level and to make it compulsory to apply policies. For example, according to "Urban development. Planning and Development of Urban and Rural Settlements" building standard[3],

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[1] The graph is compiled by the author, the source of the statistical data https://statbank.armstat.am/pxweb/hy/-ArmStatBank/ArmStatBank_8%20Environment_(B)%20Climate%20change_(B3)%20Greenhouse%20gas%20emissions/EE-b3-2.px/table/tableViewLayout2/?rxid=9ba7b0d1-2ff8-40fa-a309-fae01ea885bb, 08.04.2023

[2] Statistical Review of World Energy 2020, 69th edition, Centre for Energy Economics Research and Policy, Heriot-Watt University, ceerp.hw.ac.uk

[3] 30-01-2014 "Urban development. "Planning and Development of Urban and Rural Settlements" Order on Approving Construction Norms and Amending Order No. 82 of the Minister of Urban Development of the Republic of Armenia dated October 1, 2001.

the economic entity carrying out urban development activities undertakes to include in its EIA document development, greening, energy saving, conservation of natural monuments, and other environmental measures in accordance with the principles of sustainable development. Otherwise, the absence of this norm in the document may be the basis for a negative conclusion. There are technical, engineering, architectural, environmental, and other regulatory legal norms that play a very important role in the transition to a green economy, but unfortunately many are not implemented, because sometimes companies do not consider energy-saving investments as a priority or there are no appropriate control levers. The "Environmental Inspectorate" performs the function of monitoring the deadline for the conclusion of the environmental expertise and the fulfillment of requirements, which, however, according to the principle of time priority, controls the types of economic activities included in the list of technically dangerous objects at the beginning of the year, and then the rest.

The predominant part of the amount presented for the environmental expertise of the projects of economic activity mentioned in Table 1 is related to the exploitation and construction of mines.

Table 1

Projects of economic activity entered into the "Environmental Impact Expertise Center", 2016-2020[1]

Sphere of activity	Quantity per year					
	2016	2017	2018	2019	2020	2021
Residential and public buildings	-*	15	35	51	113	69
Wind and solar power plants, hydroelectric power plants	1	31	15	10	5	23
Mines and accompanying structures (tailings)	92	119	126	102	95	133
Treatment plants	2	1	7	3	2	4
Production	-	2	9	8	9	19

• - no reliable data found

However, in contrast to the data of the Environmental Impact Expertise Center, the Strategic Plan for the Development of the Energy Sector of the Republic of Armenia states that as of July 1, 2020, 2,669 autonomous solar plants were operating. Moreover, one of the strategic goals of the Republic is to increase the share of solar energy production in the total to at least 15% instead of 1% by 2030[2].

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[1] Data provided unofficially by "Environmental Impact Expertise Center", Law on Environmental Impact Assessment and Expertise, 2014, Article 14, the table was compiled by the author.

[2] Strategic plan for the development of the energy sector of the Republic of Armenia (until 2040) Yerevan 2020, Resolution of the Government of the Republic of Armenia n 48-l of January 14, 2021

The inconsistency of these quantitative data is due to the state promotion policy. In order to encourage the production of renewable energy and not increase the financial burden on the private sector, solar plants occupying an area of 40 ha or more and wind power plants with a capacity of 8 MW or more are subjected to environmental examination. In order to curb the pace of construction, urban structures with a built-up area of more than 1,500 square meters are subject to environmental inspection, but the state fee for environmental inspection is set at AMD 15,000.

Despite the recent progress, the region is facing a number of challenges in the wake of the Artsakh war and various provocations and, of course, in the transition to a green economy, particularly for small and medium-sized entrepreneurs. Administrative or financial incentives are the simplest levers to promote green growth, but policymakers need to ensure a business environment that is conducive to green investment and that encourages all companies to improve their management practices and, moreover, their corporate responsibility.

For this purpose, in 2020, the Armenian government ratified the Capital Market Development Program, which will promote the establishment of the green bond market in Armenia. In other words, by creating the financial levers (green loans, bonds, etc.) necessary for the development of the green economy, they will support the involvement of the private sector in green development.

To solve this problem, first of all, it is necessary to create scientific and educational platforms (especially between state structures and scientific and educational complexes), which will help to study the relationship between economic and environmental indicators, identify existing patterns, and make the necessary assessments.

Analytical assessments should make it possible to determine the relationship between development indicators at different levels (the economy as a whole and individual regions as micro-regions), assess the impact of structural changes in the economy and changes in the structure of investments on the environment. As a result, it will be possible to see the interaction of the economic and environmental indicators of the area's development.

Conclusion. Economic management requires information not only about the past and present state of the economy, but also about possible future changes. External influences must be taken into account, as globalization will increasingly affect the development of Armenia and its individual regions. It is necessary to analyze the development trends of the entire economy and individual branches, evaluate the possible consequences of the decisions made, and develop typical models of green production corresponding to the development of the region. In order to improve the efficiency of economic management, it is great importance to develop a scientific and analytical platform that will help make sustainable decisions.

Incorporating the Green Development Standard Model into EIA projects or EIA processes as part of a consultation will facilitate the combined use of green economy principles and financial instruments. Moreover, the use of typical models will reduce the failures of the transition to green production and the costs associated with them. For example, Espoo

Convention member states are supported in the development and implementation of EIA and EIA legislation, as well as helping countries improve their current EIA practices and legal and institutional frameworks (particularly in a transboundary context).

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MARINA BUSHUEVA
Ph.D. in Engineering, dean of the faculty of pre-university training and additional educational services, Nizhny Novgorod State Technical University n.a. R.E. Alekseev

YEVGENIY IVASHKIN
Ph.D. in Engineering, the first vice-rector – vice rector for educational activities, Nizhny Novgorod State Technical University n.a. R.E. Alekseev

ALEKSEY LABAEV
Head of the information department, Nizhny Novgorod State Technical University n.a. R.E. Alekseev

SERGEY MITYAKOV
Doctor of physical and mathematical sciences, director of the institute of economics and management, Nizhny Novgorod State Technical University n.a. R.E. Alekseev

THE MODEL OF DIGITAL TRANSFORMATION OF NIZHNY NOVGOROD STATE TECHNICAL UNIVERSITY N.A. R.E. ALEKSEEV

The problems of digital transformation of universities of the Russian Federation are considered. The review of the scientific literature devoted to implementation of digital services at the country's universities is given, the examples of implementation of individual solutions are given. The methodology is developed for digital transformation of universities in the context of development of digital economy, including justification for feasibility, purposes, tasks, stages of digitalization, as well as criteria for effectiveness of introduction of digital services. Among these criteria are: economic (income growth, reduced lost profits), security criterion (reducing likelihood of cyber threats, increasing protection of personal data); technological (increase in labor productivity); social (user-friendliness), reputational (increase in university ratings); managerial (speed of decision-making). Introduction of the digital transformation model on the basis of Nizhny Novgorod State Technical University n.a. R.E. Alekseev is described as aimed at strengthening its position as a university focused on territorial and sectoral leadership in conducting world-class scientific research.

Introduction. In Russia the national program "Digital Economy of the Russian Federation" is adopted and is currently being implemented which notes that "digital data is a key factor in production in all areas of socio-economic activity and which ensures effective interaction, including cross-border, business, scientific and educational community, the state and citizens…" [1].

The important link in implementation of digitization processes for a whole range of sectors of the economy is digital transformation of education. The state sets the task for universities to ensure development of human resources and technological independence of the country. One of the key conditions for solving this problem is deep digital transformation of all areas of activity that can unlock the innovative potential of universities.

The most tangible result of digitalization of universities is the launch of digital services both at the federal level and local developments. The most famous one is the superservice at the State Services "Admission to the university online". The article provides the overview of the literature on implementation of such services and also describes the digital transformation methodology used in one of the leading technical universities in Russia - Nizhny Novgorod State Technical University n.a. R.E. Alekseev.

Literature Review. We considered some scientific works devoted to problems of introducing digital services at universities. This paper [2] presents the approach to digital transformation of higher education in Russia which involves changes in various areas of university activity. We are talking about the introduction of digital technologies in programs, methods and teaching aids in the forms of educational activities and methods for assessing the knowledge gained. This involves formation of digital competencies of students which can be defined as a set of skills and knowledge necessary for implementation of professional activities by graduates using digital technologies. Such competencies include skills of working with digital data, application programs and equipment and for IT specialists - creation of their own digital products, software development.

The article [3] gives the concept of digital transformation of the classical university into the "Digital University". It helps to change the content and form of the educational process at the university in accordance with some new requirements for personnel in the digital economy and is based on the use of individual educational trajectories. To implement this concept it is necessary to create a certain set of digital services at the university. One of the tasks of such services is to provide students with various references in a single window.

In [4] the article the classification of digital educational services that can be used to improve the quality of online education is proposed. Such services are designed to prepare educational materials, generate tests, create graphic and musical applications and organize online work on projects.

The article [5] describes digital services for organizing mobile learning in higher education institutions using wireless communication capabilities. The structure of mobile learning which is necessary for successful activity in the conditions of development of digital society and its

elements are developed. The clustering of digital services to support educational processes to provide mobile learning at the university is given.

The paper [6] proposes the university information infrastructure model that ensures unhindered data transfer between information systems and allows organizing the principle of a single entry point. The formed "ring" of electronic services made it possible to create the platform for supporting educational, personnel and financial processes at the university.

The article [7] presents the experience of introducing digital services by integrating research and educational activities of the university. Services include management of research projects, procurement, digitalization of scientometrics, interaction between teachers and students, including for the purpose of early identification of students inclined to research activities.

The paper [8] describes the introduction of basic digital services "Teacher's Personal Account" and "Student's Personal Account". The first of them has the following functionality: data about teachers, schedules, workload, messaging systems, publications, effective contracts, etc. The second one - data about students, courses of educational processes, schedules, electronic educational resources, intermediate and final certifications, extracurricular activities, etc.

The article [9] proposes a digital service that records attendance and progress of students during semesters. It is aimed at improving the quality of education through operational monitoring and analysis of key indicators. The results of introduction of the digital service led to reduction in time spent on the analysis of attendance, dean's office - by 95%, teachers - by 70%. In addition, an increase in the average level of student attendance is revealed, due to which an increase in academic performance is expected.

The above information is one of the few where there is estimated data on effectiveness of introduction of digital services in universities. In general, at present there is no single methodology for such assessments. A few scientific papers are devoted to assessing effectiveness of implementation of enterprise management information systems. The article [10] provides the following evaluation criteria: functionality - the ability of the system to perform set of functions that meet specified needs of users; reliability - the ability of the system to perform certain functions without fail during a given period of time within the given conditions; ease of use - minimizing user's efforts in the process of working with the information system; flexibility - minimizing the effort to make changes and eliminate errors; mobility - the ability to transfer from one hardware platform to the others. In the paper [11] effectiveness of implementation of the information management system is directly related to combination of various components: technological efficiency (increasing labor productivity); functional efficiency (increasing the quality of management); social efficiency (increasing the level of customer service, improving working conditions of employees); production efficiency (improving the quality and expanding the range of goods and services).

The analysis of the presented literature review allows us to conclude that there is no unified methodology, including justification for expediency of digital transformation of universities, its goals, objectives, stages of implementation, as well as development of criteria and evaluation of effectiveness of introduction of digital services.

Research Methodology. *The expediency* of digital transformation of universities is determined by global trends in development of digital economy, regulatory documents of country's strategic development. The goal of transformation is to increase efficiency of all types of university activities through implementation of the proactive management model through introduction of modern digital technologies. *The tasks* of digital transformation of universities are to ensure transparency, convenience and optimization of work of students and employees and transition to the data-based management system. The stages of digital transformation are mentioned below.

The first stage consists of setting the task of digital transformation determining the necessary technical means of monitoring and requirements for them. The prerequisite for solving this problem is the analysis of the current state of digitalization and the main barriers that impede transformation. The specific tasks are determined from the need for their implementation in accordance with the university development program.

The second stage involves development of the digital infrastructure of the university (computer and multimedia equipment, office equipment, server and network equipment, data lines and channels, corporate computer network, system and application software, Wi-Fi, access to resources, cloud technologies). Here the issues of information security of networks and services are resolved, given the high level of risk of disruption of the university's activities as a result of cyber attacks, violation of integrity and confidentiality of data. In addition, it is necessary to resolve organizational issues, including the availability and qualifications of IT specialists.

At the third stage, the measures are taken to build the single contour of information systems, the general concept of their construction and functions, as well as interaction between themselves and external systems. The unified digital platform is being formed which is based on the modern microservice architecture, in which addition of new systems and functions does not affect the rest in any way, and also helps to easily scale and flexibly configure interaction processes.

At the fourth stage, digital services are developed in the main areas of the university's activities (educational activities, scientific activities, scientific and innovative activities, extracurricular activities and youth policy, management, finance, personnel, campus, etc.). For each of the services the implementation roadmap and the system of performance criteria are being developed.

At the fifth stage, effectiveness of digital transformation is monitored by comparing planned and actual performance indicators. The conclusion is made about expediency of further transformation, tasks are updated and actions are adjusted.

Among the criteria for effectiveness of digital services, the following can be distinguished:

- economic (E) - income growth, reduction of lost profits;
- security criterion (B) - increase in the level of information security (reducing likelihood of cyber threats, increasing protection of personal data, centralization);
- technological (T) - growth in speed, labor productivity, optimization of business processes in time;
- social (S) - convenience for users, new opportunities for career growth and employment of graduates;
- reputational (R) - growth of university's ratings, growth of recognition in the media space, growth in number of foreign students, growth of the average USE score;
- managerial (U) - transparency of information for management, speed of decision-making, optimization of the management structure.

The authors' methodology involves the use of general scientific principles of the system approach, methods of the logical, factor and comparative analysis, economic and mathematical modeling, quantitative and qualitative research into the main trends and directions of digital transformation of the technical university.

Research. Implementation of the digital transformation methodology is carried out on the basis of Nizhny Novgorod State Technical University n.a. R.E. Alekseev (NNSTU) [12]. Development of NNSTU in the period 2021-2030 as part of implementation of the Priority 2030 program is aimed at strengthening its position as a university focused on territorial and industry leadership in conducting world-class scientific research in the fields of nuclear and power engineering, intelligent electric power industry, intelligent transport systems, radio electronics, chemical and biotechnologies, in training of highly qualified personnel, in ensuring entrepreneurial activity, in formation of industrial and youth policy.

It includes policy in the field of digital transformation which occupies a special place in the program, "penetrating" all policies and strategic projects of the university and providing conditions for increasing their effectiveness. To implement this policy the digital transformation program is developed that contains specific activities aimed at improving efficiency of the main activities of the university: development of scientific and educational ecosystems of the university; human development; promoting results of university's activities, including innovative products and services; increasing society's satisfaction with results of university's work.

At the stage of setting the task, the analysis is made of the current state of digitalization at NNSTU. It is found that previously created information systems have a very different purpose, they often use fundamentally different approaches to their creation and maintenance. Their support and development constantly require significant financial and human resources. It is proposed to "get away" from cumbersome solutions, using separate digital services in work, focused on solving narrow tasks for specific users.

Development of digital infrastructure includes activities aimed at increasing digital stability, improving the quality of access to digital resources, expanding opportunities for remote work and distance education and enabling digital transformation. In the field of information

security, the system is being introduced to differentiate user rights, store and use ES and tools for cryptographic information protection.

NNSTU is forming the single digital platform which includes development of the software core and user interfaces that combine all the necessary data and allow them to be managed according to specified algorithms thanks to formalized description of the organization's business processes.

The key areas for development of the ecosystem of digital services are:

1. Educational Activities: management of contingent of students; formation of teaching load; schedule of classes and exams; intermediate and current monitoring of progress; constructor of educational programs and curricula; printing of diplomas; formation of an electronic portfolio of students; electronic educational and methodical complex; informing about various events and communication in corporate chats.

2. Scientific Activities: formation of an electronic portfolio of scientific collaborators; registration of grants and documentation of scientific research; management of scientific research and development work; "factory" of technology transfer.

3. Management and Personnel Activities: user support service; electronic telephone directory; travel arrangements; digital campus; project management; maintenance of contracts and memos; remote ordering and issuance of certificates, extracts and other documents for students and employees (University MFC); work with electronic signatures; personnel assistant.

4. Extracurricular Activities and Youth Policy: score-rating assessment of student extracurricular activities; registration of university graduates.

5. Financial Activities: electronic financial document management; coordination of procurement procedures for goods and services; coordination and accounting of contractual obligations with university partners and executors of various contracts; payment of scholarships and social benefits; payment of rent by residents of hostels.

6. Electronic personal accounts of an applicant, employee, student and trainee which are sets of software graphical user interfaces and act as a single window for access to all systems and services using the single account and possibility of flexible access control settings in order to quick access to all the necessary information for work and study.

7. Service of end-to-end authorization and authentication to all systems and services of the university using one account.

Below is Table 1 which lists some of the digital services that have been implemented or are in the process of being implemented. The table contains the name of the service, its purpose, as well as the received or expected effect in the form of previously accepted letter designations (E - economic, B - aimed at increasing information security, T - technological, S - social, R - reputational, U – managerial).

Table 1

The examples of evaluating effectiveness of digital services

№	Name	Purpose	Effects
1	The smart campus	Opening of media studios in hostels. Creation of electronic passports of hostels. Creation of systems for recording resettlement of students and staff in hostels. Creation of electronic passports for educational buildings	E - reducing cost of organizing work of hostels; B - improving information security by automating all processes; T - simplification of all decision-making processes during resettlement of students in hostels and prompt correction of class schedules; S - ease of use of all services provided by those living in dormitories; U - optimization of management decisions by automating all processes
2	The applicant	Creation of personal accounts of applicants; remote entrance examinations; interaction with the superservice "Enter the university online"; processing data about applicants, informing applicants about the course of admission campaign and possibilities of enrollment, transferring information about those enrolled to the Dean's Office system.	E - increase in commercial reception; B - protection from external cyber attacks during admission campaigns, security of applicant's personal data; T - acceleration of interaction of selection committees with applicants, automation of formation of the first-year contingent; S - friendly interface for applicants; P - awareness of achievements of the university in the media space, attracting talented applicants from regions of Russia and abroad; U - formation of statistical reports on the course of admission campaign for making managerial decisions in order to fulfill admission control figures
3	Management of the educational process	Student contingent management; formation of training load; schedule of classes and exams; intermediate and current control of progress; constructor of educational programs and curricula; diploma printing; formation of an electronic portfolio of students; electronic educational and methodical complex	E - reducing cost of organizing work of NNSTU employees by optimizing educational processes; B - increasing information security by automating all processes; T - improving the quality of organization and conduct of educational processes on platforms by optimizing systems; simplification of all decision-making processes in educational processes and operational correction of these processes; S - ease of use by employees and students, expansion of user tools of the system; U-optimization of managerial decisions by automating all processes
4	Management of research and development technologies (R&D)	Description of key technologies of the university with open and convenient access, research topics conducted by scientific teams of the university which are at different stages: from an idea to a prototype	E - increase in NNSTU income from R&D by 2 times over 3 years of project implementation; T - optimization of processes associated with organization of R&D at NNSTU; P - formation of package of scientific and technological areas of NNSTU; U - abilities to monitor R&D, increase the speed of decision-making on specific projects and project packages

5	"Factory" of technologies of transfer	Comprehensive solutions for a virtual showcase of developments and technology transfer from laboratories to real life which will help to connect the university and the market and accelerate innovation processes	E -fold increase in NNSTU income received from technology transfer within 3 years of project implementation; T - optimization of processes associated with the registration of the transfer / granting rights to RIA NNSTU; R - formation of packages of developments ready for implementation at the request of enterprises; U - the ability to monitor development packages
6	The employee's personal account	Set of software graphical user interfaces that acts as a single window for access to all systems and services using a single account and possibilities of flexible access control settings in order to quickly obtain all the necessary information	E - reducing cost of organizing work with employees; B - increasing information security by automating personnel processes; T - growth of labor productivity of employees of the Personnel Development Department; C - ease of use for employees of all services provided, feedback; P - formation of images of employees in public domains; U – optimization of management decisions by automating personnel processes, systematization of data on publications, generation of reports with different levels of user access
7	Modernization LMS Moodle open source learning management system	Comprehensive solutions for modernization of LMS Moodle system and its connection to the virtual showcase of developments The State Information System "Modern Digital Educational Environment"	E - making profit when teaching students of the other universities when connected to the portal; B - improving information security through introduction of user agreement templates and consent the processing of personal data; T - improving the quality of organization and conduct of the educational process; C - expansion of user toolkit of the Moodle system by improving the quality of electronic resources; U - ease of administration by optimizing processes of the system.

Conclusions. Digital transformation of universities is one of the key processes of modernization of the higher education system in Russia. Today, we can confidently conclude that there is no unified approach and model for organizing the processes of digital transformation of higher educational institutions of the country, including the rationale for its feasibility, goals, objectives, stages of implementation, as well as unified and clearly formalized methodologies for assessing effectiveness of digital transformation, services and information systems. This article helps to correct this gap and offers the author's vision of the digital transformation methodology which includes criteria for evaluating effectiveness of implementation of digital services. The results of the work were tested at Nizhny Novgorod State Technical University n.a. R.E. Alekseev in its development program that uses the proposed stages of implementation of digital transformation processes in educational, scientific, managerial, personnel, extracurricular and financial activities. A number of developed digital services and the obtained (or expected) effects from their implementation are described.

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VITO DI SABATO
Slovak University of Agriculture in Nitra
Institute of Management, Department of
Management

SUSTAINABILITY AND INNOVATION: THE CASE OF INDUSTRY 4.0

Keywords: *sustainability, Industry 4.0, digitalization*

In the last years, sustainability has increased in popularity not only among firms but also among their stakeholders. The latter are now aware that to fight and minimize climate change, sustainable practices are important. They are likely to reward those companies meeting sustainable principles. From their side, in addition to a growth in sales, companies can improve their financial and investment opportunity as well as reduce operational costs and be more productive, minimize carbon fossil material used, and improve energy efficiency, opting for renewable opportunities such as solar energy and wind power. Traditionally, sustainability is based on three pillars – environment, economics, and society – that companies have to balance to be considered truly sustainable. According to the literature, there seems to be a correlation between sustainable companies and innovation. Advanced technologies may contribute to sustainability. This is the case of the Fourth Industrial Revolution – known also as Industry 4.0, which is an industry paradigm shift introducing many new technologies. Thanks to its technologies indeed, it is possible to monitor and reduce emissions, diminish wastes and have a more efficient production. Assuming that technological level is an indicator of sustainable practices, the objective of this paper is to study how it differs among micro, small, medium and large companies. This was achieved by analyzing data from a survey conducted in Slovakia and Italy in 2021.

Introduction. Policymakers, consumers and other stakeholders – including many employees enthusiastic about greener production - are now demanding products that are made employing sustainable practices. This is due to an increasing awareness of the importance of fighting climate change and being more environmentally friendly. Consumers are then likely to reward those companies that are compliant with those principles by purchasing from and being loyal to them even though their products are more expensive. Similarly, investors may decide to invest in sustainable companies as they are more appealing from the financial side: sustainability increases their value. Moreover, all economic activity is dependent and conditioned by both renewable and non-renewable natural resources of the environment (Rout, Verma, Bhunia, Surampalli, Zhang, Tyagi, Brar & Goyal, 2020). Therefore, their wise consumption and employment in production are a must.

The perception of a global environmental crisis started to appear in the government's agenda in the first part of the second half of the 20th century, but only in 1987, the World Commission on Environment and Development (WCED) was formed (Lazaretti, Giotto, Sehnem & Bencke, 2019). As a result, certain practices that were performed by firms in the last century are now done differently and no longer accepted because of their harm to the environment. In the past indeed, there was no or little concern regarding sustainable practices and concerning the damage that firms may inflict to the environment. Technology development can enhance sustainable practices by ensuring improved efficiency and better use of resources. Nevertheless, it often occurs that the availability of these technologies has the opposite effect: resulting in increased pollution and resource overuse (Rout et al., 2020).

Hopefully, thanks to very advanced technologies firms can be sustainable in their everyday routines. The industry shift towards the Industry 4.0 (I4.0) paradigm (the Fourth Industrial Revolution) makes it possible and it is characterized by these technologies. The latter offer efficient solutions for energy savings, control of emissions, and machine maintenance (Garetti & Taisch, 2012). Nonetheless, I4.0 does not imply inevitable sustainability: sustainability and I4.0 should be considered jointly, i.e. the former should be "the very core of the Industry 4.0 strategy" (Piccarozzi, Aquilani & Gatti, 2018, p. 19). What is more, it represents a central issue when planning innovation and formulating new strategies (Adams, Jeanrenaud, Bessant, Denyer & Overy, 2016). In the agricultural sector, the paradigm shift is known as Agriculture 4.0, which improves traditional farming practices that allow farms to ensure the sustainability of the agricultural sector and agrifood production processes as well as transparency of their operations (Spanaki, Karafili & Despoudi, 2021). In addition to agriculture, it can be adapted to every sector, industry and company regardless of their dimensions.

The objective of this paper is to assess the technological level of companies of different sizes, specifically micro, small, medium and large companies. The rest of the article is organized as follows: a literature review was conducted on sustainability and how I4.0 can support and enhance it, then the methodology to analyze the questionnaire is shown. The last part presents a discussion based on its results.

Sustainability and Industry 4.0: a literature review

In this section, sustainability and I4.0 as well as the role of the latter in enhancing green practices in meeting the principles of sustainable development are examined.

Sustainability is a wide concept that stresses the importance of preserving resources so that future generations can make use of them. Indeed, sustainable development recognizes the interdependence of environmental –the impact of natural resources and pollutant emissions, and social impacts of innovations on communities where the organization carries out its business - and economic – about economic efficiency - systems (Khan, 2016). Their balanced integration performance of human lives within the society, environment, and economy is to the advantage of current and future generations (Geissdoerfer, Savaget, Bocken & Hultink, 2017). From the 1970s, the three are commonly referred to as the pillars of sustainability, although some works

include other dimensions such as institutional, cultural, and technical (Purvis, Mao & Robinson, 2019). However, it is possible to argue that these additional dimensions are already included in the three pillars. Another name to refer to them is, among the others, the three bottom pillars (TBP). To affect the pillars are externalities of socio-environmental and economic effects (El Baz, Tiwari, Akenroye, Cherrafi & Derrouiche, 2022).

A more specific concept of sustainability for firms is business sustainability. This is the ability to generate resources to compensate factors of production (i.e. inputs), to replace used assets, and to invest to continue competing (Barbieri, Vasconcelos, Andreassi & Vasconcelos, 2010 cited in Kuzma, Padilha, Sehnem, Julkovski & Roman, 2020) positively affecting the society as a whole (note that the basic pillars are included in this definition too). Moreover, today's sustainable businesses must effectively fulfil social, financial, and profitability objectives and it can contribute to significant financial and environmental problems (Javaid, Haleem, Singh, Suman & Gonzalez, 2022). The environmental and social dimensions of sustainability should be considered with equal importance of economic ones, the most studied pillar (Piccarozzi, Silvestri, Aquilan & Silvestri, 2022) – namely profitability in business and market share – when formulating strategies (Kuzma et al., 2020). Only in this way, firms can aspire to be sustainable since all three pillars are valued and balanced as well as the economic pillar.

Even the choice of suppliers is relevant if a firm aspires to be truly sustainable. Apple and Dell had suppliers whose employees had to work in dangerous conditions for the electronics; Nike and Adidas' suppliers were dumping toxins into rivers in China. To avoid these undesirable behaviors, firms have to establish long-term sustainability goals and demand first-tier suppliers (the closest suppliers to the firm) to set their own long-term sustainability goals; the overall sustainability strategy should include lower-tier suppliers too (Villena & Gioia, 2020). There exist diverse tools to perform supplier sustainability assessments (Lee & Kashmanian, 2013 cited in Matthess, Kunkel, Xue & Beier, 2022).

According to the literature, there seems to be a correlation between innovating firms and sustainability. Nidumolu, Prahalad and Rangaswami (2009) argue that innovation is a great supporter of sustainable development and a source of competitive advantage (cited in Lazaretti et al., 2019). From the literature review by Piccarozzi et al. (2022), it is generally possible to find a positive relation, not always precisely quantifiable, that emphasizes "a positive potential impact of innovations on sustainability dynamics". Thanks to innovation, companies can advance their processes and improve their products by using more eco-friendly materials, being more efficient in production and reducing their waste.

I4.0 represents a group of innovations that not only increase companies' efficiency, but also reduce costs, can beat "traditional" companies, and they can comply with the other two pillars of sustainability keeping at the same time quality standards high. It positively affects the socio-environment and economic externalities (El Baz et al., 2022). For instance, if on the one hand, many job positions are disappearing, new job opportunities are being created. Advanced technologies can increase safety and enhance working conditions: risky and repetitive tasks are

starting to be performed by machines. According to various authors, social welfare can be improved too. This is thanks to a promising growth of minimum wages due to "skill intensiveness" (El Baz et al., 2022) that would reduce economic inequality; increase global accessibility of goods and services and their affordability for production cost reduction and satisfy the demands of the individual customer making personalized solutions (customization of goods).

These technologies and the blurring of reality and the virtual world are the true essence of the I4.0. Digital automation of sustainable energy processes is among the essential factors that Industry 4.0 technologies can enhance. Note that some technologies have an indirect effect on sustainability (e.g. augmented reality) (Chiarini, 2021 cited in Piccarozzi et al., 2022). Regardless of whether the influence is direct or indirect, the enabling technologies pursuing the economic and environmental pillars of sustainability are Autonomous Robots, Additive Manufacturing, Cloud Computing, Autonomous Robots, Cybersecurity and Augmented Reality (Ramirez-Peña, Sánchez Sotano, Pérez-Fernandez & Batista, 2020). Then, the technologies that should be integrated and that can contribute to the social principle of sustainability are Big Data, Blockchain, Simulation, the Internet of Things and Artificial Intelligence (Piccarozzi et al., 2022). Moreover, digital technologies offer different chances to improve both data availability and verifiability of sustainability claims of supply chains. I4.0 enables data collection of sustainability-related data at different stages in the supply chain (carbon emissions in logistics and the recyclability or reusability of discarded products) thanks to e.g. radio-frequency identification (RFID) (Rane & Thakker, 2019 cited in Mattheus et al., 2022).

The next section summarizes the essential challenges firms have to face to perform and successfully upgrade their technologies and innovate, in general.

Implementing technologies of Industry 4.0

The digitalization of companies is not always smooth due to challenges and barriers firms have to deal with. They range from those of a financial nature and operational to those related to human beings and strategic ones (Marcon, Marcon, Le Dain, Ayala, Frank & Matthieu, 2019). In different sectors/industries, a variation of barriers and the importance given to them can change. As the size of companies increases, financial opportunities increase too. Financial constraints would be a big problem for smaller companies due to their difficulties in purchasing the latest available technologies, which in turn would increase the gap between bigger and smaller ones. Furthermore, training to use these technologies is better done in bigger companies, whereby more resources (time and money) is and can be dedicated to it. Training is different concerning technological and financial opportunities available to firms of different sizes and industries (Boothby, Dufour & Tang, 2010). More generally, big companies and small ones do not have equal opportunities in the area of Industry 4.0 (Horváth & Szabó, 2019). Indeed, big companies have higher driving forces and lower barriers than small and medium enterprises.

In addition to the human resources barriers of the necessary training to acquire competencies to effectively use novel technologies, psychological ones are relevant too. Among

them, resistance to change is also significant. That may be rooted in organizational culture. Several studies (e.g. Hansen, 1992, Jaumandreu, 2004; cited in Lousã & Gomez, 2017) found that a negative relation exists between the size of a company and culture of innovation support (e.g.: Chandler, Kellerand & Lyon, 2000; Rebelo & Gomes, 2011 cited in Lousã & Gomez, 2017). In addition, the company's age seems to be negatively related to innovation.

Data and Methods. This article aimed to assess differences among micro, small, medium, and large companies for what concerns their technological level. Hence, this study will test previous studies' outcomes. It is assumed that the firms that have higher technological levels (i.e. more I4.0 novelties) are more sustainable than traditional ones. The hypothesis was thus formulated, which is based on the literature and previous studies.

H1. Bigger firms have more advanced technologies than smaller firms.

As such, a closed-ended questionnaire was sent to Slovak- and Italy-based companies by email. The respondents were mainly owners and managers. It is made of three sections, of which the first two parts were necessary for the current study. Table 1 summarizes the features of each section.

Table 1

Section of the questionnaire

Type of questions	n° questions	Examples
Sample characteristics	12 Q.	e.g. *work position*, *years employed*, *location*, *industry*, and *size* of the company
Likert-like scale	28 Q.	About *personal, marketing and customer, strategic* and *technological innovation*
Ranking	04 Q.	About barriers to I4.0 of *strategic*, *organizational* and *human* nature

Source: author's elaboration based on own questionnaire

The sample totals 102 answers (62 from Italy and 40 from Slovakia). They operated in many different industries and sectors – more than 30, which can be grouped into two major types: manufacturing (or product) and service industries. Service industries are usually involved with customers (final user or B2B), without making any product, but delivering it. Firms belonging to product industries make tangible products instead: for example, car manufacturing, furniture and heavy machinery. Of the product group (63 companies), mechanical and electrical engineering (13) were the main companies belonging to this category, followed by commerce (5) and agriculture (4). Of service companies, more than half are financial and professional services (23 over 37). Note that 2 answers were removed as not classifiable. Among the surveyed companies, compared to 2020, 37 enjoyed a better economic situation: it was unchanged for 31 of them and 34 experienced a worsening of it. In 38 of them, foreign investors contributed to the capital structure and just 4 companies were owned publicly or by the State. Taking into consideration the dimension of companies, the sample comprises: micro

(≤ 10 employees), 26, small (10-49 employees), 22, mid-sized (50-249 employees), 26, and large companies (≥250 employees), 28.

The work positions of respondents were grouped under 4 labels: lower manager (28), top managers (28), owners (22), and others (grouping other positions, 24). Qualification titles started from pre-university titles to post-graduate education. Respondents in possession of a post-graduate title (including PhD) were 65% of the sample. Lastly, 58% of respondents were employed in their companies for more than 5 years.

The second part comprised Likert-like scale questions, ranging from 1 to 7. 1 means total disagreement and 7 - total agreement with a statement. Every time the mean of each question was greater than 3.5 (the center value), the particular technology was assumed to be not only installed but also commonly used by the companies of each category. For the analysis of the differences between one category with another, statistical tests were performed. In this concern, being the data ordinal (and so not normally distributed), it opted for Kruskal-Wallis test, which is non-parametric and is used for the analysis of differences in case of more than two groups (for example company size that comprises 4 groups: micro, small, medium and large firms). Because the test does not say much about where the differences lie, Bonferroni post-hoc test was used any time Kruskal-Wallis was significant.

Results and Discussion. In Table 2 the mean for each category is reported (see the Appendix for the corresponding question). Means lower or equal to 3.5 are highlighted in red. Note, that as the number of employees increases (and so the size of the firm), the score for each question related to technology becomes greater. Overall, except micro firms, all companies of the sample have adopted and used the latest technologies. H1 is thus corroborated. The only exceptions are Augmented Reality and Virtual Reality, which are not so popular among the studied firms (the average score is never greater than 3.5). Interestingly, Q4 (end-to-end supply chain) is fairly common among all companies, even among micro ones.

Table 2

Results of the questionnaire

Firms	Q1	Q2	Q3	Q4	Q5	Q6
Micro	3.88	3.35	2.85	3.54	2.23	4.50
Small	4.86	4.00	3.23	4.00	2.41	5.73
Mid-sized	5.65	5.31	4.31	4.50	3.08	5.42
Large	5.54	5.36	4.54	5.18	3.50	5.86
The average for the sample	5.00	4.54	3.76	4.33	2.83	5.37
Sig. Kruskal-Wallis test	.005	.000	.002	.009	.019	.025

Source: Author's calculation based on questionnaire

Due to the lower score and the significant difference between the other firms, it was investigated further. More specifically, the industries and sectors in which each micro firm operates were observed more in detail. The majority of them are involved in the financial sector. Surprisingly, most of them do not make use of Big Data and do not have a digital vision. This

would be expected from firms making bakery products, which score 1 on average, similar to commerce (mean = 1). Agriculture-related firms (including farms) never score higher than 3. Kruskal-Wallis test confirms that there are statistical differences among groups. Thanks to Bonferroni's post-hoc, the mentioned differences can be identified: for all technologies, micro firms and large companies statistically differ. For Q1 (digital vision), Q2 (Big Data usage), and Q3 (Artificial Intelligence), differences are to be found between micro and mid-sized firms too. Lastly, small and large firms vary in the usage of big data.

The reason why these differences are present might be due to the greater financial possibilities of large companies and the sector in which the latter do their business. Investments are the key to the 4IR, as without them, the digitalization process cannot be performed. Taking advantage of I4.0 is challenging, particularly for SMEs, as it requires significant investments in technologies (Vaidya, Ambad & Bhosle, 2018; Agostini & Nosella, 2019).

Besides these findings, related questions were about smart working, popular after the spread of the COVID-19 pandemic. According to the respondents of firms that have smart working it accelerated the process towards a 'smart' company" (mean = 5.55), i.e. their companies speeded up the adoption of technologies 4.0.

Conclusion. This paper is about the link between sustainability and I4.0 and the importance of pursuing both of them. Thanks to sustainable practices, resources can be preserved for future generations and can improve the conditions of current generations. Sustainable practices are well-regarded by firms' stakeholders who reward them by being loyal and – as for consumers - purchasing their products. The transition of firms, regardless of the industry in which they operate, towards I4.0 can guarantee sustainability. The main condition that must be met is the centrality of sustainability in the I4.0 implementation strategy. The latest technologies of this industry shift can positively affect the three pillars of sustainability by providing technologies that increase safety and improve working conditions of employees, new job positions for the latter, energy savings and CO_2 control emission, increase in wages and improve availability and affordability.

Implementing I4.0 in companies presents several challenges and obstacles to surmount. These were identified in the literature in some studies (e.g. Marcon et al., 2019). They are different, varying from operational, strategic and human resources. More specifically: resistance to change, financial opportunities and time to dedicate to training.

The questionnaire confirmed the results of previous studies, as the size of companies increases, and the organizations have more investment opportunities for the latest generation of technology. Moreover, it emerged how micro firms are different concerning other firms scoring significantly lower than them in the questions related to the technologies 4.0 they have and use.

Perhaps, the funds and incentives provided by the Slovak and Italian governments as well as the European Union (European Green Deal) will not only make the digital transition easier but also reduce the gap among the companies. Having always as priority sustainability in the

strategy of Firms 4.0, the overall result of the transition will be firms pursuing sustainable practices.

Limitations. The study has some limitations. These regard the geographic area and the impossibility of generalizing the results since the sample size is not so large. The sample comprises companies from two European countries and only a hundred answers were collected. Future research may aim at analysing the results in other countries situated in other continents. Potential shortcomings derive from the nature of close-ended questions as well.

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IVAN DIMITROV
University of National and World Economy (UNWE)
International Economic Relations and Business

THE IMPORTANCE OF RENEWABLES FOR ENERGY TRANSITION AND SUSTAINABLE DEVELOPMENT - LESSONS FROM THE GERMAN EXPERIENCE AND BEST PRACTICES IN INTERNATIONAL BUSINESS

The topic of renewable energy has gained increasing relevance in recent times. Producing renewable energy sources (or renewables) addresses climate change and current issues such as energy shortages and high electricity prices for consumers. The matter also concerns sustainable development and its dimensions, considering that the seventh goal of the United Nations' Sustainable Development Goals is precisely related to energy from renewables. This article reviews and summarises German companies' experience and best practices (developers of renewable energy projects). The paper also examines the history and legal framework of the energy transition in Germany, thus highlighting the political aspects of this process. Consequently, renewable energy sources are viewed in the context of the energy transition in Europe and as a supporting tool for sustainable development policies in private companies. This aim is achieved through the analysis of various publications on economic, environmental, and climate change-related topics. Additionally, surveys and case studies of German renewable energy project developers' work were conducted to obtain and synthesize empirical information. Germany stands among the world leaders in successfully implementing green energy and its practical application. Therefore, this study serves as an example of the successful integration of renewable energy sources in international business. It also draws conclusions from the best practices observed in Germany to support the transition to a low-carbon economy in Eastern European countries.

Introduction. Nowadays, it is considered that the energy produced by renewable energy sources (renewables in short) is called "green energy". The reason is due to the minimal environmental impact and the extremely low pollution levels. Furthermore, renewable energy sources are not only clean but also widely available depending on natural conditions and weather patterns. The goal of its usage is to reduce the harmful emissions of carbon dioxide (CO_2) into the atmosphere while also minimizing the impact of Global Warming and the Greenhouse Effect. This is also why so many governments worldwide have taken numerous measures and strategies to increase the share of renewable energy sources in their countries' total energy consumption.

International business, renewable energy sources and sustainability

The concept of sustainability (we will use sustainable development as its synonym) is a modern phenomenon influencing many areas, including international business. By developing sustainability policies, modern companies are gradually adapting to the changing business environment and meeting new demands from customers and partners. The international renewable energy business is no exception and implements sustainability norms according to its environmental, economic and social dimensions. Furthermore, it is essential to clarify that renewable energy is an integral part of the concept of sustainability and is even included as a separate goal in the United Nations (UN) strategy for sustainable development. To be more precise, it is included as goal number seven - "Ensure access to affordable, reliable, sustainable and modern energy for all" (United Nations, 2015).

Therefore, the interconnection between international business with renewable energy sources and sustainability is manifested through the policies of governments and transnational organizations to comply with the UN principles. This is mainly represented through the following two directions:

- Measures against the climate change;
- Synchronization of policies about environmental protection, economic growth and social interests.

German experience in the development of renewable energy sources

Moreover, most developing economies are also investing in order to reduce their carbon footprint. Germany is among the leaders in terms of energy transformation and carbon reduction. It has a long history of development and a gradual rise in the use of renewables. Moreover, there are examples of the adoption of technological innovations and creative measures such as agrivoltaics and others. That is why the country is an excellent example to explore the experience of local companies developing renewable energy projects. Consequently, their experience can serve the Bulgarian entrepreneurs in the future to work on similar projects. Therefore, the work of local project developers can serve as an example of the best practices in Europe.

Why project developers? As their name suggests, they develop renewable energy projects, and they are the drivers who lead the whole process of completing a new power plant that operates with green energies. The project developers are a key component of the whole energy transformation alongside the government, investors, and consumers. More precisely, these companies can give us practical insight into what the changes in the energy sector are in terms of renewables. Most German project developers operate internationally and are involved in international business.

Data and Methods. This article results from years of research on two separate university projects in Bulgaria and Germany. The first project primarily relates to the sustainability policies of companies with Bulgarian and international presence, while the second focuses on the impact factors of renewable energies in international business, using German project developer

companies as examples. In this article, some of the findings from these two topics are briefly presented, with the full results to be published in greater detail in the near future.

The methods include analysing and synthesising empirical information and databases from German companies, as well as content analysis of various publications on economic, political, environmental, and ecological topics. Real business examples and case studies based on best practices in the research area are also utilized. The previous experience and knowledge from German project developers (from Saarland) are essential. Solar and onshore wind plants are the most suitable for further development in Bulgaria, as they are affordable and cost-efficient. Additionally, interviews with scientists and policymakers about renewables are conducted, and data from project developers and the results from a questionnaire are used.

The author aims to explore the success factors of renewables and their impacts on a business level. The timeframe of the analysis is from 2000 to 2021, but it also considers the goals and expectations for the development of the energy sector up to 2030. Additionally, a custom methodology has been developed to analyze the sustainability practices of selected international corporations.

Results and Discussion. We will start with some interesting findings from the first research about sustainability (Dimitrov et al., 2021). They are presented in the following figure, which uses data from a specially developed rating system created by the author to evaluate the sustainability policies of the companies under review:
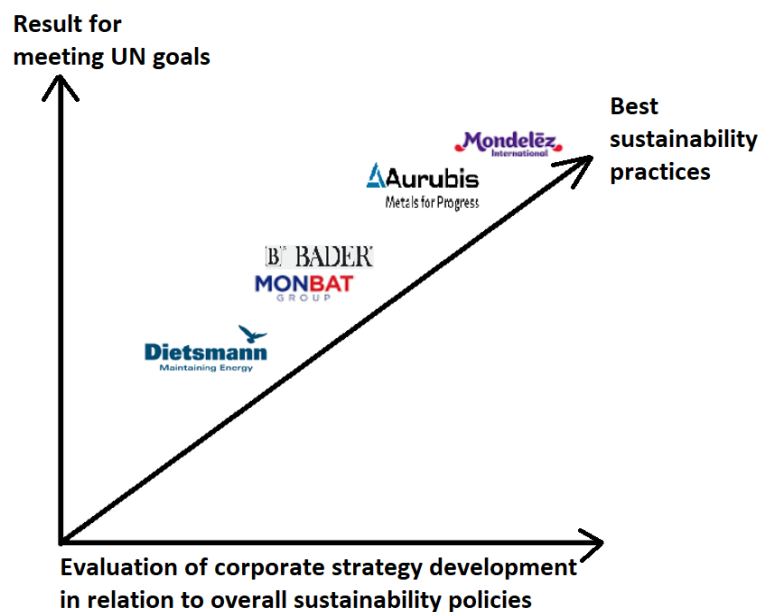
Source: Own representation based on the selected companies' sustainability reports and author's evaluation model

Figure 1. Ranking of the companies according to their sustainability policy implementation level

The main criteria by which the companies are included in the rating is that they are large enterprises with a proven track record of good sustainability practices and have operations in many countries. They are among the ones that have a well-developed sustainability policy and should be an example to others. Furthermore, each of the five companies impacts the energy market and is directly or indirectly linked to renewable energy or its rivals (fossil or nuclear power).

We can summarize the information by pointing out that Monbat JSC and Bader GmbH & Co. KG are relatively on the same level concerning the sustainability policy their managers apply, with an average score of 4.58. Dietsmann ranks lowest among the top five companies due to its focus on maintaining fossil or nuclear power plants, resulting in a lower score for green energy use. This is normal as the company is mainly involved in maintaining power plants operating with fossil or nuclear energy. This will likely change when Dietsmann's management will have to focus on renewable energy projects. Aurubis AG, on the other hand, is an example of a successful company that uses innovative, sustainable business models and production practices despite being involved in heavy industry and processing metals and raw materials. The top performer in this peculiar ranking is Mondelez International, which, with its pursuit of ever-higher sustainability and a plan for future development, receives a score of 4.92 out of 5 possible. This shows that there is always room for improvement in corporate policy concerning sustainable development.

The newer data is from a project (Dimitrov, 2022) that includes a detailed analysis of the German energy transition and the best practices of German project developers (mainly working with solar and wind onshore projects in the Saarland region but with influence in neighbouring markets). The study was divided into a theoretical and a practical part.

The German energy transition (Energiewende) is an ongoing process and is still directed by the political will for changes. The term Energiewende was introduced back in the 70s as part of the anti-nuclear movement, according to a study (Evans, 2016). However, it has gained significant popularity only since 2000 and the concerns from Global Warming. The legislation in Germany about the energy sector started to change in 1990. The Electricity Feed Act of December 7, 1990 (StromEinspG) was introduced and began to take effect in the country from the beginning of 1991. Almost a decade later, the Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz or EEG, 2000) represented a new step in promoting renewable energies in Germany. The whole process of the German energy transition could be represented as follows:

Energiewende

First mention of the term Energiewende as a result of the anti-nuclear movement

A law about energy from renewable sources is implemented in Germany for the first time

Erneuerbare-Energien-Gesetz (EEG) is created and is enacted in the country

EEG is amended for the first time

The Federal Government implements the energy concept, which sets out Germany's energy policy until 2050

The modernized versions of EEG contribute to the place of Germany among the leading countries in the world, which are operating with renewable energies

Currently new amendments in the law are being considered for the near future

1970   1980   1990   2000   2004   2010   2012   2014   2017   2021

StromEinspG   EEG   Renewable targets set   Energy Concept   Market premium   Auctions

Source: Evans (2016) and Bundesministerium für Wirtschaft und Klimaschutz (BMWK)

Figure 2. *Simplified timeline with the whole process of energy transition in Germany*

It was very important to understand the legal and theoretical background of the energy transition in Germany, including the history and the changes in EEG during the previous decades. However, as the project is practice-oriented, more attention is devoted to the second part of the research with empirical analysis.

As a next step, a special questionnaire was created to gather practical information. It was sent to several companies, which are the most significant project developers in Saarland. They specialize in carrying out projects with a focus on solar and onshore wind installations. The majority of them operate not only locally but also internationally. Therefore, they are especially suitable for the current research purposes.

The questionnaire included twenty questions and was completely anonymous. The survey aimed to identify the best practices in the work and development of renewable energy projects in Germany and to support the future implementation of such practices in Eastern Europe. Another goal was to find expert opinions on what new strategies and incentives policymakers should promote further to encourage the successful implementation of renewable energy projects. The third key moment was to increase the general public's awareness about the actual working activities of the project developer companies to promote the rise in energy usage of renewable sources.

Based on the received answers from the questionnaire, we constructed a profile of the average manager in a renewable energy project development company in Germany. The typical manager in such a company could be described as:

▪ Usually, a man who is over 50 years of age (60% are over 50 years and 80% are older than 35 years).

- He has more than ten years of experience in the energy sector.
- He runs a company that has several local and international competitors (usually less than ten).
- Some of the results are not so conclusive for analysis, but it is noteworthy that nearly 40% of managers run large companies with more than a hundred employees. The remaining companies (60%) have less than twenty workers.

For the project developers in Saarland, the most common problems are related to the lengthy time required to obtain the necessary permits for launching a project and restrictions regarding the local environment. All the respondents gave these two issues a top priority for resolution.

At the end of the questionnaire, the German managers of renewable energy project development companies gave their advice to their Bulgarian counterparts. This advice includes aiming for more transparency in administrative and operational aspects as well as paying attention to their employees' remuneration, which is the key to a successful business. The topic of workers' skills and corresponding remuneration is increasingly discussed in Eastern Europe, especially since energy prices and inflation are rising. In Bulgaria, many workers will also need to be prequalified to work with renewables, as a significant part of the population still works with conventional fuels.

Subsequently, some of these companies also sent case studies for analysis. The case studies helped to identify the exact types of problems managers face during the work with onshore solar or wind renewable energy projects and how these challenges impact various formulated factor groups. The German project developers provided practical guidelines for solving problems in their operations that may be useful for their Bulgarian colleagues in the future. There were four case studies that the companies sent, and the summary is represented here:

Table 1

Findings from the case studies

Case study	Type of energy for the project	Type of problem	Impact factor	Type of Solution
1	Solar	Legal issues and the need for extended credit line	Law and Politics	Intervention by the state authorities
2	Wind	Problem with the delivery of the planned wind turbine	Economy and Management	Intervention by the state authorities
3	Solar	Problem with the beginning of the construction work due to ancient remains in the area	Law and Environment	Adjustment in the construction plan and decision from the Management
4	Solar	Problem for the safety of workers and locals	Others (force majeure)	Increase in spending and changes in the time planning

Source: Information from the received case studies and project developers in Saarland

Based on the collected information, all case studies show the expertise of the project developers in Saarland from their daily operations. This confirms that the companies in Germany possess the know-how to deal with a variety of challenges – from dealing with local regulations and restrictions to defusing bombs and clearing sites for new projects. In contrast, project developers in Bulgaria have comparatively less experience in working with renewable energy sources than their counterparts in Germany. Therefore, it is important to understand and learn from the past lessons.

The role of government and scientific institutes in the energy transition in Germany was evaluated through four interviews with scientists and policymakers who specialize in working, researching, and are directly involved with policies about renewable energy. The information could be summarized as follows:
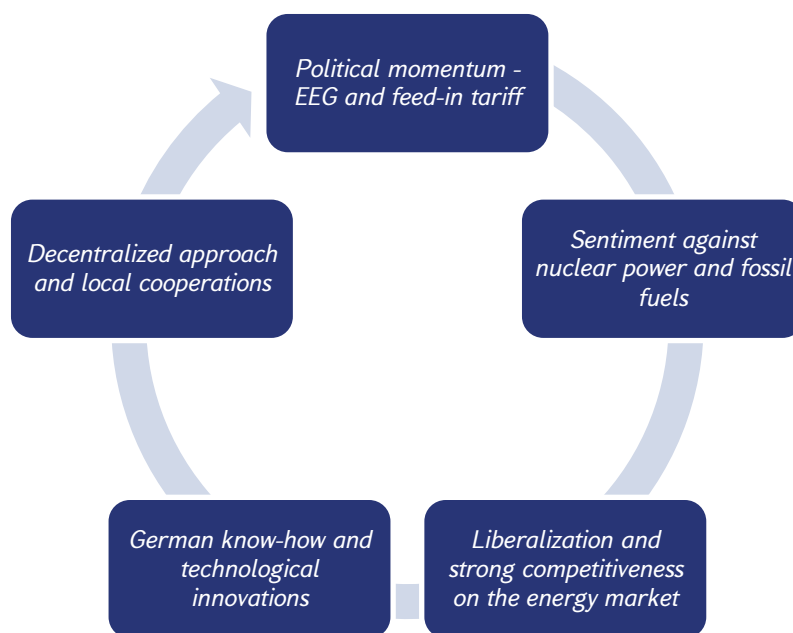
Source: Interviews with different experts and policy makers

Figure 3. *Key drivers for the German Energiewende (summary from the interviews with the experts)*

These conversations were constructive in understanding the current sentiment and the upcoming trends in Germany regarding the development of renewable energy sources. Furthermore, they provided the opportunity to highlight measures that support the smooth energy transition towards renewables and to summarize the key drivers for the German energy transition (Energiewende). The interviews and various experts' opinions revealed the key drivers (five factors from the previous figure) for the energy transformation process in Germany.

We can conclude that regular updates in the legal framework, decentralization, and liberalization contribute more to the rise of renewables than pure financial incentives. Technological innovations, which were also mentioned in the paper, have also contributed. The

same goes for people's awareness and the political will to implement the necessary changes to secure a cleaner and energy-efficient future for the next generations.

Conclusion. The obtained information provides a basis for predicting future trends in sustainability policies and renewable energy development. They can be summarized as follows:

- Businesses with renewable energy sources are part of a global system and are susceptible to various changes in the economic or political environment. The increase in their use is primarily due to government policies and incentives, especially during periods of crisis and rising inflation.
- Private investors are looking to profit from renewables, and governments see them as a measure to reduce the effects of the Global Warming phenomenon and to provide energy security, so their implementation is essential for all.

Investing in renewables in the short term can help companies reduce the uncertainty of price changes in volatile market conditions and ensure a cleaner and safer future for the next generations.

Renewable energy will significantly impact the international economy in the near future, especially after last year's and this year's events. The long-term forecast predicts it will become the world's leading energy source in the mid-21st century.

Currently, there are also conditions for increasing energy prices around the world. Among the leading reasons are rising inflation, supply chain problems, rising tensions around the Globe, and a lack of reserves of different commodities. In parallel, the population's energy needs have also increased, which is a further prerequisite for the incoming energy crisis. Therefore, constructing a greater number of renewable energy generation facilities is essential, as they are cost-effective and have a minimal environmental footprint.

The following suggestions can facilitate the energy transition and help in solving the energy issues:

- Having less bureaucracy will be a powerful incentive for investors and more entrepreneurs to enter the energy business.
- More renewable energy professionals are needed as the number of installations is expected to increase, creating new jobs worldwide.
- More funds are needed for research by scientists who specialize in the study of renewable energy applications of all kinds. This could help improve the current level of technology and increase the efficiency of installations.

The introduction of independent courses in schools and universities will enhance public awareness and general knowledge about the benefits of renewable energy.

Following this analysis, we can reasonably predict that the use of renewables will continue to grow in the coming years. This will not only change the economic balance but will also give international business the impetus to deal with the consequences of the current market changes.

Leprich from HTW, Saar and Assoc. Prof. Dr. Dobroslav Mollov from UNWE, Sofia. Special thanks to DBU, HTW and UNWE representatives, who made the research possible and supported the author. Also, institutions like IZES, dena, Öko-Institut and others contributed further to the collection of the necessary data for the whole study.

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DMITRY ENDOVITSKY
DSc in Economics, Professor, Rector of Voronezh State University, Russian Federation
IRINA DURAKOVA
DSc in Economics, Professor, Head of the Department of Human Resource Management, Voronezh State University, Russian Federation
IVAN GRIGOROV
PhD student, Department of Human Resource Management, Voronezh State University, Russian Federation

FACTORS HELPING TO RETAIN THE RESIDUAL WORK CAPACITY IN OLDER EMPLOYEES

Keywords: *employment of older workers, factors affecting career longevity, health, work, lifestyle*

The purpose of the article is to justify the possibility of preserving the residual work capacity of older staff through the study of factors that have an impact on the prolongation of their active work period. The idea was to identify a group of specific employed people in the age structure and provide a possible alternative of the conditions that will allow employees, first of all, to overcome the main medical and biological risks related to their health. To do this, based on a biochemical blood test, we determined the threshold of ageing or the most vulnerable period of discrepancies between the calendar age and a person's functional capabilities, when the body is sending signals about its abnormalities and the beginning of deterioration. Secondly, they will allow continuing their employment in an organisation through the minimisation of discrepancies between the individual's ability to work and the objective requirements for its performance and attenuating the formation of an "enemy image" regarding the job and the workplace, and thirdly, they will allow changing their lifestyle, which prevents cognitive ageing. A lifestyle change was studied through the identification of irregularities in the time budget due to the priority of one role over others, the justification of two models of conflicts that hinder the achievement of a work-life balance, and a reduction in the food energy content.

Introduction. Demographic changes, the transformation of values, and the increasing internationalisation of business determine the mobility of organisational structures[1]. Employment diversity was once a suggestion and now it is becoming a reality. Under new conditions, modern approaches to the solution of the issue of the organisation's success in the market and the employer's competitiveness in the labour market are becoming more relevant.

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The modern management paradigm is based on the formula "person - organisation - victory". Only victory and success allow for meeting new requirements of the consumer market taking into account the Olympic motto "faster, higher, stronger". The idea of sporting in management coincided with the time of the silver economy, which demonstrated that the competitive ability of employers should now be based on the changed demographic situation, new types of workplaces, labour shortage, and slower staff ageing.

The term "elderly" is commonly used to refer to two age groups characterised by certain transformations in the behaviour of workers and the loss of capability to acquire new competencies respectively. (In the USA, ageing of employees refers to the loss of ability to earn money.) The interdisciplinary approach, involving biology and behavioural science, is the basis of the concept of retaining the residual work capacity in older employees[1].

Following this, the purpose of the article is to justify the possibility of preserving the residual work ability of older workers through the study of three groups of factors that affect the prolongation of the active work period.

Literature review. The scientific discussion regarding the ability to work and older workers' potential for success is focused on various aspects of the problem. On the one hand, modern specialised literature underlines the need to prolong the active work period due to the demographic situation, which indicates the ageing of the population and its significant mechanical movement[2] [3]. On the other hand, researchers substantiate the advantages and disadvantages of the new variants of retirement age[4]. Those who study the impact of age on a person's shelteredness in the framework of the employment law note that despite the ageism problem older workers were not considered a vulnerable group till the end of the 20th century and did not have any special status. Having assessed the legal regulation of seniors' labor in Russia, the authors have concluded that it does not yet take into account the international approaches to the role of seniors in the world of work. Older workers form a diverse group; therefore, the purpose of legal regulation is to put a correct emphasis. The main goal of differentiation of legal regulation of labor as related to people approaching retirement age is to retain them at workplaces and protect them against discrimination while also maintaining health and ensuring self-fulfillment for those who have already reached the retirement age[5]. There are

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different notions on the working life of older employees as well as the risks and barriers associated with its continuation after retirement[1] [2] [3]. Scientists share their visions concerning the actions of employers and HR departments aimed at the development of older staff [4] [5] [6] [7] [8] and also study the differences between the work performance of older and younger members of work teams[9] [10] [11]. Another topic is the study of older workers' motivation regarding the continuation or suspension of their professional activity[12] [13]. The timely recovery of older staff

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for more prolonged employment is also a relevant aspect of the issue[1] [2].

Research Methodology. To achieve our goal, we used general and empirical research methods. The method of *analogies* or the transfer of knowledge from one subject of study to another, which constitutes the essence of the method, was used to develop the idea of the coexisting paradigms of efficient staff ageing and "sporting". *Method of analysis and synthesis.* Analysis, according to the philosophical approach, is a method of obtaining new knowledge. As scientific thought changed from simple to complicated, the analysis allowed, first of all, to determine in detail the specific features of the factors that affect the professional and personal success of older employees. Second, to determine social and biomedical risks in the process of ensuring and achieving success in work. Third, to determine the biochemical blood elements for the sampled population (patients of a clinical hospital).

The method of *observation* allowed to develop the idea of an array of information that characterises the phenomenon of labour shortage caused by staff ageing and the transformation of the values of younger generations. We used the method of *groupings and classifications* to identify four groups of risks due to complex changes in health, physical activity, mental condition, and special aspects of psychology and behaviour. We identified three groups of the elements that form the work-life balance. The measures that would help employees to recover in their personal lives and keep a work-life balance were divided into eight groups.

Method of modeling: As a result of the study, the recovery in work and personal life can be represented as a four-element mechanism, and we also developed a three-element model of achieving a work-life balance.

Analysis. The ability to work is a dynamic phenomenon, whose components change throughout a person's life. It is a result of interaction between individual resources (including health, functional abilities, education, and skills), working conditions, and society. Therefore, measures aimed at retaining the residual work capacity should take into account various factors, since, besides biological ageing, it is necessary to consider at least three other factors: *health*, *work*, and *lifestyle*.

Health. Everyone ages, but at different rates. This is one of the laws of gerontology. There are at least two definitions of ageing. The level of deterioration of a functional structure or a living organism is characterised by *chronological age*. The *Functional age* represents the dynamics of physiological functions and functional resources, i.e. the functional capability of a

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person, over time. Therefore, the ability to work depends directly on the functional age, which in turn is determined by how healthy the person is[1].

Based on the biochemical blood tests performed during periodic health examinations, we determined seven age groups: 35-45, 46-55, 56-60, 61-65, 66-70, 71-80, and over 81 years old. In each group, we assigned experimental and control samples, which in turn were divided into subgroups based on their gender. This helped us to determine the most vulnerable period, when there is a discrepancy between the chronological age and the functional abilities of a person (35-44). This is the *ageing threshold*, i.e. the time when the first signs of physical deterioration start to appear. Our study demonstrated that an increased level of total cholesterol and glucose was observed in half of the patients over the age of 35. These together are a serious risk factor for atherosclerosis. The disease usually develops over decades. Pathologies reduce the functional age on average by 5 years.

We determined the main medical and biological risks and barriers in the work of older employees, which present a problem for their employment related to a hazardous industry or mental work due to behavioural and cognitive changes. Among these risks are changes due to natural ageing in the composition of the human microbiota that lead to age-related diseases and a decrease in the older staff's performance; age-related atrophy of some body structures, organs, and tissues resulting in the loss of functions; and accelerated involutional processes in the body functioning which affects the work of almost all organs and systems[2]. An increase in the amplitude of deviations from homeostasis caused by stress factors (for example, failure of biorhythms, physical activity, heat or cold shock, etc.) poses a problem for the older staff's activities in those fields where quick adaptation to various working conditions is required.

Work. The study demonstrated that performance problems facing older employees result from the difference between the individual ability to work and the objective performance requirements. Besides the tensions occurring at the workplace, there are also individual factors: physical and mental conditions, family problems, including the sandwich generation issues when a person has to take care of grandchildren and elderly parents, etc. At the same time, although it takes older employees more time to adapt to new working conditions, they demonstrate better performance than younger ones. They suffer more from overwork under time pressure but are more accurate and punctual otherwise. They are less hindered by such unfavourable work conditions as noise, pollution, smoke, fumes, or heat. Older employees to a larger extent understand the health and life risks and do not neglect the means of protection at work as they are not ashamed of their appearance in special protective clothes and shoes, goggles, and

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masks. Starting from the age of 45, we observed a growth in artistic and analytical abilities in individuals working in intellectual and educational areas.

It is possible to preserve work capacity through schedule flexibility, safety management, and workplace hygiene[1]. To maintain the musculoskeletal system, it is necessary to minimise static positions, install transformer desks, and provide mini-breaks for recovery. Use natural flooring materials (joints). Cardiovascular system (avoiding night shifts), sensory system (hearing, vision): fallback warning systems for alarms, as well as light and vibration signals. Balance: marking for steps and ramps, lighting for workplaces. Availability of healthy food in the organisation. Hereditary and body state diagnosis; a healthy lifestyle and psychological self-regulation, medication, and therapy that slow down general and staff ageing and prolong the period of active ageing.

Work ability can be maintained through flexible working hours and occupational safety and hygiene management. In our study, we suggest a list of activities for employers aimed to maintain musculoskeletal, cardiovascular, sensory (vision, hearing), and other bodily systems in their workers.

Lifestyle. Career longevity is hardly possible without adjusting the lifestyle. Obesity in *middle* age is associated with lower cognitive ability and faster cognitive ageing in *old* age. It also reduces the lifespan on average by 6-7 years. Therefore, the energy intake should be gradually reduced to 30% in the age range from 30 to 70.

The study demonstrated that the work-life balance does not necessarily characterise the equality of elements but presents a harmonious scenario, a healthy and measured proportion that allows maintaining a good quality of living[2]. The weakened competitiveness of older workers and their lower tolerance level are caused by their poorer health, psychosomatic issues, and burnout syndrome that are due to the following: the role of a victim or a person with many duties and constant stress because of conflicts of interests at work and outside work. There appears an "enemy image" associated with their profession and workplace and dissatisfaction with the performance of duties outside work which only increases with age due to new family roles or difficulties related to their performance together with their functions in an organisation.

The study identified three basic causes of role conflicts accompanying the lack of work-life balance and hindering the performance of older workers. They are the following: wrong time budgeting due to prioritising one role over the others; overpressure due to the need to perform several roles at the same time; and behavioural peculiarities leading to the

[1] Durakova, I. & Mayer, E., On the Concept of Extending Physical and Psychological Employability and Its Potential Impact on Shaping a Positive Attitude of the Public to Older Employees, Proceedings of Voronezh State University, 2022, 3, 69-85.

[2] Durakova, I., Rakhmanova, T., Matasova, L., Mayer, E. & Grigorov, I., Biological and behavioral elements in older workers success maintaining mechanism. Dela Press Conference Series: Economics, Business, and Management. 003 007, 2022. Available from: https://doi.org/10.56199/dpcsebm.nftw7028

incompatibility of certain roles. Based on this information, we suggest two models of conflicts: "Work interferes with private life" and "Private life interferes with work".

An individual assessment of the value of free time varied depending on an employee's level of education, profession, and social class. Representatives of higher-status groups mostly preferred cultural and sports activities in their free time. Passive and group activities were more typical for the lower-status groups. We proved the hypothesis of "transfusion" (secondary effect), which means that the behaviour in the workplace and outside it is identical. The subjective attitude toward colleagues, self-alienation, avoidance of communication, and isolation was also reflected in their social behaviour. Passive free time behaviour combined with a sedentary routine nature of work results in a cumulative body deterioration effect through limitations and additional stress. Employees with the opposite behaviour are enthusiastic, they participate in corporate events, are open to business and sociocultural discussions, expand their circle of contacts, feel depressed less often, and thus prolong their professional life.

Conclusion. The transformation of the labour market with an increased number of employed older workers creates a situation that requires interdisciplinary research. The analysis methods used in the article, allowed, first of all, to grasp the idea of staff diversity in the organisation and the need to develop an inclusive policy for HR management. Second, to justify the possibility of preserving the residual work capacity of older employees through the study of three groups of factors that affect the prolongation of the active work period. The group of factors includes diseases, work, and lifestyle. Third, they allowed representing work capacity as a category that is directly dependent on the employee's functional age, which, in turn, is determined by their health. With a timely establishment of the ageing threshold, we can identify the signals about the body's abnormalities and the beginning of its deterioration. Fourth, they allowed considering the version of ageism, which stigmatises older workers as incapable of work, to be controversial. Fifth, they allowed determining the reasons for the lack of work-life balance and the formation of the "enemy image" regarding the profession and workplace, as well as developing recommendations for the behaviour style at work, at home, and in social situations.

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RUBEN GHANTARCHYAN
PhD in Economics, associate professor
Armenian State University of Economics (ASUE)
LILIT GHANTARCHYAN
PhD in Economics, senior researcher National
Institute of Labour and Social Research (NILSR)

THE IMPACT OF EDUCATION ON THE BIRTH RATE AGAINST THE BACKGROUND OF THE KNOWLEDGE-BASED ECONOMY IN THE REPUBLIC OF ARMENIA

Demography is a crucial field that focuses on understanding and analyzing population change and trends, as well as developing population theory and policy. Its multi-layered nature means that changes in each sector of the economy can impact a country's demographic situation. The planet's population is constantly changing, with shifts in the sex-age composition and population structure influenced by factors such as birth rate, death rate, migration, and social changes.

As we enter the 21st century, demography faces significant challenges, particularly regarding population reproduction. In this context, fertility is more important than ever, especially as knowledge-based economies continue to develop. To better understand the attitudes, preferences, and desires of unmarried and childless students who are of reproductive age, this study aims to explore their views on family, children, state support, and the ideal age for motherhood.

Introduction. In today's era of rapid scientific and technological advancement, the key to economic development for any country is a knowledge-based economy in which education plays a crucial role. It is widely acknowledged that education and fertility have an inverse correlation in many countries. For example, in the West and the former Soviet Union countries, the decline in the birth rate is often linked to the increase in women's education levels. Globally, the total fertility rate has dropped from an average of 3.5 and 2.9 in the 1980s and 1990s, respectively, to 2.3 in 2020 The World Bank https://data.worldbank.org/indicator/SP.DYN.TFRT.IN.

While the fertility rate in low-income countries has decreased from 6.7 in 1980 to 4.7 in 2020, it remains relatively high compared to middle/high-income countries. Armenia, as an upper-middle-income country with a human development index of 87 among 191 countries, must address the challenges of population reproduction UNDP, Human Development, report 2021/2022, Uncertain times, Unsettled lives: Shaping our future in a transforming world, p. 273.

Our objective is to develop a tool to investigate students' attitudes toward demographic concepts and their role as active participants in the population reproduction process. This tool could serve as a foundation for ensuring the qualitative growth of Armenia's population.

Literature review. The article's research draws upon various sources, including reports published by the Statistical Committee of Armenia, handbooks, articles from international institutions, and works by other authors.

It has been noted by the Worldometer online updating site Worldometer https://www.worldometers.info/worldpopulation/#:~:text=World%20population%20has%20reached%208,according%20to%20the%20United%20Nations.

That global population growth is primarily driven by the birth rates of the world's poorest countries. Currently, the world's population has reached 8 billion, and it is predicted to exceed 9 billion by 2050.

According to the United Nations report World Population Prospects 2022, Summary of Results, Department of Economic and Social Affairs, Population Division, United Nations, New York, 2022, p.13, the trend of declining birth rate is global. Two-thirds of the world's population lives in countries with a fertility rate below 2.1.

The Demographic Handbook of Armenia, 2007, RA Statistical Committee, Yerevan 2007 p. 48, The Demographic Handbook of Armenia, 2013, RA Statistical Committee, Yerevan 2013, p. 71-72, The Demographic Handbook of Armenia, 2022, RA Statistical Committee, Yerevan 2022, p.60.

The demographic data for Armenia indicates that during the 1980s, the total birth rate exceeded the necessary 2.1 points for simple reproduction and reached 2.3. However, during the 1990s, due to various objective reasons, there was a decline in the birth rate, with a 29.8% decrease recorded in 1995 compared to 1990. Over the last two decades, the fertility rate has remained below the level needed for simple reproduction, ranging between 1.3 and 1.6. In the past decade, the birth rate has been higher in urban areas, while rural areas have seen a decline of 23.5% in 2020 compared to 2011. In 2021, the birth rate in both urban and rural areas showed an increasing trend (1.7) compared to the previous 10 years, although it remains below the necessary level for simple population reproduction.

It's worth noting that over the last decade, the average age of motherhood at the child's birth and the age of motherhood at the time of having a first child has increased in Armenia. The average age to become a mother for the first time in 2021 was 25.7 years, while the average age to become a mother was 28.4 years, compared to 23.5 and 25.3 years, respectively, in 2011.

Shchur A. E. (2019). The level of education is a factor in demographic prognosis. Demographic Review, 6(2), 204-208.

A. Schur considers the level of education an important factor in predicting demographics, rightly noting that the level of education is an important factor influencing human demographic behavior and therefore population size. Women's education is a significant factor affecting the

birth rate: an increase in women's education level lowers the actual birth rate and the desired number of children.

Shapa A. O., Olvinskaya J. O. The Impact of Education on Fertility in the Context of Human Development.

Provided by Odessa National Economic University, Issue 2 – Odessa, ONEU. 2016. P. 94–102.

Women and Men in Armenia 2022, Statistical Handbook, RA Statistical Committee, Yerevan 2022, p 51,78, Women and Men in Armenia 2014, Statistical Handbook, RA Statistical Committee, Yerevan 2014, p 122.

Based on data from the statistical handbook of Armenia, there has been a significant increase in the enrollment of women in higher education in the last decade. In 2021, 61.1% of women were enrolled in the first stage of higher education (bachelor's degree), while the enrollment rate for men was 45.3%. This represents a substantial increase compared to 2012 when the enrollment rate for women and men was 46.5% and 43.3%, respectively. In addition, the enrollment rate for women in the second stage of higher education (master's degree) was 20% in 2021, while for men, it was 9.7%. This is again a notable increase compared to the figures from 2012, which were 13.7% and 6.6%, respectively.

However, the increase in women's educational attainment has had some negative consequences for the country's demographic picture. The average age of women's fertility is 15-49 years, and since higher education typically ends around age 22, women who pursue higher education miss out on a significant portion of their fertile period. This has likely contributed to a decrease in the fertility rate. Furthermore, there has been a substantial increase in the number of employed women of reproductive age with higher and post-graduate education, from 27% in 2013 to 55.6% in 2021. This may result in women delaying or excluding the intention to have a child at an earlier reproductive age.

M. Movsisyan, L. Karapetyan Attractiveness of social programs and birth rate fluctuation in the Republic of Armenia, AMBERD bulletin 3(16), Yerevan 2022

According to M. Movsisyan and L. Karapetyan, the reproductive behavior of young women has changed, they give priority to education, and the growth of their working career, pushing childbearing to the background.

UNDP, Global knowledge index- https://www.knowledge4all.com/country-profile

By K4A rating Armenia is a moderate performer in terms of its knowledge infrastructure. It ranks 72nd out of 132 countries in the Global Knowledge Index where the global knowledge index is 45.2 and the world average is 46.5 in 2022. This fact is imperative to prioritize the strengthening of a knowledge-based economy in Armenia in the conditions of the independent and free economy of Armenia.

OECD has defined the knowledge-based economy-"an economy based directly on the production, distribution, and use of knowledge and information.

OECD, The Knowledge-based Economy, Organisation for economic co-operation and development OECD / STI Outlook, Paris 1996, 45 p.

Methodology. In examining the relationship between education and birth rate in the context of Armenia's knowledge-based economy, we utilized various research methods, including:

The historical and logical method: We employed both methods in tandem, using the historical method to review official statistics and scientific articles related to the topic while applying the logical method to organize our research systematically.

The analysis method: This method involved several approaches, including:

Data analysis: We analyzed data from the Statistical Committee of RA and various international sources characterizing birth rate and education level, as well as data obtained through surveys.

Graphical and tabular analysis: We used these tools to observe and evaluate the relationship between Armenia's birth rate and education level, utilizing characteristic indicators and survey data to make various types of comparisons.

Dynamic analysis: Given our focus on birth rate trends, we analyzed data spanning several decades, starting from the 1980s.

Quantitative and qualitative survey methods: To gather additional data, we conducted online surveys using a random selection of respondents. A social survey was carried out in 24 out of 55 state and non-state higher educational institutions of RA, using a pilot survey approach with a random selection of respondents. The questionnaire, which consisted of closed questions with some allowing multiple options, was filled out online.

Analysis. In the pursuit of both quantitative and qualitative growth of the population in RA, an investigation was conducted to explore the attitudes, perceptions, and aspirations of unmarried and childless students of reproductive age towards concepts such as family, child, state support, and age of motherhood. A social survey was carried out in 24 out of 55 state and non-state higher educational institutions of RA, using a pilot survey approach with a random selection of respondents. The questionnaire, which consisted of closed questions with some allowing multiple options, was filled out online. Observations and recommendations were made in a free essay format at the end of the survey.

A total of 124 students participated in the survey, with 103 females and 21 males. 93.5% of the respondents were aged between 18 and 23, while the rest were over 23 years old, with the oldest being 32 years old. Results revealed that 51.6% of the participants viewed family as the union of a man and a woman, with children strengthening that union. An equal percentage of students believed that marriage is necessary to have a child, while 37.1% considered it desirable to be married before having a child. On the other hand, 27.4% thought that it is impossible to have a family without children, while 11.3% believed that a family can exist without children, and 8.1% did not think marriage is necessary to have children.

Gasparyan Yu., The development of sociological thought in Armenia in the 4th-8th centuries, Yerevan, 2014, p. 107.

Most of the youth participating in the survey emphasized the importance of family and prioritized a model where the presence of children is a foundation of a strong family, and marriage is a prerequisite for having a child. According to M. Mashtots, a healthy generation can only be raised in society through the family, which must beautify social reality and is crucial for building a strong state.

Figure 1. Student opinions, facts, and desires, respondents, %

Around half of the respondents (51.6%, as seen in Figure 1) grew up in families with two children, and the same percentage believed that a family should have at least two children. Among those who expressed a preference for a specific number of children, 44.4% wanted three children and 25.0% wanted four children. Only a small number of respondents indicated a desire for 5 or more children (1-3 individuals), while one person reported not wanting any children. Those who preferred two children stated that having one boy and one girl would allow them to have a full and secure life and that having too many children may prevent parents from providing a good future for all of them.

Interestingly, almost half (46.8%) of the students who grew up in families with two children expressed a desire for three children, signaling a shift towards a family model with 3-4 children, which has not been typical in RA for many years

Social Snapshot and Poverty in Armenia, Statistical and analytical report, RA Statistical Committee, Yerevan 2022, p.30-31. Conversely, 35.1% of those who grew up in families with three children want to have two children, and 56.2% of those who grew up in families with four children want three children. It is suggested that individuals who grew up in families with three or more children should aspire to reproduce at least their family's model and that various methods and means should be employed to promote this goal.

Figure 2. Besides the health problem reasons for delaying the desire to have a child, according to respondents, %

There are three main reasons why people in Armenia delay having children: financial difficulties, lack of owning their apartment, and concerns about the country's security. Today's youth strive to become financially independent before getting married, and the desire to live with their parents after marriage has decreased. Therefore, it's important to establish financial stability and own an apartment before planning to get married and have children. As a result, the average age of marriage and having a first child has increased in Armenia.

According to the survey results, 79.8% of respondents believe that a suitable age for a woman to have a child is between 22 and 27 years old, while 85.5% believe that a suitable age for a woman to have her first child is also between 22 and 27 years old. These results are partially in line with the data of the Armenian Statistical Committee, which reported an average age of 28.4 for marriage and 25.7 for having a first child. Regarding men, 56.5% of respondents believe that the suitable age for a man to have a child is between 28-33 years old, 41.9% think

it's between 22-27 years old, and only 1.6% believe it's between 34-39 years old. Interestingly, 61.9% of male students who participated in the survey indicated that the suitable age for a man to have a child is between 22 and 27 years old, whereas the average age of marriage for men in Armenia is 31.2 years old, according to the Armenian Statistical Committee.

The percentage of families with three or more children in Armenia has decreased in the past decade, but there was a 0.4% increase in 2021 compared to 2020. The trend of having three or more children seems to be highly polarized, with vulnerable families tending to have more children due to social assistance provided by the state or very well-off families. As a result, the family model with 1-2 children is dominant among middle-income families. The majority of surveyed students (79.8%) believe that the Armenian Government should implement financial support programs to encourage having more children. However, 37.1% found it difficult to determine how much monthly income a family needs to have three or more children, while 19.4% believe that 500,000 to 1 million AMD and 14.5% think 250,000 to 500,000 AMD is enough to make a family's decision to have three or more children. Providing housing is considered the most important issue for families according to the subjective assessment of the Armenian population, and 71% of surveyed students believe that the state should provide housing for families with children. Therefore, it's important to continue the 2020-2023 program of state support for housing security for families with children and provide certain privileges to a wider range of youth to access housing programs.

Figure 3. Programs implemented by the RA Government aimed at having many children, according to the percentage of the respondents.

As previously stated, research suggests that higher levels of education are associated with lower fertility rates. However, a significant proportion of students (53.2%) do not believe that education has any influence on the decision to have three or more children. Meanwhile, 17.7% of students believe that families with higher or post-secondary education are more likely to desire having three or more children, and 16.1% found it challenging to provide a definitive response.

It is worth noting that in the recommendations section, students emphasized the need for government support to encourage population growth, which includes creating a secure environment for future children and providing comprehensive sexual education.

Conclusions. The expectations of today's youth have undergone significant transformations, with a focus on practical advancement, financial independence, and separate living. Comparing data from 2011 and 2021, there has been an observable increase in the average age of first marriage for both men and women. In 2011, the average ages were 28.7 and 25.0 for men and women respectively, while in 2021, they were recorded as 31.2 and 27.7.

Aside from health issues, the predominant family model with 1-2 children is attributed to various socioeconomic factors that limit the number of births. This is driven by a shift from a focus on quantity to a focus on quality. In addition, values formed and implemented within the socio-cultural context of the family, with education as a crucial pillar, also play a significant role.

Students who emphasize the importance of the "family" institution prioritize a model where having children is the foundation of family strength, and marriage is considered a necessary prerequisite for starting a family.

According to the opinion of the majority of students, there should be 3 or more children in the family and the state should implement various incentive programs in this direction. So, the transition from a family model with 1-2 children to a model with 3 or more ones can be made possible. The latter has obtained special significance for RA demography,

There is another serious signal when transiting from the family model of 1-2 children to the model of 3-4 children - students who have grown up in a family with two children want to have three children (for years, the family model with 1-2 children has prevailed in Armenia, and 2021, 64.1% of families are childless families).

The conclusion of the study the attitude of students in the current reproductive age to such values as family, child, and motherhood, reveals the fact that it is possible to change reproductive behavior in favor of the qualitative growth of the population birth rate, which is one of the demographic problems of the RA population.

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HAYK HAKOBYAN
Doctor of Economics, Armenian State University of Economics

CONCEPTUAL PROBLEMS OF FORMING A GREEN ECONOMY AT THE PRESENT STAGE IN ARMENIA

Keywords: *"green" economy, sustainable development, concept, principle, greening, economic system*

The recent series of crises has revealed the instability of the established model of global economic development. One reason for the preservation of the traditional economic development model, with its low sensitivity to social and environmental problems, is the lack of attention given to these issues by economic theory. The article demonstrates the unsustainability of current global development trends and the need for new economic models to address modern challenges. Transitioning to sustainable development, with the economic foundation being the establishment of a green economy, is crucial for overcoming the current unsustainable trends. The article provides a theoretical analysis of the concept of a green economy, different approaches to understanding it, and the conditions necessary for its implementation. This issue is discussed in the context of the priority socio-economic aspects of Armenia's development.

Introduction. The world community has recently faced a number of new challenges: hunger as a global problem, poverty alleviation, social aspects of pandemics: challenges and consequences, international and domestic security, deterioration of the environment, as well as increasing climatic changes. To overcome these unsustainable trends, the transition to a sustainable development path, in which a green economy is the economic foundation, is essential. The various recent crises have shown the unsustainability of the established global economic development model. One of the reasons why the traditional type of economic development, with its low sensitivity to social and environmental problems, has persisted is that economic theory pays insufficient attention to these problems. At present, new economic models

that take the environmental factor into account have become very popular. These include the green economy, green growth economy, low-carbon economy, bioeconomy, blue economy, and others. Unfortunately, although these concepts have become generally accepted, there has been little progress in their practical implementation around the world. This is an issue that needs further analysis.

The purpose of this article is to examine the theoretical aspects of the green economy concept and its relevance to the greening of Armenia's economy.

Literature review. In the scientific literature the term "green economy" first appeared in 1989 in the work of British scientists D. Pearce, A. Markandia, and E. Barbier "Blueprint for a Green Economy"[1], where the need for economic support of environmental policy was justified. However, the concept had hardly been elaborated until the mid-2000s.

A single, internationally accepted definition of the green economy does not yet exist. Researchers have attempted to analyze current challenges through the prism of pre-existing economic models[2].

In general, the green economy is often seen as a new economic model that replaces the neoliberal model and contributes to combating current global problems. A study of different sources allows us to define the green economy as a model of economic development that involves the responsible use of nature's resources by society.

According to separate observations[3], the word "green" in the name "green economy" does not fully correspond to the essence of this type of economy, expresses only a part of it. The new model of the economy, which in international practice is commonly referred to as the "green economy", represents a much wider system, therefore its name should correspond to its essence as much as possible.

If we approach the problem from the perspective that economic growth is contrary to the concept of green economy, and it is desirable that economic growth should give way to economic development, then it is appropriate to view the green economy as "an economy aimed not at economic growth, but at quality development of the environment, including improved well-being and social justice, while maintaining the balance of the global geo-ecosystem"[4].

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[1] Pearce D.W. Markandya A. and Barbier E.R., Blueprint for a Green Economy. London. Earthscan Publications Ltd., 1989.

[2] Lipietz A. Fears and hopes: The crisis of the liberal-productivist model and its green alternative // Capital & Class. 2013. Vol. 37(1). P. 127–141; Custers P., The Tasks of Keynesianism Today: Green New Deals As Transition Towards a Zero Growth Economy? // New Political Science. 2010. Vol. 32 (2).

[3] Harutyunyan V., The transition to the green economy as the most important direction for the sustainable development of human society and overcoming the impoverishment of the population, Current issues of socio-economic development of RA, Collection of scientific articles, volume 2, RA NAS M. Kotanyan Institute of Economics, Yerevan 2018, pp. 235-241.

[4] Pakina A.A., Gorbanev V.A., Prospects for a green economy as a new development paradigm, Bulletin of MGIMO-University. 2019.12(5). pp. 134-155.

The concept of the green economy is based on the concept of sustainable development[1,2,3].

Summarizing international research on this issue allows us to highlight the following set of principles for green economic development[4,5].

1. The green economy is a means to achieve sustainable development[6,7];
2. A green economy is a resource and energy-efficient economy, which protects biodiversity and ecosystems and does not violate environmental constraints;
3. A green economy takes an integrated approach to decision-making;
4. A green economy evaluates progress not only through GDP but also through indicators and assessments that take into account sustainability[8];

The concept of the green economy is already being adopted by many developed countries and measures to achieve it are seen as a means to combat the global crisis[9]. The concept of a green economy has strengths such as increasing people's incomes, protecting the environment, and ensuring a high level of sustainability in the global economy[10]. At the same time, in our view, the green economy also has a number of drawbacks. Thus, the recommendations to implement the principles of the green economy are mostly global and do not take into account the diversity of states, their interests, goals, and objectives.

There are also other concepts close to the green economy, for example, the concept of "green growth". According to the World Bank, "green growth" is "growth that is efficient in terms of the use of natural resources; clean in terms of minimizing pollution and environmental impacts; and sustainable in terms of accounting for natural disasters"[11].

The green economy is sometimes equated with green growth, but according to several

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[1] The future we want. Outcome Document of the UN Conference on Sustainable Development. Rio de Janeiro, Brazil. June 20-22, 2012 UN.

[2] Transforming Our World: The 2030 Agenda for Sustainable Development UN, New York, September 2015

[3] Acceptance of the Paris Agreement. Conference of the Parties. Twenty-first session. Paris, November 30 - December 11, 2015 United Nations Framework Convention on Climate Change. UN, 2015.

[4] Towards a Green Economy in Europe: EU Environmental Policy Targets and Objectives 2010–2050 / European Environment Agency Report No 8/2013. Copenhagen, 2013. URL: https://www.eea.europa.eu/publications/towards-a-green-economy-in-europe (accessed: 12.10.2017)

[5] Materials of the V Moscow Economic Forum (March 30–31, 2017). Public administration. Electronic Bulletin Issue No. 64 October 2017 Art 34-44

[6] Bobylev S. N. Sustainable development: a paradigm for the future // Mirovaya ekonomika i mezhdunarodnye otnosheniya. 2017. V. 61. No. 3. S. 107–113.

[7] Green economy and sustainable development goals for Russia: collective monograph / scientifically. ed. S.N. Bobyleva, P.A. Kiryushina, O.V. Kudryavtseva. M., Faculty of Economics of Moscow State University named after M.V. Lomonosov, 2019. 284 p.

[8] World Development Indicators 2016 / The World Bank. Washington DC: World Bank, 2016. URL: https://openknowledge.worldbank.org/handle/10986/23969 (accessed: 12.10.2017)

[9] UNDESA. A guidebook to the Green Economy. 2012

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[11] The World Bank. Inclusive Green Growth: The Pathway to Sustainable Development, 2012.

researchers, there are significant differences between these concepts. For example, in the view of the experts of the International Chamber of Commerce, green growth is implemented in a "bottom-up" approach, i.e. allows at the operational level to "green" technologies, processes, products, and services and increase investment in "green" innovations[1].

At the same time, some authors believe that green growth is also characterized by the emergence of new economic opportunities to enable structural shifts in the economy[2],[3]. Currently, the use of the term 'green economy' is supported by the UNEP and many non-profit and non-governmental organizations, and 'green growth' by the Organization for Economic Co-operation and Development (OECD) and the World Economic Forum[4].

Research methodology. Scientific research methodology is based on a systematic approach to the problem under study and comprehensive consideration of overcoming unsustainable trends in economic development and the formation of a green economy, as the economic basis for the transition to sustainable development.

The research and presentation of the material were carried out using general scientific approaches: theoretical analysis and synthesis of scientific literature on the problem of research, method of historical analogy and systematization of empirical and theoretical materials, descriptive method, method of statistical, cause-effect, and comparative analysis. These methods are characterized by abstractness and generalization and help to systematize the collected material for its successful study.

The methodological basis was based on the works of domestic and foreign economists on the theoretical issues of the development of the concept of the green economy. All studies and assessments were made based on the current legislative and regulatory framework of the Republic of Armenia, the Green Economy Development Program, the decision of the Supreme Eurasian Economic Council, the recommendations of several international organizations (the World Bank, the International Chamber of Commerce, the Organization for Economic Cooperation and Development) on the implementation of the principles of the green economy.

Analysis: Prospects for transition to a green economy in Armenia.

New models of the economy have been reflected not only in academic writings but also in the priorities of practical activities of many states. For example, the European Community has adopted green economy, circular economy, and bio-economy programs for 2030-2050. The Paris Climate Agreement aims to move all states towards a low-carbon economy. The OECD,

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[1] ICC. Ten conditions for a transition toward a "Green Economy", 2011.

[2] Tereshina M.V., "Green growth" and structural shifts in the regional economy: an attempt at theoretical and methodological analysis / M. V. Tereshina, I. N. Degtyareva // Theory and practice of social development. 2012. No. 5. S. 246–248.

[3] Samoilova L.K., "Green" course in the system of ensuring the protection of socio-economic interests of macro- and micro-subjects // National security / nota bene. 2021. No. 4. P. 53-68.

[4] AtKisson A. OECD Global Forum on Measuring Well-Being for Development and Policy Making" // Life Beyond Growth. The history and possible future of alternatives to GDP-measured Growth-as-Usual, 2012.

which brings together the developed world, widely uses the term green growth in its documents. The development of "economic cooperation in the field of "green" technologies and environmental protection" is one of the sections of the strategic directions of development of Eurasian economic integration until 2025, approved by the Decision of the Supreme Eurasian Economic Council of 11 December 2020 № 12. As part of the implementation of the tasks set in 2021, the EEC Macroeconomic Policy Department has prepared an analytical report "On International Experience in Developing and Implementing Green Economy Principles, Measures and Mechanisms.

It is erroneous to think that only rich countries can afford a green economy.

The basis of public policy of Armenia on the transition to a green economy has been formed following international obligations for the development of a strategy for a green economy, in particular, by Montreal and Kyoto Protocols, but the key role played by the five-year program of the Government of Armenia, which has a separate subsection "Sustainable Development and Green Economy", which defines the main goals and objectives of the executive branch of the development of green economy[1].

One of the characteristics of a green economy is the efficient use of energy resources.

The "Energy" sector (as a result of the combustion of energy for energy production, transmission, and consumption, including transport) accounts for about 70% of the RA carbon emission structure, one key component of which is electricity production, while the share of industry is about 5%.

In turn, natural gas accounts for 41% of Armenia's electricity production and 29% of the domestic electricity consumption basket, taking into account the electricity-for-gas agreement with Iran. In addition, natural gas penetration in Armenia is at an extremely high level even compared to countries such as the Netherlands, Norway, and the UK. More than 90 percent of households in Armenia use natural gas for heating and cooking and more than 80 percent of vehicles use natural gas as fuel. However, global natural gas reserves are projected to be exhausted within the next 45-55 years at the current rate of consumption. Reducing the availability of natural gas as a key source of energy initially and eliminating it in the long term will cause significant disruption to all sectors of the economy.

Thus, the imperative to limit carbon emissions within a green economy is not only derived from global interests but is also a vital necessity for the sustainable development of the economy of the Republic of Armenia. The "Sustainable Development and Green Economy" subsection of the Government's five-year plan defines the main goals and objectives for the development of a green economy. The main objective of a green economy is to ensure that the economy is ready for the new realities of low-carbon energy. A comprehensive program of activities for its implementation includes:

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[1] The program of activities of the Government of the Republic of Armenia for 2021-2026. Resolution N 1902-L of the RA Government dated November 18, 2021.

- Permanently reducing the role of natural gas in the electricity generation mix, replacing it with renewable and alternative sources of electricity,
- Preparing the electricity transmission infrastructure for demand growth and structural changes,
- Preparing the infrastructure for transition to alternative transport[1].

The limited natural resources of Armenia dictate the imperative of efficient use of natural resources and maximum economy in economic processes. Therefore, the second objective of the formation of a green economy will be to create prerequisites for a longer conservation of natural resources in the economic cycle.

Both the public and the private sector must take part in the formation of the new economic system. The state faces the task of equalizing the rules of the game for "green" and conventional production, also known as "grey production"[2]. A legal basis for a smooth transition to the new system needs to be established, as well as new incentives for the transition to the green economy and public investment from the grey economy to the green economy.

The private sector must take advantage of the promising and new opportunities created by the transition to a green economy model by investing more in "greening economic sectors".

A key advantage of the green economy concept is its practical orientation. In this regard, a key role in the implementation of the concept is to solve the problem of financing green initiatives, which include international economic programs, platforms, partnerships, foundations, and other institutions that contribute to the introduction of green economy principles into practice.

The G20 report defines Green Finance as "funding investments that provide environmental benefits within a broader context of environmentally sustainable development"[3]. The environmental benefits are generally linked to traditional indicators in this area, such as reductions in air, water, and land pollution, greenhouse gas emissions, improvements in energy efficiency in natural resource management, as well as climate change mitigation and adaptation. It is no coincidence that one of the most widely accepted indicators of financing the green economy is the amount of investment in renewable energy sources.

The role of international and local development finance institutions in enabling the transition to a green economy can be increased. Thus, the development of green finance is an essential element of the green economy transition framework. In this regard, UN experts suggest reforming the global financial system, taking into account the main groups of problems that impede green finance, such as accounting for externalities (externalities); information bases;

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[1] The program of activities of the Government of the Republic of Armenia for 2021-2026. Resolution N 1902-L of the RA Government dated November 18, 2021.

[2] http://www.unep.org/greeneconomy/Portals/88/documents/ger/GER_synthesis_ru.pdf

[3] Green finances: G20 Green Finance Synthesis Report. URL:http://unepinquiry.org/wp-content/uploads/2016/09/Synthesis_Report_Full_EN.pdf (accessed 02.10.2019)

analytical capacity; and maturity mismatches[1].

Investors around the world have also begun to see green solutions as more important, and there are already cases where Armenian banks have raised foreign funds for green initiatives. Today there are already expectations that international financial institutions will take the green economy component into account when lending to commercial banks in Armenia. The share of the green economy in total lending to commercial banks for project refinancing should be at least 20%. This measure is aimed at reducing greenhouse gas emissions and improving the overall environmental situation in the country. Large international financial institutions, such as the European Bank for Reconstruction and Development and the European Investment Bank, raise billions of dollars from the Climate Fund for environmental projects. These financial institutions, in turn, refinance these projects, forming "chains" that favor large solar power plants. The problem is that these plants are being built on agricultural land, and they need to be built in areas such as tailing dumps or abandoned mines. And it is not just a question of energy, but also of other areas. A successful transition to a green economy requires an enabling environment and adequate financing. Environmentally and socially harmful subsidies are an obstacle and must be removed. However, in some situations and for certain limited periods, the rational use of subsidies can facilitate the transition to a green economy. Taxes and other market-based instruments can be used to stimulate the necessary investment and innovation to finance the transition. While the transition to a green economy will require large-scale investments, these investments can be mobilized through sound public policies and innovative financing mechanisms.

Conclusion. For Armenia, the terms "green economy" and "green growth" are still new and rarely used in official documents. At present, the term "green economy" is still poorly integrated into the Armenian legislative framework.

Adequate consideration of green economy principles in new projects will accelerate the pace of greening the economy of Armenia and solve important social, environmental, and economic development issues of the country.

To adopt green economy as one of the pillars of development and in connection with the participation and commitments of the country in international platforms it is necessary to integrate green economy in the legislative framework of Armenia. Successive steps of integration can be the adoption of the concept of green economy implementation principles, introduction of economic mechanisms to ensure the development of green economy, clarification of problems aimed at ensuring the implementation of green economy principles, and clarification of appropriate economic and legal mechanisms to stimulate their solution. The nationalization of the UN Sustainable Development Goals is also of fundamental importance.

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[1] Green finances: G20 Green Finance Synthesis Report. URL:http://unepinquiry.org/wp-content/uploads/2016/09/ Synthesis_Report_Full_EN.pdf (accessed 02.10.2019)

The transition to a green economy in Armenia will require a long period of transformation and modernization of the economy, structural and technological changes, and the formation of a new economic model.

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GAYANE HARUTYUNYAN
Ph.D., Associate professor
Armenian State University of Economics

SYNERGY EFFECT IN INSURANCE BUSINESS

Often, to make a corporate decision, it is necessary to find out whether the value of the company will increase, decrease, or remain at the same level as a result. This is especially important when making decisions that, in principle, will affect the value of the company's business, for example, in case of the introduction of new products, provision of new services, and capture of new markets.

In the "Synergy effect in insurance business" article the calculation of the synergy effect obtained by insurance companies was presented. For that purpose, the discounted cash flow method and triangular membership function's method were applied. The analyses were carried out in the following way: the business cost of each insurance company was calculated, and then the business cost was calculated for companies that had theoretically joined their forces. Next, an area of effective synergy or investment was presented, which served as a basis for assessing the riskiness of the synergy effect. The obtained data allowed us to get an idea of what factors can affect the result of synergy, and to understand whether a high synergistic effect is accompanied by a high risk or not.

Introduction. In some cases, especially when it comes to products whose implementation is directly related to the socio-economic situation in the country or is considered strategic, the question arises whether a company should act alone or join forces with another company.

The sale of innovative products in the future is likely to be accompanied by the need to provide compensation. It is expected that one insurance company will not be able to work alone as effectively as if it combined its capabilities with one or several insurance companies. If an insurance company makes an incorrectly calculated decision about whether to merge its efforts or not, the value of its business may decrease sharply, and the company will lose the opportunity to work effectively in the market in the future.

In practice, various approaches have been developed to assess the possibilities of increasing the value of the business, as well as increasing the profitability of the company, one of which is the calculation of the synergy effect. Thus, the analysis is based on the following goal: to assess the impact resulting from the association of insurance companies, calculate the effect of synergy, and measure its risk level.

Literature review. Various definitions of the term "Synergy" have been formed in the literature. According to them, synergy is one of the major components in a firm's product market strategy. It is the extra value added achieved when two businesses are integrated so that the sum of the whole is greater than that of the constituent parts. It is popularly described as "2+2=5". The concept lost some credibility when expected synergistic effects were found to be elusive, and it became said that in many situations "2+2=3".[1] The concept of synergy is defined as follows: "Synergy is the combined power of a group of things which, when working together, achieve a higher overall strength than that achieved by the individual components separately"[2]. Synergy is an increase in the performance of the combined company over what is already expected of the two companies or needs to be achieved as independent companies. If the acquirers can achieve the performance that is already expected from the objective, the net present value (NPV) of the acquisition strategy is then clearly expressed by the following formula: NPV = Synergy - Premium"[3]. Synergistic benefits generally arise from five possible sources: increased revenue, cost reduction, improvement of processes in society, financial efficiency, and risk reduction[4].

There are also differences between operating synergy and financial synergy. Operating synergy aims to gain profits through a combination of the acquirer company with the resources of the acquired company, such as revenue growth through new product offerings or cost savings due to changes in the economies of scale. Financial synergy aims to gain profit through a combination of acquirers and targets through the company's structure, including tax savings, lower capital costs, diversification of cash flow, or decreases in profits caused by lack of good management so that it is undervalued[5].

Synergy has a great impact on the company's management. It is the superior use of resources to adapt more successfully to a changing environment with increased competitive pressure.[6]. Management identifies synergy potential early in the acquisition process. The process to identify synergy is labeled planned synergy, in other words, the goal of acquisition.

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[5] Rabier, M. R, Acquisition Motives and the Distribution of Acquisition Performance, Strategic Management Journal, 38(13), 2017, https://doi.org/10.1002/smj.2686

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Planning is a pre-acquisition phase and includes synergy intended to be realized. It has been argued to be important to identify the integrated business-critical activities early to realize synergy. These activities can include sharing technologies, and production resources or coordinating marketing and distribution[1].

As can be seen, the result of synergy is a rather complex phenomenon. If two or more companies join forces, there is not necessarily a synergy effect that will take place. Combining the forces of two large companies holding leading positions can worsen the situation of both companies and reduce the business results of each of them. For this reason, the evaluation of the results of synergy is quite important before joining the forces of the companies. It is especially important to take into account the cost of discounted cash flows of each of the companies, the price of liabilities, return on equity from the point of view of the dividend policy, and the growth of the company as an opportunity to increase the value of shares. A change in each of these factors can affect the business value of the combined companies on a sufficiently large scale.

A study of the literature shows that both the concept of the synergy effect and its calculation especially in insurance companies have been studied a little, and the studies conducted are few. Thus, there is no concept of insurance synergy in the literature. That is why, from the point of view of the insurance business, synergy is presented and calculated on general principles, taking into account the features inherent in insurance. So in this study, we will try to assess the synergy effect calculation gaps through massive data analyses, simulations, and predictions.

Research Methodology. The calculation of the synergy effect was carried out on the example of three insurance companies (Rosgosstrakh Armenia ISJC (RGS)[2], Ingo Armenia ISJC (INGO) and Nairi Insurance ISJC (NAIRI)). The calculations were made from 2017 to 2021. A forecast for 2022 up to 2025 was done. Necessary data were taken from companies' financial public statements. Calculations were made both for each company separately, then in the case when RGS and INGO join their forces, then the same was done for INGO and NAIRI. Let us mention that in 2021 Rosgosstrakh Armenia ISJC showed the worst profit result (-766,132 thousand AMD) and Ingo Armenia ISJC showed the best result (787,366 thousand AMD).

Let us present each of the synergy effect calculation methods.

I. Discounted cash flow method.

1. $DCF = \sum_{i=1}^{n} DCF,$ where n-the number of years for the calculation,
2. $CF = EBIT - Tax - \Delta NWC$[3] .
3. The value of the company's business in the post-forecast period is determined by the

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[1] Gates, S. and Véry, P., Measuring performance during M&A integration, Long Range Planning, Vol. 36 No. 2, 2003, pg. 167-185.

[2] Liga Insurance ISJC

[3] Analyzing Project Cash Flows, Chapter 12, 57 pg., pg. 9,
http://pthistle.faculty.unlv.edu/FIN301_Fall2019/Slides/Ch12_Full.pdf

Gordon formula: $V_{term} = \frac{CF_n(1-g)}{WACC-g}$ [1], where CF$_n$ - is the amount of CF in the last year of the forecast period, g - is the growth of the company in the post-forecast period, and WACC - is the discount rate for each company's passives. g - the percentage increase of the dividends paid by the company.

4. The discount rate was calculated using the following formula: $WACC = \frac{E}{K}y + \frac{D}{K}b(1-t)$[2], where y - return on equity and is calculated as the amount of dividends paid for the period concerning the amount of the nominal value of shares that provide the possibility of paying dividends, b - borrowed funds, T - income tax rate, D - the amount of long-term and short-term loans, E -the amount of equity, K - the amount of passive.

5. The Monte Carlo predictive modeling method was performed. For the forecast period, the average and standard deviations of the actual indicators were calculated. The forecast indicators were calculated using the moving average method. Scenarios with changing indicators were calculated using the RANDBETWEEN function in Excel.[3].

6. The companies' business values were calculated using the formula: $EV = \sum_{t=0}^{n} DCF_t + Vterm$. To make a forecast in Excel, the Data Analyzes tool was used to calculate the maximum and minimum values of indicators.

7. The synergy effect was calculated by the following formula $V_{syn} = EV_{1+2} - (EV_1 + EV_2)$[4]:

II. The triangular membership function method

1. The triangular membership function was built, where a, b, c are the numbers that receive the corresponding values,

$$f(u, a, b, c) = \begin{cases} 0, & u \leq a \\ \dfrac{u-a}{b-a}, & a \leq u \leq b \\ \dfrac{c-u}{c-b}, & b \leq u \leq c \\ 0, & c \leq u \end{cases}$$

Changes in the presented indicators were evaluated in such a way that "a" is the smallest possible change, "b" is the most likely, and "c" is the maximum one. Based on these values, a triangular function was built[5].

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[1] Stock Valuation: Gordon Growth Model, 30 pg., pg. 10, http://people.umass.edu/nkapadia/FINOPMGT304/Week2.pdf

[2] FIN 3701, Chapter 5: WACC (Weighted Average Cost of Capital), 8 pg., pg 1-4.

[3] Harutyunyan G., Atanyan A., Risk assessment methods, Teaching manual, Yerevan, Meknark, 2021, 239 pg., pg. 140-147, 149-182 (Հարությունյան Գ., Աթանյան Ա., Ռիսկերի գնահատման մեթոդներ, ուսումնական ձեռնարկ, Եր.: Մեկնարկ, 2021, 239 էջ, էջ).

[4] Damodaran A. Investment valuation: Tools and methods for evaluating any assets, Moscow, 1340 pg., pg. 730, (Дамодаран А. Инвестиционная оценка: Инструменты и методы оценки любых активов 5-е изд. М.: 2008, 1340 с., с. 730).

[5] Ivanov, A.A., A priori assessment of the synergetic effect of integration, based on a fuzzy multiple model for determining the coefficient of synergetic growth, Business value assessment, 42 (297), 2012, 10 pg., pg. 9,

2. The next step is the calculation of the indicators presented in points 5 and 7 of the previous method, which served as a basis for building the triangular membership function.

Analysis. With the first of the methods presented in the methodology, the analysis was carried out. In Table 1.1 and Table 1.2, the indicators and descriptive statistics data of Rosgosstrakh Armenia ISJC are presented. Table 1.1 and Table 1.2 were presented to show what indicators were included in analyses and which of them affected the EV the most.

The indicators of all other companies were calculated in the same way.

Table 1.1

Data for Rosgosstrakh Armenia (thousands AMD, %)*

RGS	EBIT	CAPEX	ΔNVC	DCF	E	K	y	D	b	t	WACC	g	Vterm	EV
2025	567,926	125,600	525,464	1,152,742			7.1%							
2024	519,207	123,156	474,602	1,055,373			6.7%							
2023	463,494	120,362	416,439	944,028			8.3%							
2022**	152,668	117,098	348,518	612,475			5.6%							
2021	-766,132	65,165	-826,540	0	6,338,405	16,886,292	0.0%	601,226		18%	0.00%	0%	-	3,647,646
2020	236,958	85,492	127159	-2	7,164,945	17,007,673	0.0%	872,284		18%	0.00%	-4010%	(2)	3,647,644
2019	138,413	93,373	152261	0	7,037,788	17,146,294	4.1%	904,429		18%	1.69%	-34%	-	3,647,646
2018	-112,070	129,736	-361766	250,000	6,885,527	14,365,528	6.3%	748,391		18%	3.01%	6177%	246,072	3,893,719
2017	610,185	104,855	427195	36,000	7,247,293	14,007,206	0.1%	586,881		18%	0.05%	-95%	73,760	3,721,407
Average	21,471	95,724	-96,338	3,647,646***			2.1%							
Sigma	457,131	21,374	444,856				2.6%							
Prognostics[1]	131,197						3.48%							

Table 1.2

EV simulation descriptive statistics for Rosgosstrakh Armenia (thousands AMD)

RGS EV simulation descriptive statistics	
Mean	3,513,951
Standard Error	7,617
Standard Deviation	417,194
Range	1,431,228
Minimum	2,918,489
Maximum	4,349,717
Simulation scenarios count	3,000

(Иванов, А.А., Априорная оценка синергетического эффекта интеграции, на основе нечетко-множественной модели определения коэффициента синергетического роста, Оценка стоимости бизнеса, 42 (297), 2012, 10 стр., стр., 9)

[1] Harutyunyan G., Atanyan A., Risk assessment methods, Teaching manual, Yerevan, Meknark, 2021, 239 pg., pg. 140-147, 149-182 (Հարությունյան Գ., Աթանյան Ա., Ռիսկերի գնահատման մեթոդներ, ուսումնական ձեռնարկ, Եր.: Մեկնարկ, 2021, 239 էջ, էջ 140-147, 149-182). The calculation is performed using the RANDBETWEEN function

*The indicators of other companies were calculated in a similar way.

**The data for 2022-2025 were calculated using the moving average method, based on the average and sigma indicators.

***The Monte Carlo method was used to develop scenarios of indicators (3000 pcs.).

The analysis was presented with the main indicators of all companies for 2021. A one-year time horizon was chosen for the analysis presentation because a 5-year time horizon would be too massive.

It can be seen from Table 2 that the largest DCF was formed when Ingo Armenia and Nairi Insurance joined forces.

EBIT, Tax, ΔNWC, DCF for 2021, thousands AMD[1]

2021	EBIT	TAX	ΔNWC	DCF
RGS	-766,132	60,408	-826,540	**-12,816**
INGO	787,366	146,019	-2,983,774	**482,513**
NAIRI	799,724	134,345	-6,338,405	**634,083**
RGS+INGO	676,153	199,203	-314,393	**814,168**
NAIRI+INGO	1,587,090	280,364	7,041,107	**2,807,740**

To determine the cost of passive, the WACC was calculated. As can be seen from Table 3 the greatest result was shown by Nairi Insurance. This is explained by sharing large dividends in 2021, which made the company attractive.

E, K, y, D, t, WACC for 2021, thousands AMD, %[2]

2021	E	K	y	D	t	WACC
RGS	6,338,405	16,886,292	0.0%	601,226	18%	**0.00%**
INGO	4,524,918	14,236,932	0.00%	605,337	18%	**0.00%**
NAIRI	2,983,774	10,430,897	51.52%	439,599	18%	**14.74%**
RGS, INGO	6,338,405	16,886,292	0.00%	601,226	18%	**0.00%**
NAIRI, INGO	7,508,692	24,667,829	0.00%	1,044,936	18%	**0.00%**

As a result, based on the growth of companies and the value of the companies' business in the post-forecast period, the full value of the companies' business was determined. As can be seen from Table 4 the largest business value is formed when Ingo Armenia and Nairi Insurance join their forces, which is more than twice as much as in the case when Rosgosstrakh Armenia and Ingo Armenia join their forces.

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[1] The table was created by the author.
[2] The table was created by the author.

Table 4

g, Vterm, EV for 2021, %, thousands AMD[1]

2021	g	Vterm	EV
RGS	0%	-	4,016,180
INGO	100%	2,217,864	6,900,841
NAIRI	128%	305,467	5,194,861
RGS, INGO	-100%	2,459,496	8,332,966
NAIRI, INGO	101%	27,820	18,979,660

Further, 3000 scenarios in Excel for the EV were performed based on the Monte Carlo simulation method. The maximum and minimum values of business values and synergy results of all companies were derived from Excel descriptive statistics. Table 5 shows that as a result of the combination of forces of Ingo Armenia and Nairi Insurance, at the maximum values, an almost 2.5 times greater result is formed, and at the minimum result of synergy, an additional result of 5.6 times is formed.

Table 5

Max and Min Synergy for 2021, thousands AMD[2]

2021	EV Max	EV Min	V Synergy Max	V Synergy Min
RGS	4,349,717	2,918,489		
INGO	6,078,240	3,929,053		
NAIRI	5,625,217	3,833,128		
RGS+INGO	15,007,505	8,541,241	4,579,548	1,693,699
NAIRI+INGO	22,008,519	16,823,103	10,305,062	9,060,921

To verify the correctness of the results the standard error was calculated, which, if less than 0.5% ensures the reliability of the calculations. The last was calculated based on descriptive statistics as a ratio of the standard error to the average result. It can be seen from Table 6 that the best result is shown when Ingo Armenia and Nairi Insurance join forces.

Table 6

Standard error for 2021, %[3]

2021	Standard error
RGS	0.22%
INGO	0.24%
NAIRI	0.15%
RGS+NGO	0.21%
NAIRI+INGO	0.12%

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[1] The table was created by the author.

[2] The table was created by the author.

[3] The table was created by the author.

Figure 1 and Figure 2 present the Rosgosstrakh Armenia - Ingo Armenia and Ingo Armenia - Nairi Insurance forces joining business values distribution histograms.

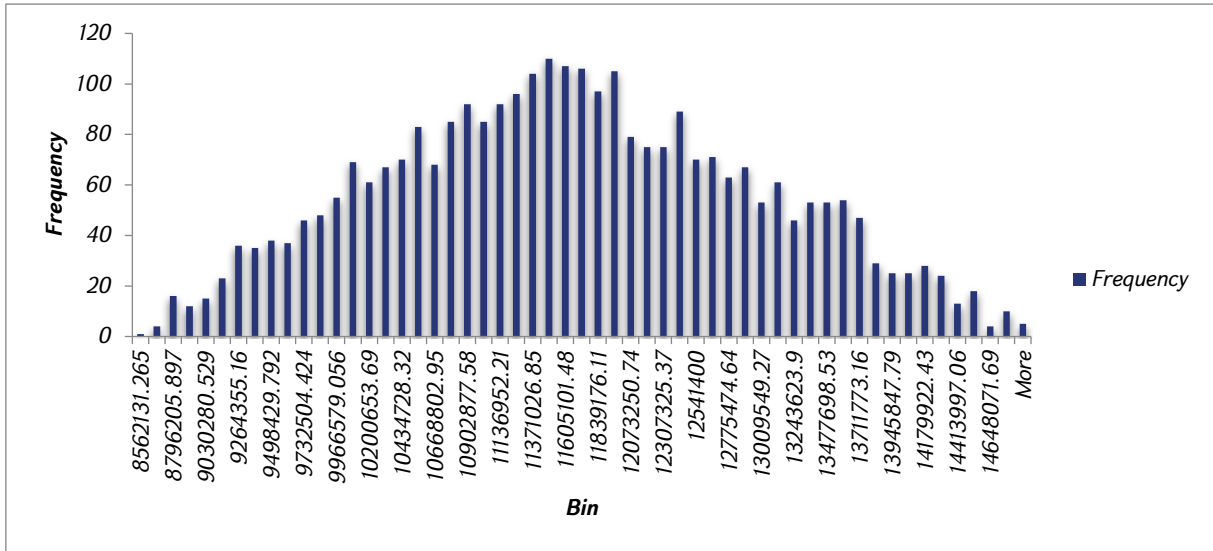**Figure 1.** *Distribution of business values as a result of the unification of the forces of Rosgosstrakh Armenia and Ingo Armenia, thousands AMD [1]*
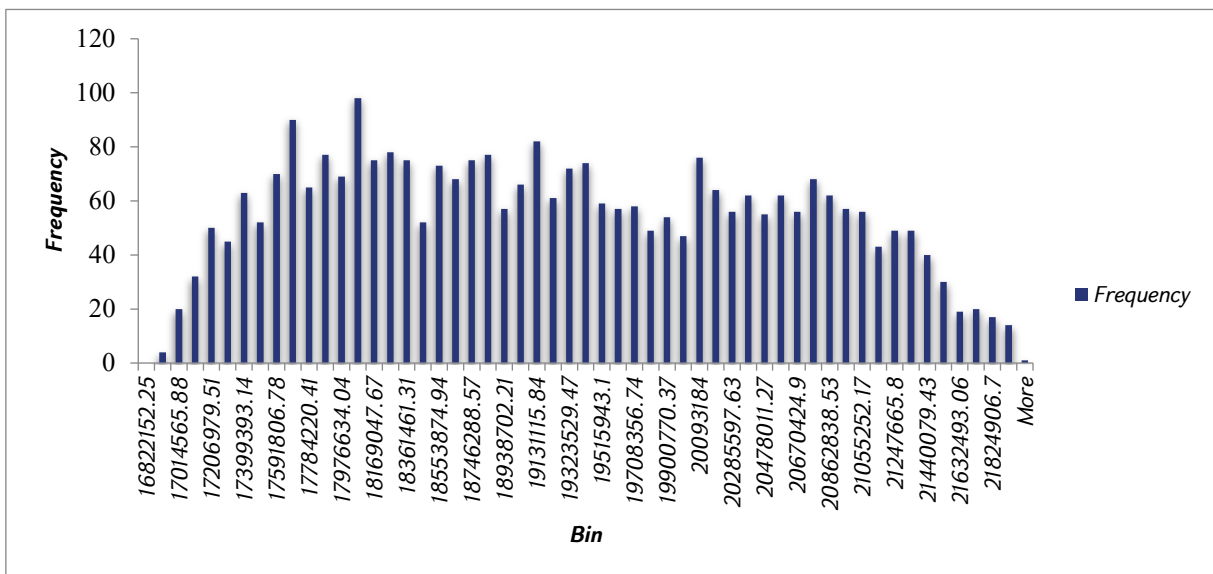
Figure 2. *Distribution of business values as a result of the unification of the forces of Ingo Armenia and Nairi Insurance, thousands AMD[2]*

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[1] The figure was created by the author.
[2] The figure was created by the author.

In Figure 1 business values are distributed normally contrary to Figure 2. This means that predicting changes in the future can be much easier and with fewer errors in the case of RGS+INGO. The parameters of the normal distribution make it easier to perform calculations, and the reaction to changes is easily forecasted. It turns out that providing an excellent result in this case is accompanied by a greater risk.

The riskiness of the result of companies' synergy was calculated using the triangular membership function method. The amount of risk is estimated based on expert assessments and ranges when the DCF of an investment project is compared with the efficiency of the G indicator.[1]. DCF and G can take maximum, minimum, and mode values. Therefore, the DCF formula will be:

$$[\text{DCF}_{min}, \text{DCF}_{mode}, \text{DCF}_{max}] = \sum_{i=1}^{n} \frac{[CF_{min}, CF_{mode}, CF_{max}]}{(1 + [y_{min}, y_{mode}, y_{max}])^n} =$$

$$= \sum_{i=1}^{n} \frac{[[EBIT_{min}, EBIT_{mode}, EBIT_{max}] - [Tax_{min}, Tax_{mode}, Tax_{max}] - [\Delta NWC_{min}, \Delta NWC_{mode}, \Delta NWC_{max}]]}{(1 + [y_{min}, y_{mode}, y_{max}])^n}$$

(Formula 1)

The efficiency of the investment project parameter G will have the $[G_{min}, G_{max}]$ range. A range beyond the DCF and G ranges indicates the degree of risk.[2]. Denoting the area of this range S_α, the risk of the project can be calculated as follows[3]:

$$\varphi(\alpha) = \frac{S_\alpha}{(G_{Max} - G_{Min}) x (\text{DCF}_{Max} - \text{DCF}_{Min})} \quad \textit{(Formula 2)}$$

DCF triangular values are calculated by using the Monte Carlo simulation method[*], and G is denoted by taking DCF's most pessimistic, optimistic, and likely scenarios into consideration[4]:

Table 7

X and Y triangular values for Rosgosstrakh Armenia and Ingo Armenia DCF, G indicators, thousands AMD [5]

Indicators	DCF (X,0)	G(X,0)	(0, Y)
Mean	11,554,788	9,000,000	1
Minimum	8,541,241	6,000,000	0
Maximum	15,007,505	11,000,000	0

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[1] Nedosekin A., Fuzzy financial management, Russia, Moscow, AFA Library, 2003, 184 pg., pg. 70-71.
[2] Nedosekin A., Fuzzy financial management, Russia, Moscow, AFA Library, 2003, 184 pg., pg. 70-71.
[3] Nedosekin A., Fuzzy financial management, Russia, Moscow, AFA Library, 2003, 184 pg., pg. 71.
[4] The most probable scenario is based on the mode value.
[*] Maximum, minimum, and average values.
[5] The table was created by the author.

Table 7 data were used to build DCF and G triangular values figure, where ABC triangle shows G indicator area and acceptable values, and DEF same for DCF.
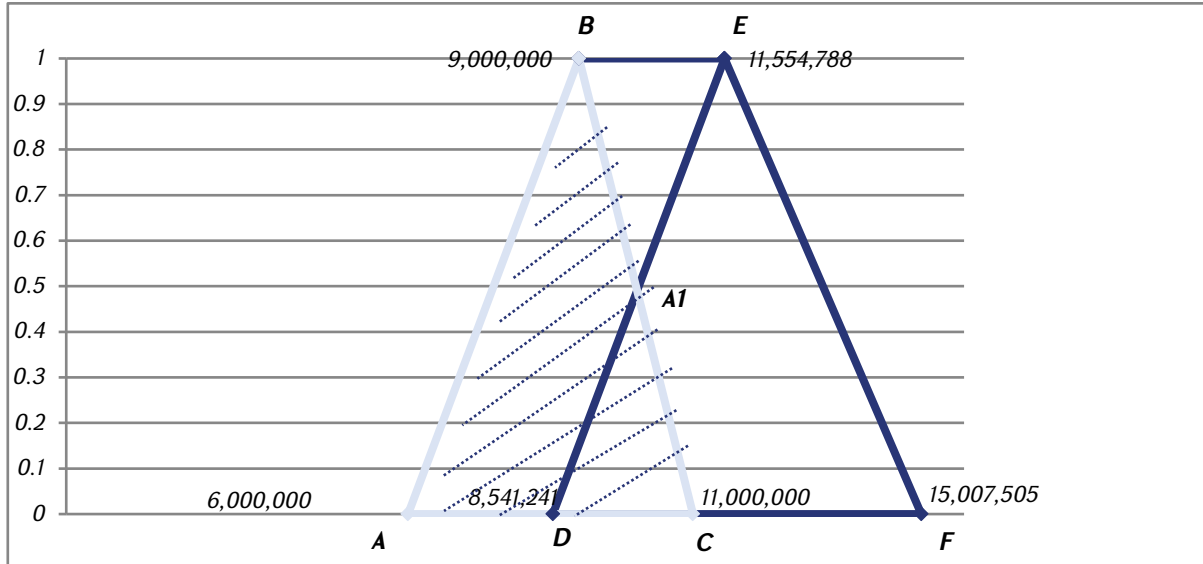
Figure 3. ***DCF, G indicators' triangular values for Rosgosstrakh Armenia and Ingo Armenia, thousands AMD[1]***

The DA$_1$C triangle shows an effective investment range. In general, the efficiency of the barcode is quite high, since the obtained indicators are based on the opinions of experts. As a result, it turns out that the risk value is characterized by the area of the quadrangle CA$_1$EF.

The same data were calculated when Ingo Armenia joined forces with Nairi Insurance (Table 8, Figure 4).

X and Y triangular values for Ingo Armenia and Nairi Insurance DCF, G indicators, thousands AMD[2]

Indicators	DCF (X,0)	G(X,0)	(0, Y)
Mean	19,194,760	17,000,000	1
Minimum	16,823,103	14,000,000	0
Maximum	22,008,519	20,000,000	0

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[1] The figure was created by the author.
[2] The table was created by the author.
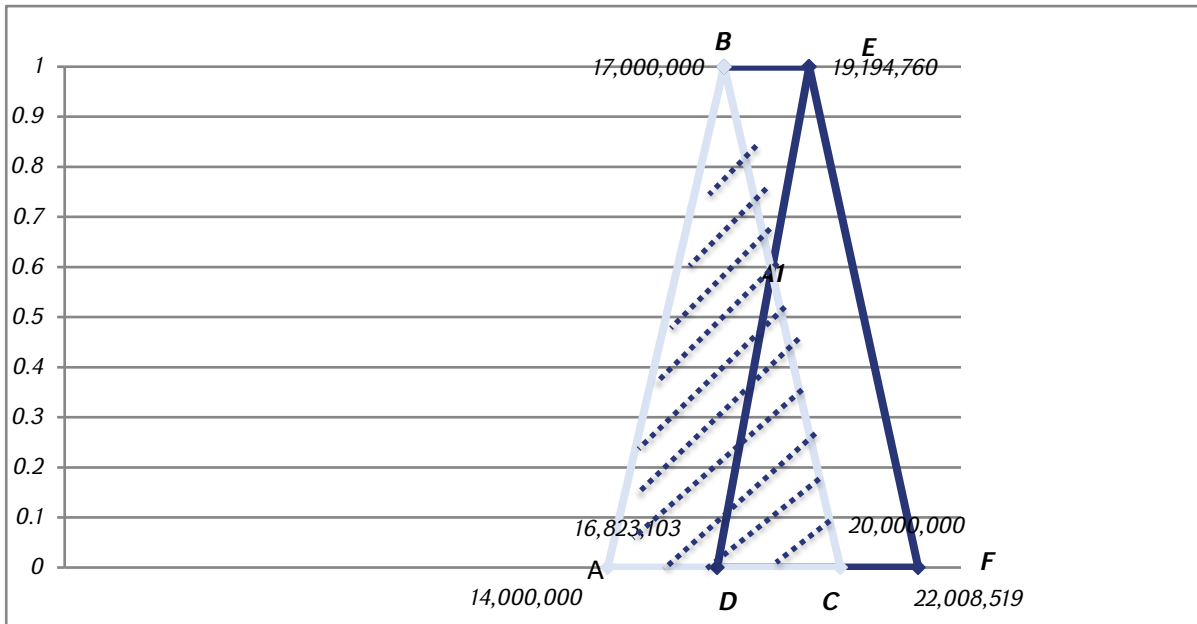
Figure 4. *DCF, G indicators' triangular values for Ingo Armenia and Nairi Insurance, thousands AMD[1]*

CA₁EF quadrangle square calculation methodology is presented in Table 9.

CA1EF quadrangle's square calculation methodology[2]

Square	RGS+INGO	INGO+NAIRI
ABEF	((11,554,778-9,000,000+16,007, 505-6,000,000)/2)*1=6,281,142	((22,008,519-14,000,000+19,194, 760-17,000,000)/2)*1=5,101,140
ABC	((11,000,000-6,000,00)/2)*1=2,500,000	((20,000,000-14,000,000)/2)*1=3,000,000
A₁BE	((11,554,788-9,000,000)/2)*0.5=638,697	((19,194,760-17,000,000)/2)*0.5=548,690
CA₁EF	6,281,142-2,500,000-638,697=3,142,445	5,101,140-3,000,000-548,690=1,552,450

From Table 9 and Formula 2, φ(α) can be calculated. So that:

$$\varphi(\alpha)_{RGS+INGO} = \frac{3,142,445}{(11,000,000 - 6,000,000)x(15,007,505 - 8,541,241)}x100\% = 0.00001\%$$

and

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[1] The figure was created by the author.
[2] The table was created by the author.

$$\varphi(\alpha)_{INGO+NAIRI} = \frac{1,552,450}{(20,000,000 - 14,000,000)x(22,008,519 - 16,823,103)}x100\%$$
$$= 0.000005\%$$

The method of the triangular membership function showed that the synergy effect is less risky when Ingo Armenia and Nairi Insurance join forces.

Conclusion. Therefore, we can conclude that if a company has a large market share, it doesn't mean that it uses its funds effectively. Calculations stated that when combining two companies with large shares, it is not guaranteed that the additional synergistic effect will be greater than when combining smaller companies. Large companies with a huge resource base often do not pay attention to the WACC and EV indicators, and they have a great influence on DCF. Companies often try to strengthen their financial stability without paying dividends, however, as calculations have shown, the payment of dividends has a great impact on the potential attractiveness of the business. The effectiveness of synergy is largely due to the normal distribution of data since the law of normal distribution allows for quick assessment of the risk of synergy, which can be calculated by the method of membership functions. Comparison of risk levels makes it possible to understand in which case the result of the merger will not only be large, but also effective. It turns out that setting up the functions of DCF and triangular membership allows not only to make an effective decision but also to identify factors that reduce the synergistic result.

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NAREK HARUTYUNYAN

Doctor of Geography, Associate Professor,
Yerevan State University

PROTECTED COMPONENTS AND TYPES OF USE IN THE TERRITORIAL PLANNING SYSTEM OF ARMENIA

The article is dedicated to the problems of implementing ecological principles in territorial planning of Armenia. At present, there are many problems in Armenia, in which environmental protection, sustainable economic development and effective use of resources have their unique place. The article highlights issues of environmental protection and environmentally sound planning. The purpose of the study is to develop scientifically based proposals for the establishment and further strengthening of ecologically oriented methods in territorial planning of Armenia.

The system «Man - Environment» can be represented using two categories - «Protected components» and «Types of use». The types of use express the needs of society in terms of space and the environment. Protected components symbolize the natural and anthropogenic components of the environment, which should be protected for environmental, social and economic reasons. In a spatial planning system, protected components and uses provide a meaningful framework for assessing the natural environment. Accounting for protected components makes it possible to ensure the sustainable use of natural resources throughout the country.

Introduction. In the Armenian system of territorial planning, the requirements of environmental protection and ecological safety are implemented through the formation of zones of restrictions established by modern normative legislative acts and technical regulations and the determination of zones of negative environmental impact of the planned objects. Previously established and calculated sanitary protection zones, which, by design, should level the harmful effects of specific objects, are displayed only in master plans. However, there is no methodology for calculating the combined sanitary protection zones of several objects; the impact of such zones on natural components has not been determined. Thus, protected components and uses are taken into account in the Armenian planning system, but to a limited extent and only in certain areas. The mechanism for a continuous comprehensive assessment of the natural environment has not yet been developed; protected components do not have priority as systemic elements of the natural environment.

Literature review. In the spatial planning system, the problems of separation of protected components and their reasonable use exist not only in the countries that were previously in the same geopolitical and economic environment as Armenia, but also in the countries with the most prosperous standard of living and developed economy. Of course, from a purely methodological point of view, it is not correct to directly implement any system used abroad in Armenia. The problem refers to the choice of such a toolkit related to spatial planning, which, being effective, modern and perspective, will at the same time be maximally determined by the peculiarities of our country. Within the framework of this research, in terms of studying the experience of abroad, the selection of countries was made according to the following principle:

1. Germany was chosen from the countries with a high level of development and established and functional system of spatial planning, which will allow us to assess the scope of systemic reforms implemented in Armenia.
2. In terms of being the heir of the same geopolitical environment and historically formed spatial planning system as Armenia, Russia was chosen, which will provide an opportunity to compare the steps taken during the transition from the planned economy to liberal relations and their effectiveness.

In the German planning system, protected components are components of the environment that, due to their social, environmental-political and/or economic significance, can

only be subject to anthropogenic pressures under certain conditions and to a limited extent. They form the basis for the entire German planning system and are subject to review and evaluation during landscape planning. The Federal Law «On Nature Protection»[1] defines the following protected components (in landscape planning, the term «natural components» is used for this):

- species and communities of animals and plants, biodiversity,
- soil,
- bodies of water,
- landscape, landscape appearance, recreation
- climate, air.

In addition to protected components, landscape planning takes into account and assesses the intensity of existing and planned uses and their impact on the natural environment and landscape appearance. This makes it possible to describe and territorially reflect uses in plans, as well as assess the impact of existing and planned uses on nature and landscape. Accounting for uses, combined with the sensitivity of protected components, helps to draw conclusions about the existing and possible risks and potential opportunities for individual uses. This can analyze conflicts between uses and protected components, as well as between individual uses, and suggest more environmentally friendly ways to solve problems or offset measures.

The main provisions on environmental protection, which must be taken into account in the territorial development of Russia, are enshrined in a number of legislative acts relating to issues of rational nature management. The Federal Law «On Environmental Protection»[2] defines the legal framework for state policy in the field of environmental protection, which ensures a balanced solution of socio-economic problems, the preservation of a favorable environment, biodiversity and natural resources, the strengthening of law and order in the field of environmental protection and environmental safety. The law regulates relations in the field of interaction between society and nature arising from the conduct of economic activities, and defines the following objects of protection:

- land, subsoil, soil,
- surface and ground waters,
- forests and other vegetation, wildlife and their genetic fund,
- atmospheric air, ozone layer and near-earth space.

The above protected components play a role in the territorial planning of Russia. Thus, the environmental justification in territorial planning includes an assessment of the possibility of developing the planned activity in a particular area of the territory, taking into account:

1. environmental quality standards;
2. the existing system of restrictions on nature use;

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[1] https://www.gesetze-im-internet.de/uvpg/
[2] http://www.kremlin.ru/acts/bank/17718

145

3. the predicted state of the environment with planned discharges, emissions and production wastes and other types of negative impact.

Research methodology. The separation of protected components in the spatial planning system and the forms of reasonable use of the area can be given by the use of the landscape planning methodology.

In addition to protected components, landscape planning takes into account and assesses the intensity of existing and planned uses (agriculture and forestry, water management, waste management, energy production, extraction of raw materials, settlements, transport, recreation) and their impact on the natural environment and the shape of the landscape.[1] Thanks to this, it becomes possible to describe and territorially conditional display of uses in plans, as well as to assess the impact of existing and planned uses on nature and landscape. The account of types of use in combination with the sensitivity of protected components helps to draw conclusions about existing and possible risks and potential opportunities of individual types of use. At the same time, conflicts between types of use and protected components, as well as between individual types of use, and more environmentally friendly ways of solving problems or compensatory measures may be analyzed.

Representation and assessment of protected components in landscape planning occurs within a separate section. When inventorying, the collection and analysis of available basic data on nature and landscape protection (for example, maps of biotopes, species and biotope protection programs) and other sectoral plans (agriculture, forestry, water management), as well as additionally compiled maps of biotopes and types of use are carried out. In each individual case, it is determined which data are important for planning and should be included in the assessment. The display of all environmental information and requirements (depending on the level of planning) should cover the entire territory of the municipality, region or national land[2].

A simple and convenient method of ecological risk analysis is more often used in practice for the assessment of protected components and potential user conflicts.[3] This method gives an opportunity to analyze and display on the map the system «Source of influence - Consequences - Affected side». In addition, it is possible to compare different types of use and assess their compatibility (for example, recreation and agriculture).

«Interference analysis» method can be used to display the multipurpose use of the territory, including connections between types of use. At the same time, the areas of interference fields of various types of use are displayed on the map and classified according to their intensity.

Analysis. The main provisions on environmental protection, which must be taken into account in the territorial development of Armenia, are enshrined in a number of legislative acts relating to issues of rational nature management. In the Republic of Armenia (RA), the protection

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[1] Haaren C., Galler C., Ott S.: Landscape planning. The basis of sustainable landscape development. 2008. 52 p.

[2] Harutyunyan N.A.: Landscape Planning: Educational-methodological manual. Yerevan, 2012, 66 p.

[3] Gormley A., Pollard S., Rocks S.: Guidelines for Environmental Risk Assessment and Management. Cranfield University. 2011. 85 p.

of natural components is defined by laws and legal acts regulating the field of environmental protection.[1] In which the main principles of regulating relations in the field of interaction between the Society and Nature arising from the implementation of economic and other activities include: taking into account the natural and socio-economic characteristics of territories in planning and implementation of economic and other activities, the priority of preserving natural ecological systems, natural landscapes and natural complexes, conservation of biological diversity. The laws and legal acts regulating the field of environmental protection defines the legal framework for state policy in the field of environmental protection, ensuring a balanced solution of socio-economic problems, preserving a favorable environment, biodiversity and natural resources, strengthening the rule of law in the field of environmental protection and ensuring environmental safety. The law regulates relations in the field of interaction between society and nature arising from the conduct of economic activities, and defines the following objects of protection:

- land, subsoil, soil,
- surface and ground waters,
- forests and other vegetation, wildlife and their genetic fund,
- atmospheric air, ozone layer.

These principles are also reflected in the Urban Planning Law of Armenia, according to which territorial planning and any other urban planning activities must be carried out in compliance with the requirements of environmental protection and environmental safety, in compliance with the requirements for the preservation of cultural heritage sites and specially protected natural areas. The field of urban planning is regulated by the Law of the RA «On Urban Planning», which stipulates the three-level classification of urban planning program documents subject to mandatory development according to national, regional and local levels[2].

Many issues related to natural and cultural landscapes are fixed by the fundamental legislation in force in Armenia. In particular, the principles of using natural resources in Armenia are regulated by the «Land Code», «Water Code», «Forest Code», other laws and legal acts.

The above protected components play a role in the territorial planning of Armenia. Thus, the environmental justification in territorial planning includes an assessment of the possibility of developing the planned activity in a particular area of the territory, taking into account:

1. environmental quality standards;
2. the existing system of restrictions on nature use;
3. the predicted state of the environment in case of planned discharges, emissions and production wastes and other types of negative impact.

Within the framework of the implementation of spatial planning functions, the complete process of landscape planning is important. Landscape planning in Europe is designed to

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[1] http://www.env.am/orensdrutyun/orenqner
[2] https://www.arlis.am/documentview.aspx?docid=109142

significantly assist in solving these problems. By ratifying the European Landscape Convention, the Republic of Armenia undertook the obligation to implement the process of protection, management and planning of natural and anthropogenic landscapes[1]. The implementation of the developed principles of the national landscape policy of the Armenia aims to ensure sustainable development based on balanced and harmonious interactions between the needs of the society, economic activity and the environment. Armenia, being a land-scarce country, has a strong demand for full and effective use of the territory, which will ensure the social and economic sustainable development of the society. Effective use of the territory and balanced development can be realized by using the landscape planning tool, which allows to accurately assess the natural resource potential and determine the target directions of socio-economic development in harmony with nature.

In the article, we considered the example of the «Shikahogh» State Reserve. «Shikahogh» State Reserve was established in 1958 by the decision N P-341 of the Council of Ministers of the Armenian SSR dated 13.09.1958 to protect the flora and natural reproduction. It is located in the south-eastern part of the Republic, in the Kapan region of the RA Syunik marz and currently occupies an area of 12137,075 ha[2].

The actual use of the area should be taken into account when submitting proposals on the provision and management of the boundaries and zoning, biodiversity conservation, use of natural, cultural and land resources of «Shikahogh» State Reserve.

The protection regime of «Shikahogh» State Reserve is defined by Article 16 of the RA Law on Specially Protected Areas, and its use is regulated by Article 26[3].

Field studies in the area of «Shikahogh» State Reserve, satellite image decoding, meetings with the management of the reserve and the administrative officials of the adjacent settlements showed that in some precincts the protection regime of the reserve is violated for reasonable reasons and the use of the area is carried out in ways not permitted by law. This is due to the military-political and socio-economic situation in the region.

«Shikahogh» State Reserve borders the RA state border in the south-eastern part. The RA Law on State Border defines the border regime (Articles 20, 21, 22 and 23). In order to ensure proper order at the state border, the Government of the RA, in accordance with this Law and other legal acts of the RA, shall establish a border regime, which regulates the entry, temporary stay, residence, transfer and other activities of RA citizens and other persons (Article 20). Article 21 of this law defines the border zone and the border layer. The border zone extends from the RA state border to the depth of the RA territory, up to five kilometers wide. The boundary layer is a part of the border zone adjacent to the state border or the state border when crossing the water area on the shores of the border waters, up to one kilometer wide. In accordance with

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[1] http://www.parliament.am/library/EX/17.pdf
[2] https://www.arlis.am/DocumentView.aspx?DocID=27649
[3] https://www.arlis.am/DocumentView.aspx?DocID=29624

this Article, the boundaries of the border zone and the border layer are determined and changed by the Government of the RA (map 1).

Land use of the "Shikahogh" State Reserve

Legend

State border		Historical and cultural object
Settlement		Summer pasture residence
Interstate road		Shikahogh State Reserve
Unpaved road		Buffer zone
Pathway		Summer pasture
River		State boundary line - 1 km
Tributary		State boundary zone - 5 km (including state boundary line)
Mountain peak		
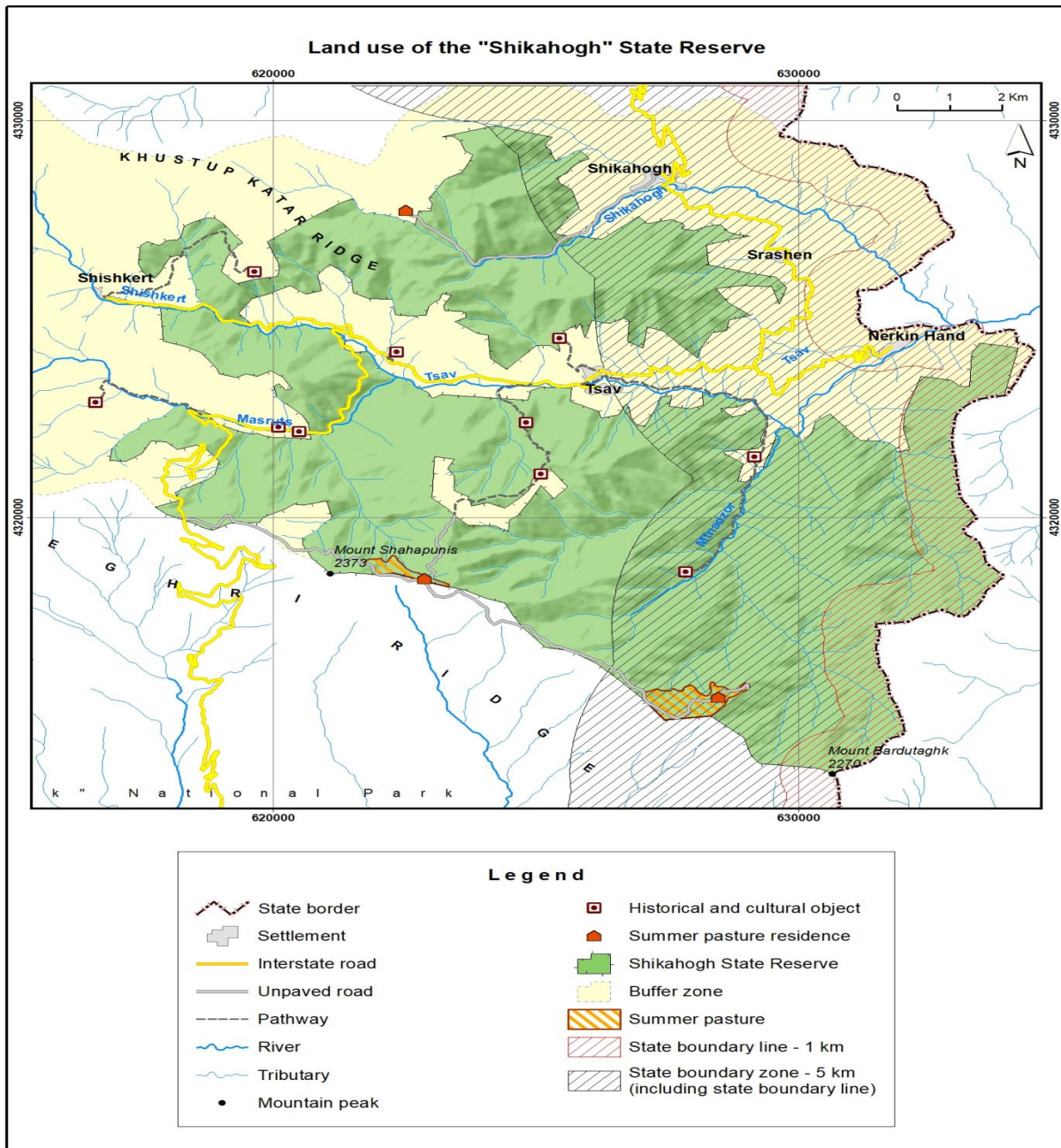
Map 1. *Anthropogenic conflicts caused by contemporary land use in «Shikahogh» State Reserve (author: N. Harutyunyan)*

The contradiction between the border regime defined by the RA Law on State Border and the protection regime of the state reserve defined by the RA Law on SPAS is obvious.

149

Local roads pass through the territory of «Shikahogh State Reserve, which are used by the residents of the adjacent Shikahogh, Srashen, Tsav and Shishkert settlements. The owners of the agricultural lands of Tsav village, which is considered to be an enclave in the territory of Shikahogh State Reserve, have to go through the territory of the reserve. The villagers of Shikahogh pass through the area of «Shikahogh» State Reserve because they have no alternative way to reach their mountain pastures. Due to severe pasture constraints, livestock (mostly cattle) from the adjacent areas of «Shikahogh» State Reserve penetrate the lower parts of the reserve and the highlands are used as summer pastures. Violations of the reserve regime by herders are often due to ignorance of borders and lack of borders. The rest of the pavilion has been built near the waterfall on the Masruts tributary on the right bank of the Tsav River, which also contradicts the reserve's regulations.

Studies have shown that the boundaries of «Shikahogh» State Reserve need to be clarified and scientifically substantiated.

According to Government Decision N 1401-N of September 7, 2006, the area of Shikahogh State Reserve is 12137,075 ha[1]. It is completely located within the administrative boundaries of Shikahogh, Srashen, Tsav and Nerkin Hand settlements of Kapan enlarged community. When overlaying the administrative boundaries of the settlements and the area of the reserve, it turns out that there are inconsistencies: in some places the boundaries of the reserve are outside the administrative boundaries and vice versa, while their boundaries must coincide. Analyzing the land demarcation map of the administrative areas of the settlements, the property subjects and the map of the boundaries of the reserve adopted by the relevant government decision, we can state that there are environmental lands in the land fund map, which are not included in the boundaries of the reserve, and vice versa, there are both community and state-owned agricultural lands, as well as state-owned forest lands, and there are no overlaps with private lands (map 2). Special attention should be paid to the administrative area of Shikahogh settlement, an area of 273 ha located 4.5 to 5 km south-east of the village, but there is no SPA in this area. Based on the land fund maps, the areas of ecological lands within the administrative boundaries of each settlement were calculated and the following picture was obtained: in the administrative boundary of Shikahogh settlement it is 1315.506 ha (without 273 ha), in Srashen – 1186.89 ha, in Tsav – 3963.801 ha and 5545.145 ha in Nerkin Hand (without the lands of «Plane Grove» SS). A total of 12011.342 ha of environmental land is obtained, which is 125.733 ha less than mentioned in the government decision (12137,075 ha).

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[1] https://www.arlis.am/DocumentView.aspx?DocID=27649
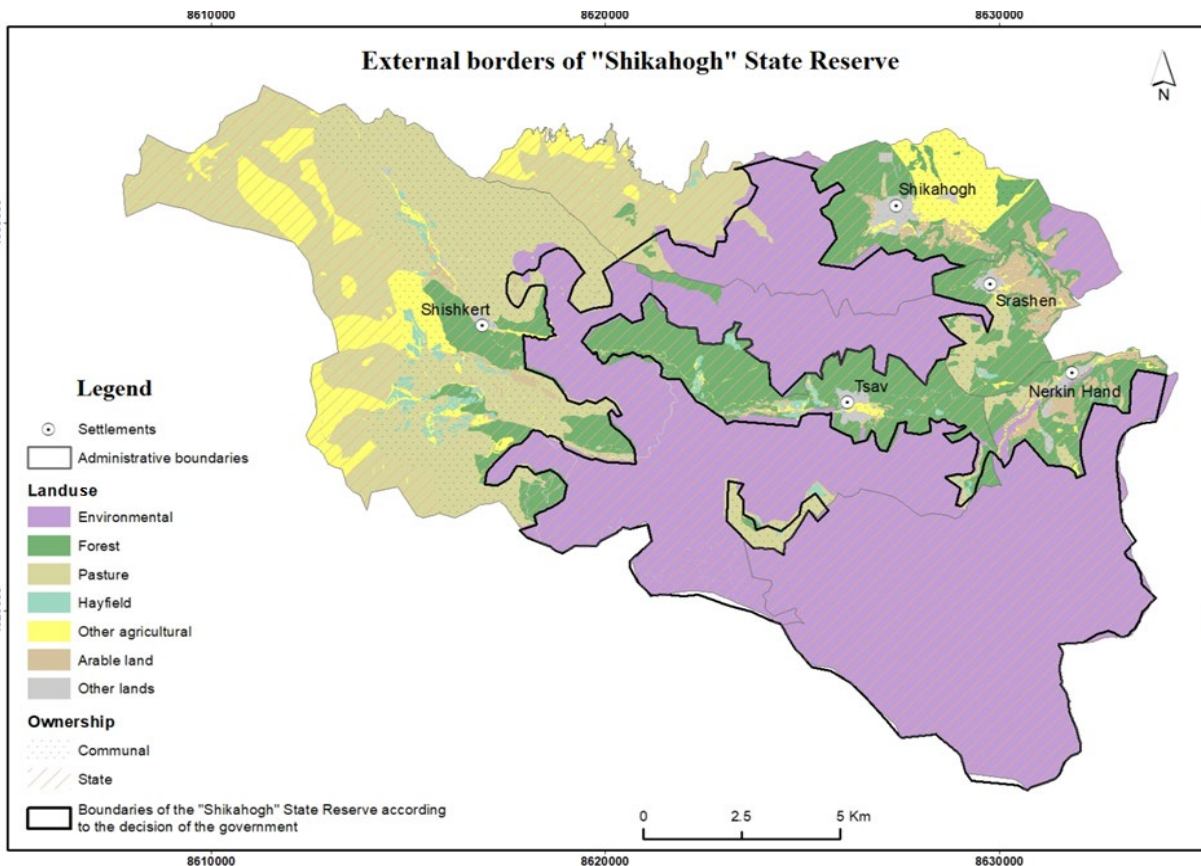
Map 2. *Analysis of external border of «Shikahogh» State Reserve (author: N. Harutyunyan)*

Conclusions. Thus, from the analysis, can be concluded that the concept of interconnectedness of landscape and socio-economic territorial strategic planning is of special importance in the development of social and ecological systems of RA. Based on the above descriptions and assessment of planning systems, key findings have been identified for the further development of Armenia's spatial planning system in relation to protected components and uses:

- Consolidation of the concept of protected components in the territorial and environmental planning of the RA.
- Uniform and universal application of the system of protected components and types of use at all levels of territorial planning.
- Development of an independent «Environmental Protection Plan» as a prerequisite for taking into account environmental requirements in territorial planning.
- The contribution of territorial planning to the coordination of various user interests and the prevention of conflicts between them.
- Ensuring the safety of protected components in territorial planning with the help of «protection zones».

- Providing an information base on important protected components and uses for the entire territory of the country.
- The use of uniform symbols in planning maps.
- Necessity of applying landscape planning methodology in spatial planning processes.

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1. Gormley Á., Pollard S., Rocks S., Guidelines for Environmental Risk Assessment and Management. Cranfield University. 2011. 85p. (In English)
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NAREK HARUTYUNYAN
Doctor of Geography, Associate Professor,
Yerevan State University
VARDITER ANTONYAN
Master's degree of Geography
Yerevan State University

VULNERABILITY OF AGRICULTURE IN ARMENIA DUE TO CLIMATE CHANGE

Keywords: *climate change, agricultural vulnerability, territorial structures, crop yields, soil degradation*

The scientific article is devoted to expose the possible impact of climate change on agriculture, as one of the most important sectors of the Republic of Armenia, to find out the degree of vulnerability of agriculture and the possible damages in Armenia caused by the impact of climate change (CC). Climate changes have an impact on the organizational system of the agriculture, and its sectorial and territorial structures as well.

Republic of Armenia being a mountainous country, the area stands out for its great difference in absolute heights and variety of natural conditions. Climatic changes are more

pronounced in mountainous regions, therefore the resulting consequences are more prominent. The assessment of the vulnerability of agriculture in RA and the development of appropriate preventive measures can serve as an example for other mountainous areas.

The article presents possible changes in agro-climatic resources and the conditions of organizational system of the agriculture of RA in the context of global climate change. According to the predicted scenarios of RA climate change, the possible risks and opportunities in the region's agriculture field are given.

Introduction. Armenia is a mountainous country covering 29,743 sq km, with a population of about 3 million. The climate is continental with hot summers and cold winters. Agriculture is a vital sector, contributing 18% to the country's GDP.

The 4th national report on climate change used the METRAS model to estimate temperature and precipitation trends in Armenia based on the RCP8.5 scenario. During 1961-1990, the average annual temperature in the Ararat valley, Tavush, and Syunik valleys was 10-14°C, but it may reach 16-18°C during 2071-2100. Summers may have an average temperature of 27°C in these regions[1].

Climate forecasting in Armenia was carried out using the CCSM4 model according to the RCP8.5 and RCP6.0 scenarios, the forecasts were developed until 2100. Starting from the middle of the 21st century (2041-2100), it is likely that the average annual temperature of Armenia in 2100 will be 10.2°C[2]

In Armenia, the impacts of climate change are already visible, and they are likely to become more severe in the future, thus its study is very important.

Literature review. As climate change research deepens, there is increased focus on the vulnerability of various sectors. Agriculture is vulnerable to climate change therefore its scientific assessment is of great importance for rational agricultural management and adaptation.

The idea of vulnerability research was first proposed by Timmerman, and it has been applied to wide range of research areas, including water resource conditions, environmental assessment, land-use change, etc. Actually, as it is mentioned in the future climate projections, declines in agricultural productivity and increases in food insecurity are due to changes in the duration and intensity of extreme heat waves, as well as changes in the distribution of rainfall, water availability and the frequency of droughts[3].

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[1] See Forth National Communication on Climate Change. Yerevan. UNDP Armenia, 2020. 213 p., page 138 (In Armenian).

[2] See Third National Communication on Climate Change. Yerevan. UNDP Armenia, 2015. 190 p., page 66 (In Armenian).

[2] See Timmerman, P., Vulnerability, Resilience and the Collapse of Society. In A Review of Models and Possible Climatic Applications;Institute for Environmental Studies, University of Toronto: Toronto, Canada, 1981, page 21.

In Armenia, numerous researches related to the field have also been implemented. According to the assessment carried out by the World Bank, Armenia is the fourth most sensitive country in the Europe and Central Asia region in terms of climate change, where the risk of natural disasters caused by climate change is the highest, which negatively affect the standard of living, economic and social stability[1].

Avetisyan S.S. studied the causes of climate change and its socio-economic consequences, referring to the prevention of these consequences and the development of adaptation policies in his work "Socio-economic consequences of climate change and adaptation measures in Armenia".

According to that study, the main negative impact on agriculture will be droughts that are repeated frequently and cover larger and larger areas in relation to projected climate change. Simooms that coincide in time with droughts can be further aggravated the situation (especially southerly winds of 5-10 m/s). This phenomenon is regularly observed in Syunik, VayotsDzor, Armavir, Ararat and Aragatsotn regions during the last ten years[2].

According to the same study, due to climate change soil moisture in Armenia will decrease by 10-30%, moisture availability of various agricultural crops by 7-13%, and soil water deficit will increase by 25-30%. All this will affect the waterless farming of the piedmont and lower mountain zone[3].

The Ministry of Environment and the Climate Change Information Center in the First and Second National Communication on Climate Change Republic of Armenia presented a fairly comprehensive analysis of the impact of climate change on economic activity in the considered periods, making forecasts and developing development scenarios as well[4].

The impact of climate change on RA agriculture and water resources is presented in the World Bank's "Climate Change and Agriculture" Country Report scientific research. As well as the development of possible adaptation measures for the sector was carried out. It is presented in the study that as a result of climate change, the yield of agricultural crops is expected to decline, unless adaptation measures are taken.According to the conducted study, by 2030, in the absence of adaptation measures, the yield of the main agricultural crops will decrease by 8-14 percent (cereal crops - 9-13, vegetables - 7-14, potatoes - 8-10 and fruits - 5-8 percent). It is

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[1] See National Adaptation Plan (NAP): Mid-term and long-term adaptation planning in Armenia" UNDP-KHC project. Assessment of the vulnerability of the agricultural sector to climate change and adaptation to climate change in Armenia Agribusiness and Rural Development Center 2019, page 43(In Armenian).

[2] See Avetisyan S.S. and others "Socio-economic consequences of climate change and adaptation measures in Armenia", Yerevan, Economist 2015, 90 p. ("Amberd" series), page 22 (In Armenian).

[3] See Avetisyan S.S. and others, Socio-economic consequences of climate change and adaptation measures in Armenia, Yerevan, Economist 2015, 90 p. ("Amberd" series), page 23 (In Armenian).

[4] See First National Communication on Climate Change. Yerevan. UNDP Armenia, 1998. 213 p., page 11 (In Armenian).

forecasted that the area and yield of pastures will be reduced by 4-10 percent, including the most valuable pastures in the sub-alpine and alpine zone by 19-22 percent[1].

Thereby, we can say that this and other similar studies provide an opportunity not only to uncover the existing threats to the agricultural sector, but also to develop a series of appropriate measures and ways that will enable to mitigate the created situation and rationally use the opportunities.

Research methodology. In the article was used the Risk-Hazard method proposed by Louis Teodor, to conduct the research. The application of the method made it possible to identify possible dangers that may affect the agriculture of the Republic of Armenia. These include natural hazards such as floods, droughts, pests, diseases, etc[2].

With the help of the Risk-Hazard method, it was possible to determine the extent of the impact on agriculture as well. It allowed to understand of how often the hazard occurs and how much its impact is on agricultural production and livelihoods.

By using the method, it was possible to determine the vulnerability of RA agriculture to the identified threats within the framework of the study. This includes identifying the main factors that make agriculture more or less vulnerable to the hazard.

The method enable to combine hazard exposure and vulnerability assessment to reveal the risks associated with each hazard. This includes assessing the likelihood of the hazard occurring and the potential consequences for agriculture.

Using the method allowed developing appropriate ways to reduce vulnerability and increase flexibility to identified hazards.

During the study of the vulnerability of agriculture under the influence of climate change was used Analytical-statistical method. In this article, the method allowed to study the vulnerability of agriculture to climate change by analyzing the data of various factors related to the organization of agriculture, including yield, soil characteristics, temperature, precipitation and other climatic variables. Using statistical models, it was possible to identify patterns and trends in the data that may illumine on the relationship between climate change and agricultural vulnerability.

Statistical models were used to analyze historical climate data and determine how changes in temperature and precipitation affected yields in different regions, analyzed future climate scenarios, and predicted how changes in temperature, precipitation, and other variables might affect yields in different regions in the future.

Generally, the analytical-statistical method is a powerful tool for the study of agricultural vulnerability under the influence of climate change. It enabled the identification of the main

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[1] See Republic of Armenia, Climate Change and Agriculture, Country Report. 2012, 32 pages, page 17 (In Armenian).

[2] See: Theodore L., Dupont R. R., Environmental Health and Hazard Risk Assessment, New York, CRC Press, 2012, 619 p. Page 67-72, page 382-392.

factors of vulnerability, the quantification of potential climate change impacts, and the development of adaptation and mitigation pathways.

Analysis. Below is the vulnerability of agriculture due to CC according to Louis Theodor's Hazard-Risk method.

1.Identifying potential hazards. Basically, climate change causes certain dangers and risks, which express the possibility of suffering losses. In this case, an attempt is made to assess the dangers and risks expressed in monetary and physical indicators (yield decline).

Since agriculture plays huge role in the economic and social life of Armenia, it's necessary to find out how climate change affects the yields of the main crops.

The article analyzed the yield indicators of some crops under the influence of CC.

Below is presented the gross agricultural product of RA for 2005-2020.
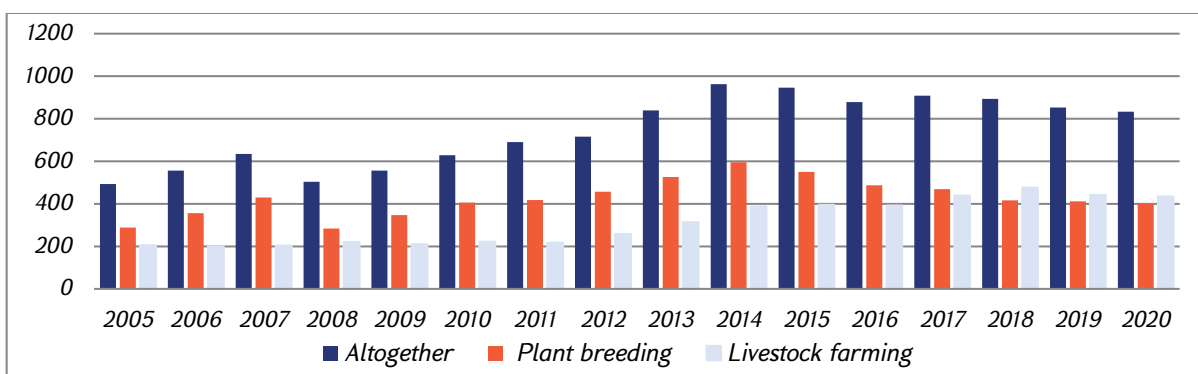
Figure 1. **Gross agricultural output 2005-2020 (in current prices, bln AMD)[1]**
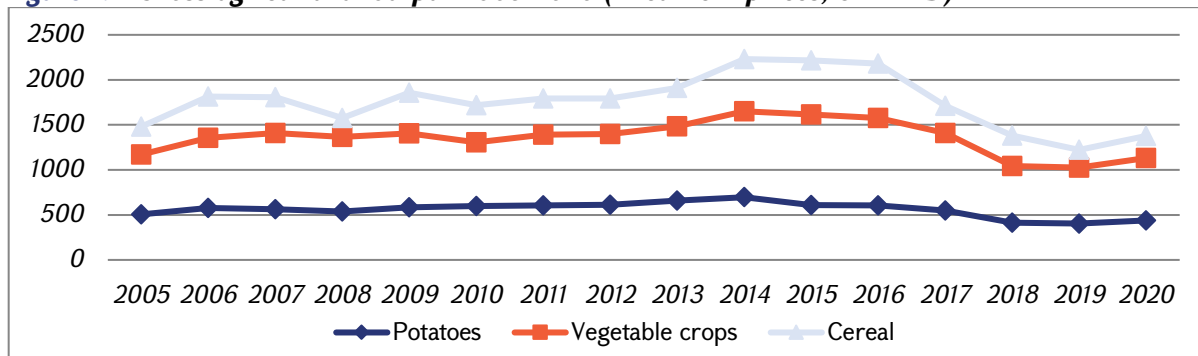
Figure 2. **Gross harvest of grain crops, potatoes and vegetable crops in 2005-2020 (thousand tons)[2]**

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[1] See https://armstat.am/file/article/armenia_14_8.pdf
[2] See https://armstat.am/file/article/marzer_2021_12.pdf
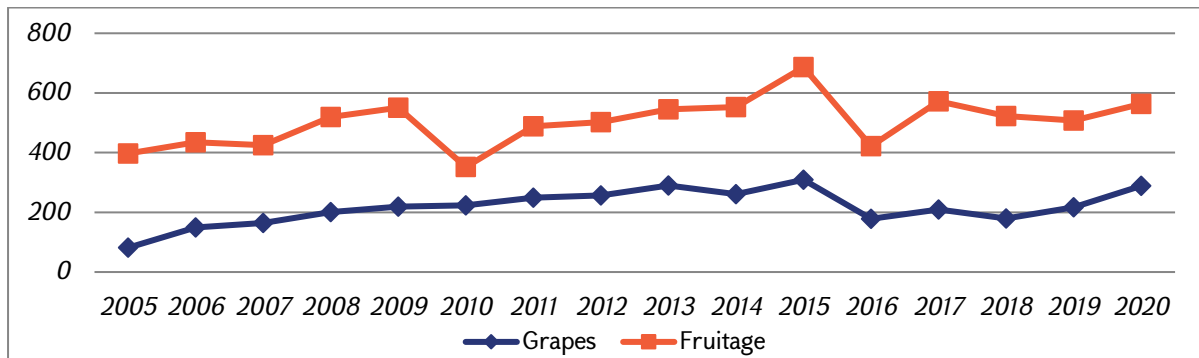
Figure 3. Gross harvest of grape and fruit plantations 2005-2020 (thousand tons)[1]

Figure's data showed that during the last years, the yield of cereals, vegetable crops and potatoes decreased, while the grape yield increased. Cereals and potatoes are distributed mainly at heights above 1500: Shirak field, Lorva plateau, Sevan basin. Unlike the Ararat valley, the artificial irrigation system in the listed zones is poorly developed, so increasing temperature and the lack of atmospheric precipitation, the increase in drought phenomena as well, the yield of crops has decreased. It's worth mentioning that grapes are a heat-loving crop and the increase in temperature, under the conditions of providing the necessary moisture due to artificial irrigation, has a positive effect on the yield of the crop.

The increase of dangerous meteorological phenomena poses a great threat to RA agriculture.According to the 3rd national Communication of RA CC, during 1975-2016, the annual number of dangerous meteorological phenomena in Armenia increased by about 40 cases or by 23.5% (average: 168 cases per year). By drought indices, during 2000-2017, droughts increased by 33 cases or 38% compared to the average of 1975-2016 (87)[2].

Table 1

The area damaged by natural disasters and the damage caused in RA agricultural branches[3]

Years	Damaged area, thousand hectare	Damage caused, bln AMD
1995	86,959	17,00
1996	36,654	12,59
1997	129,819	26,53
1998	63,411	14,95
1999	43,026	11,33
2000	-	59,78
2001	83,500	23,94
2002	74,546	15,14
2003	48,667	82,63

[1] See https://armstat.am/file/article/marz_12_11.pdf

[2] See Forth National Communication on Climate Change. Yerevan. UNDP Armenia, 2020.- 213p. page 88(In Armenian)

[3] See Avetisyan S.S. and others "Socio-economic consequences of climate change and adaptation measures in Armenia", Yerevan, Economist 2015, 90 pages ("Amberd" series), page 35 (In Armenian).

2009	35,368	11,89
2010	17,474	35,50
2011	4,061	0,91
2012	2,219	0,49
2013	11,101	23,92

Table 1 shows that hydrometeorological phenomena can cause great financial losses to the RA economy also threaten the issue of food security. According to the data reported by the Ministry of Economy of the Republic of Armenia, the damages caused to agriculture in the period of 2013-2019 as a result of natural disasters amounted to more than 110 billion AMD[1].

<div align="right">Table 2</div>

2040-2050 Impact of CC on Crop Yields in Average Scenario Without Considering Adaptation and Irrigation Water Limitation[2]

N	Crop	Cultivation zones		
		low-set	*Medium height*	*Mountainous*
1	Irrigable lands			
1.1	Apricot	-5%	-5%	-5%
1.2	Grapes	-7%	-5%	-5%
1.3	Potato	-12%	-9%	-5%
1.4	Wheat	-6%	1%	38%
2	Arid lands			
2.1	Apricot	-28%	-7%	-5%
2.2	Grapes	-24%	-12%	-1%
2.3	Potato	-14%	-14%	-8%
2.4	Wheat	-8%	1%	38%

Table 2 calculates the yield indicators of some crops under the average scenario of CC under the conditions of irrigated and arid agriculture. It's clear that crop yields will decrease in the future in all zones, especially in low-lying areas.

In 2030 a decline in yields of major agricultural crops by 8-14% is predicted (cereals by 9-13%, vegetables by 7-14%, potatoes by 8-10% and fruits by 5-8%)[3].

2. Possible impacts Identification (positive, negative) and risk analysis.

2.1 Potential negative effects

Temperature and frequency changes. CC may change temperature and precipitation patterns, which will affect crop growth and yield performance. These changes can also cause extreme weather events such as drought, sleet, hail, torrential rain, and more.

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[1] See https://mineconomy.am/news/1885

[2] See Avetisyan S.S. and others "Socio-economic consequences of climate change and adaptation measures in Armenia", Yerevan, Economist 2015, 90 p. ("Amberd" series), page 22 (In Armenian).

[3] See Avetisyan S.S. and others, Social-economic consequences of climate change and adaptation measures in Armenia, Yerevan, Economist 2015, 90 p. ("Amberd" series), page 23(In Armenian).

*Scarcity of water.*Armenia is already a water-scarce country, and climate change is expected to exacerbate this problem. As temperatures rise, the rate of evaporation increases, resulting in greater soil and plant water loss. This can cause water scarcity, which will affect the quantity and quality of crops.

Increase in pests and diseases. Changes in temperature and humidity can cause the spread of pests and diseases. This will prevent low yields, reduced quality and increased costs for farmers.

Soil erosion. Climate change may increase the frequency of extreme weather events, such as heavy rains and storms, which can exacerbate soil erosion. This will cause the loss of fertile land, reducing the productivity of agricultural land.

Crop compliance changes. As temperature and precipitation patterns change, some crops may no longer be suitable for cultivation in certain areas of Armenia. This will cause reduced agricultural productivity and increased risk of food insecurity.

The possible negative consequences listed above have already manifested themselves in the agricultural sector of Armenia, causing natural disasters, which in turn cause large monetary losses, which amounted to 446 billion AMD for 1995-2019. (see table 1, reference 15).

2.2 Possible positive effects. Extending the growing season. CC implies an increase in temperature, which will lead to the extension of the vegetation period, which enable to increase the cultivation areas of heat-loving crops at the expense of high-altitude zones.

Multiple land use. Temperature increasing will enable multiple crops to be harvested from the same area, especially pronounced in the Ararat valley and valley regions.

Cultivation of the most thermophilic crops. rising temperature will enable cultivation citrus crops, olive trees and other heat-loving crops in RA.

3. Vulnerability assessment. As a result of CC, agriculture becomes vulnerable, especially in mountainous regions. Considering the mountainous nature of the RA surface, any manifestation of CP becomes more pronounced.

According to Spanish researcher Tomas Felman, vulnerability has the following picture:
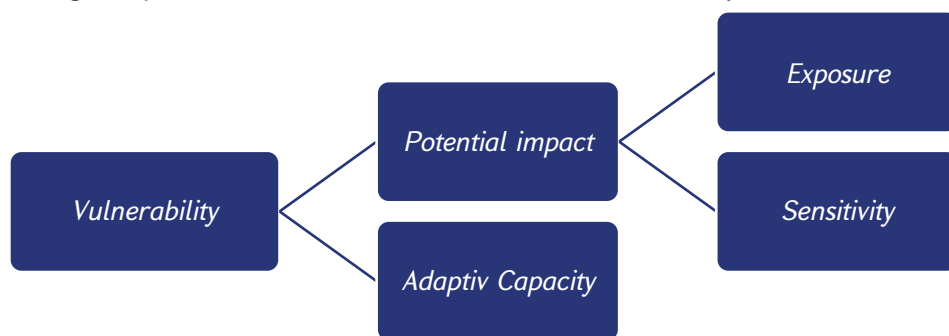

Figure 4. Vulnerability and its components[1]

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[1] See The assessment of climate change-related vulnerability in the agricultural sector: reviewing conceptual frameworks- *ThomasFellmann: Department of Economics, Pablo de Olavide University, Seville, Spainpg 39*

According to the diagram, the extent of vulnerability is determined by the combination of exposure and adaptability.The effects of climate change on RA agriculture are diverse and multifaceted, also, the possibilities of adaptation are poorly developed.Due to climate change, the vulnerability of agriculture is most evident in the low-lying and medium-altitude zones of the RA.The riskiness of agriculture also increases due to the low level of land security, large losses of irrigation water (about 80%) and insufficient condition and operation of risk prevention systems.

Armavir, Kotayk and VayotsDzor regions are the most vulnerable regarding natural disasters.Temperature-related impacts will be particularly severe in the Ararat valley, as the temperature in that area is already relatively high. The Ararat Valley (Ararat, Armavir and Aragatsotn regions) is particularly vulnerable to late spring frosts, Shirak, Lori, Tavush and VayotsDzor to hail and flooding.The hot wind is the most frequent phenomenon in Syunik, VayotsDzor, Armavir, Ararat and Aragatsotn regions.Compared to other regions, the Ararat Valley is better protected against drought, due to the fact that most of the agricultural land is irrigated[1].

Prolonged droughts due to climate change pose serious risks to livestock.According to the analysis of climate change scenarios, a reduction of pastures and grasslands by 4-10% will be recorded in Armenia, including a reduction of alpine and sub-alpine pastures by 19-22%.A decrease in grassland productivity of 7-10% is expected, which will cause reduced forage production.[2]Rising temperatures and variable rainfall will increase pest and disease pressure in the livestock sector, causing frequent and severe disease outbreaks.

4 Possible solutions. When talking about the need to ensure stability in the field of agriculture, it should remember that, it also ensures food security. Variety solutions are needed to mitigate the impacts of climate change on agriculture, including:

Improving water resource management. The Armenian government should invest in water infrastructure to increase water efficiency, building new reservoirs, repairing irrigation systems, and developing water-saving technologies (drip irrigation).

Using climate-resistant crops. The Armenian government should promote the development of crops that are more resilient to climate change.

Supporting farmers. Smallholder farmers are particularly vulnerable to the effects of climate change. The Armenian government should support farmers, such as access to credit, insurance and training.

Early warning systems. The Armenian government can develop early warning systems for extreme weather events to help farmers prepare for and cope with these events.

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[1] See "National Adaptation Plan (NAP): Medium-term and long-term adaptation planning in Armenia" UNDP-CRC program, Yerevan 2020, page 8 (In Armenian).

[2] See Forth National Communication on Climate Change. Yerevan. UNDP Armenia, 2020. 213 p., page 107 (In Armenian).

Addition to above, State grant programs are crucial for lowering risks in agriculture. In 2022, the RA government implemented a number of grant programs aimed at reducing risk in the agricultural sector. Including. "Interest rate subsidy program for loans provided for the implementation of modern irrigation systems" (72,925.7 thousand AMD) and "Interest rate subsidy for loans provided for the implementation of hail protection networks in the agriculture of the Republic of Armenia" (20,884.4 thousand AMD)[1].

Conclusion. Thus, future climate forecasts show that Armenia will be subject to an increase in average air temperature, precipitation, river flow, and snow cover reduction.

Obviously, as a result of CC additional demand for irrigation water will arise. Taking into account the height, surface and other indicators of the irrigation zones, 395 million m^3 of water will be required for sufficient water supply. Water vulnerability supply in upland zones of arid agricultural regions will increase by 30-40%.

Until 2030 yields of major agricultural crops will decrease by 8–14% in the absence of adaptation measures. Climate changes are expected to have three main impacts on crops in Armenia:

1. The cultivation area of each crop will shift upwards by 2030. 100 m above sea level, and by 2100 - 200-400 m above sea level.
2. The combination of higher temperatures, higher evaporation and lower precipitation levels will result in reduced productivity of many crops.
3. Changing weather will damage crops and agricultural land.

It is predicted that pasture area and yield will be reduced by 4-10%. Due to the shift of climatic zones, the areas of the most valuable alpine and sub-alpine pastures will be reduced by 19% and 22%, respectively. The area of semi-desert (17%) and meadow-steppe (23%) relatively low productive pastures will increase. Due to decrease in atmospheric precipitation and increase in air temperature, natural springs will dry up, as a result of which it will be difficult to water irrigation and balanced grazing in pasture areas.

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ERICH HEUMÜLLER
Baden-Wuerttemberg Cooperative State University, Center for Digital Transformation, Stuttgart, Germany
NEBOJŠA RADOJEVIĆ
Ph.D., IU International University of Applied Sciences, Dresden, Germany
SEBASTIAN RICHTER
Baden-Wuerttemberg Cooperative State University, Stuttgart, Germany

DIGITAL TRANSFORMATION OF AN ECONOMY: TRANSFERRING THE CONCEPT OF DIGITAL FITNESS

Keywords: *digital fitness, digital transformation, digital economy*

In the era of digital transformation, economies strive to be digitally mature and attractive for companies and employees. This endeavor is challenging since goals and objectives are vague: Digital transformation is a process of evolutionary change with increasing digitalization at its heart, yet this process has no clearly defined target state. Consequently, it is difficult to steer with an eye on the goals within the change process. Digital maturity models aim at providing guidance but typically focus on individual organizations, suggest a linear development, and neglect idiosyncratic development paths. In addition, they design an optimal end state, which is contradictory given that digital transformation as an evolutionary process has no ultimate target or end. To address this challenge, we transfer a model of digital fitness from the organizational to the economic level, which allows the determination of an appropriate level of digitalization to meet present and future stakeholders' expectations. As a result of an argumentative-deductive process, we argue that the digital transformation of an economy is a process that considers social and technological elements, and that is defined relative to this economy's current digital development and usage of information and communication technologies.

Introduction. The digital transformation of the economy and society with an unprecedented set of possibilities and innovations has been seen as a major force of development for a couple of decades[1]. The objective of a plethora of organizations is both to

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[1] Brynjolfsson, E., McAfee, A. (2014), *The Second Machine Age. Wie Die Nächste Digitale Revolution Unser Aller Leben Verändern Wird*, Börsenmedien AG, Kulmbach.; Yoo, Y., Boland, R.J., Lyytinen, K., Majchrzak, A. (2012), Organizing for innovation in the digitized world, *Organization Science*, Vol. 23 No. 5, pp. 1398–1408.
Yoo, Y., Henfridsson, O., Lyytinen, K. (2010), The new organizing logic of digital innovation: An agenda for information systems research, *Information Systems Research*, Vol. 21 No. 4, pp. 724–735.

benefit from this development and to avoid their own Kodak moment[1]. Start-ups engage as creative destructors[2] and disrupt incumbent placeholders[3]. Societies and states as open social systems try to lay ground so that their organizations can keep the pace of development. This digital transformation is an ongoing process of digitalization and technological and social renewal.

A society's organizations develop interdependently, bringing the metaphor of an ecosystem in mind[4]. To predict the chance of survival of species in biological ecosystems, the concept of fitness is established[5]. Following this analogy, the concept of digital fitness as the target state of digital transformation of organizations has been introduced to the scientific community[6]. Therefore, we raise the question of whether the organization-level concept of digital fitness is helpful for the digital transformation endeavor of an economy.

The remainder of this contribution is organized as follows. In a state-of-the-art analysis, we briefly discuss the concepts of digital transformation and digital fitness. The research methodology section explains our argumentative-deductive method, followed by a conceptualization of digital fitness as an explanation of economic development. We conclude with several preliminary recommendations for action to foster the digital transformation of a given economy.

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[5] e.g. Barker, J.S.F. (Stuart). (2009), Defining Fitness in Natural and Domesticated Populations, in Werf, J. van der, Graser, H.-U., Frankham, R. and Gondro, C. (Eds.), *Adaptation and Fitness in Animal Populations. Evolutionary and Breeding Perspectives on Genetic Resource Management*, Springer, Amsterdam, pp. 3–14; Endler, J.A. (1986), *Natural Selection in the Wild*, Princeton University Press, Princeton.; Orr, H.A. (2009), Fitness and Its Role in Evolutionary Genetics, *Nature Reviews*, Vol. 10 No. 8, pp. 531–539.

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Literature Review. Digital Transformation (DT) is an intensively researched phenomenon that is conceptualized very differently[1]. Typically, DT is considered to be a construct observable at the organizational level[2]. Several scholars share the mental model of DT as a process: Vial (2019) considers DT as a process of significant change due to the impacts of information, computing, communication, and connectivity technologies. This process aims to improve the transformed entity (e.g., an organization; ibid). Morakanyane et al. (2017) also emphasize the processual character and argue that the DT "leverages digital capabilities and technologies to enable business models, operational processes and customer experiences to create value" (p. 437).

Most definitions agree that emerging digital technologies enable new solution patterns for both well-known and emerging problems. By adopting these solution patterns, social systems such as teams, organizations, and even whole societies substantially change[3]. Digital technologies hence change the way we communicate and coordinate, as well as how we perceive reality and build business models. This outstanding importance of digital technologies results in the phenomenon that – both in science and professional practice – the term "digital" is excessively used as "digital x" in the sense of "digital everything"[4].

"Digital" is often discussed from two distinct viewpoints: the digitization and the digitalization view[5]. Whereas the digitization view refers to converting an analog information-

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[4] cf. Bayer, A., Grover, V., Lyytinen, K.J., Woerner, S.,Gupta, A. (2023), Digital ' x '— Charting a Path for Digital-Themed Research, *Information Systems Research*, Vol. forthcoming, pp. 1–24.
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Bockshecker, A., Hackstein, S., Baumöl, U. (2018), Systematization of the Term Digital Transformation and Its Phenomena From a Socio-Technical Perspective – a Literature Review, *Proceedings of the 26th European Conference on Information Systems (ECIS), Portsmouth, UK, 23.-28.06.*;

carrying object into bitstrings as the language of IT systems[1], the digitalization view arises in a more contextual sense with "digital" transforming the social, organizational, or other social realities[2]. With an analog object being digitized, the resulting digital object is discrete, abstract, and mathematic, and can be manipulated, stored, and transmitted independently of its material realization based on an abstract and unified machine – a computer[3]. To understand "digital" in this sense includes the universal machines interpreting the bitstrings and bringing the digital objects to life[4]. Thus, digitization also covers the physical computing systems responsible for the information processing capabilities of modern organizations[5].

The digitalization view, however, emphasizes the ongoing reorganizations as well as novel social and technological structures[6] that appear because new digital objects with new properties are used to reach new agents' goals or to reach well-known agents' goals more efficiently[7]. The digital transformation, we observe, is a sequence of waves of digitizing and digitalizing with new, typically loosely coupled infrastructural technical systems which create new affordances[8]. Nowadays, such new affordances enable new and unprecedented large-scale collaboration (e.g., open source, innovation platforms) based on sharing standardized digital objects (e.g., e-commerce, digital money). Digital infrastructures enable convergence (device, network, industry, market) and transform tightly coupled IT platforms and their core services[9]. As a

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Saarikko, T.,Westergren, U.H.,Blomquist, T. (2020), Digital transformation: Five recommendations for the digitally conscious firm, *Business Horizons*, Elsevier Ltd, Vol. 63 No. 6, pp. 825–839.

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result, we observe innovative digital objects such as social media, transaction platforms such as Uber or Airbnb, the Internet of Things, and robotics.

Synthesizing the discussed concepts and arguments, we define digital transformation on the societal level as the evolutionary unlocking of latent potentials of digital objects based on growing and developing loosely coupled digital infrastructures.

To recommend a target state for digital transformation, the concept of digital fitness has been developed[1]. This concept was revised[2] and is briefly presented in the following (cf. Figure 1). The idea of the digital fitness model is inspired by a two-sided weight scale. The middle of the graphical representation of the model depicts the actual digitalization potential of an organization. The left side features the expected possibilities of digitalization at present. Thus, the present external expectations of customers, the market, and society are assessed in comparison to the potential of the organization. The right side represents future expectations. The digital fitness of an organization is a concept to evaluate the fit of the digitalization potential with the current expectations of the environment and to evaluate the adaptation capability for future expectations of the environment. Therefore, an organization is digitally fit if it can meet present expectations about the digitalization of its most relevant stakeholders and if it is capable of adapting so that it can meet their future expectations as well.
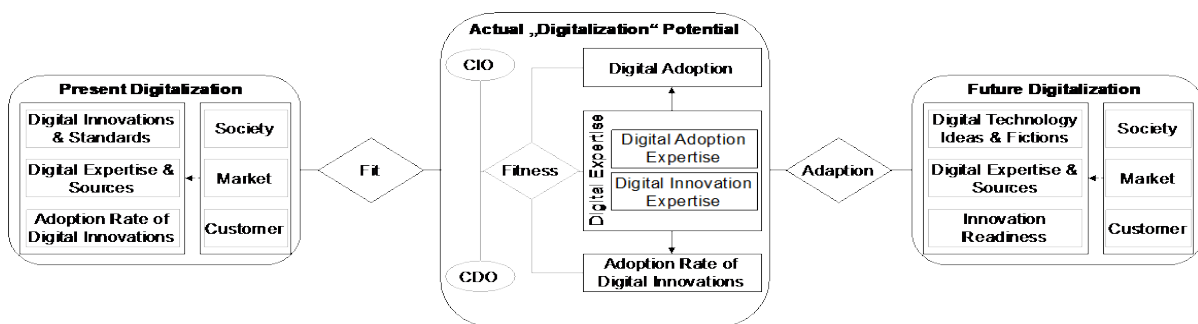
Figure 1. Digital Fitness Model

Digital fitness is determined by digital adoption, digital expertise, and the adoption rate of digital innovations[3]. Digital adoption is the amount and variety of digital technologies adopted by an organization to leverage organizational capabilities for strategic impact (ibid). Digital expertise (DE) is complex and two-parted. On the one hand, it measures the ability to manage

Tilson, D., Lyytinen, K.,Sørensen, C. (2010), Digital infrastructures: The missing IS research agenda, *Information Systems Research*, Vol. 21 No. 4, pp. 748–759.

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the current digitalization infrastructure. Digitalization infrastructure management is traditionally the central task of a CIO[1]. As such, DE reflects the fit with the current expectations of the (external) stakeholders. On the other hand, DE measures the capabilities necessary to handle change. That means that DE describes how adaptable an organization is. This ability to explore and seize future opportunities (dynamic capabilities[2]) is the playing field and responsibility of a chief digital officer (CDO[3]). The adoption rate of digital innovations (ARDI) measures how fast an organization can adopt digital innovations. This rate consists of the time per innovation necessary to be adopted, and the number of innovation projects an organization can handle concurrently. A digital innovation is "a product, process, or business model that is perceived as new, requires some significant changes on the part of adopters, and is embodied in or enabled by IT"[4]. ARDI reflects how adaptive an organization is. To measure this adaptiveness, benchmarks with other companies are sufficient, especially from one's market and adjacent markets.

This model has been developed to support digital transformation managers such as CDOs. The goal for these managers is to meet the idiosyncratic expectations of the stakeholders of their organization. Therefore, the metaphor of the scales is at the heart of the model. We propose that this model is useful to support the digital transformation journey of an economy as well and discuss this in the following.

Research Methodology. Our initial version of the digital fitness model was based on a rather representative literature analysis[5] and an interview study[6]. The digital fitness approach

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[6] cf. Kossowski, J., Lenz, A., Heumüller, E., Richter, S. (2020), Digital Fitness – The Goal of Digital Transformation, *Proceedings of the 25th UK Academy for Information Systems (UKAIS 2020), Virtual Conference, April 29*.

origins in an analogy[1] of biological fitness[2]. In this contribution, we build a further analogy from a single organization and an economic perspective. The usefulness of the digital fitness model from an economy's perspective is analyzed in an argumentative-deductive method[3]. The strength of this creative process lies in the creation of new ideas and insights [4] which fits the aim of the following analysis: to bring in new thoughts and explanations for orientation and creative future theory development[5]. The recommendations for development are proved in the context of the digitalization strategy of Germany.

Analysis. We postulate that all organizations in a given country apply the digital fitness model to track their digital fitness and to guide their digital transformation (DT). Furthermore, we postulate that the statistical office of this country has access to digital fitness measures and that it can aggregate them. The statistical office could then determine the respective digital fitness aggregates for different markets. In this sense, it would be possible to recognize whether a particular market is in fit with the expectations of the customers, or whether the organizations within the market either overemphasize future digitalization endeavors or do not offer enough digitalization capabilities at present time. The central question based on these pieces of information would then be how the policymakers can foster the DT endeavor. Figure *2* depicts different developmental stages for DT of a given country. The first market on the left side of Figure *2* is at a certain point in time in equilibrium and fulfills the expectations of customers. Yet how can policymakers foster the adaptation for future capabilities? Drawing on our discussion of digitization and digitalization above, such a situation calls for further digitization. The goal is to enable organizations to create new digital objects. Therefore, investments in computing infrastructure (e.g., network infrastructure or new or modern physical computing systems) as a prerequisite for software as infrastructure (e.g., blockchain or artificial intelligence platforms) will enable organizations to develop new and meaningful digital objects that provide

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[5] cf. Gregor, S. (2006), The Nature of Theory in Information Systems, *MIS Quarterly*, Vol. 30 No. 3, pp. 611–642.

value. Such investments can be direct in the sense of the state as an infrastructure operator or in the form of super-depreciation models[1].
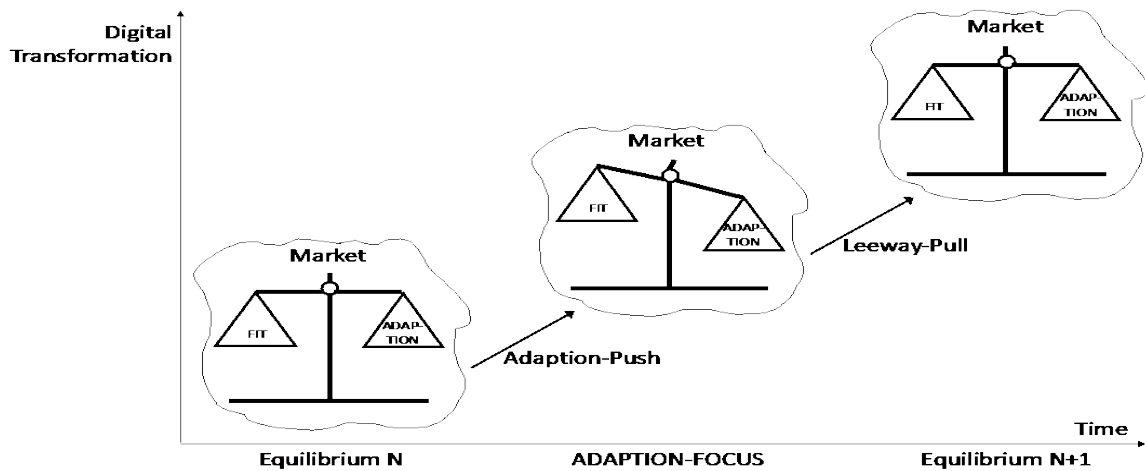
Figure 2. Digital Transformation as the development of markets

Investments in infrastructure do not only mean to develop new infrastructure but also to improve the existing infrastructure for further development. That means to modularize[2] and to emphasize loose coupling[3]. With the improvement of loose infrastructural couplings, new opportunities for digital objects will emerge and can be implemented[4]. Another option for policymakers to enable the exploitation of possibilities of new digital objects is to foster standardization projects. A standard is a collective knowledge that enables the coordination of independent actors[5] and reduces transaction costs[6]. With standards well developed, it is more likely that numerous start-ups will engage in developing new digital objects. A last option to foster development is to pool resources in one market that is well developed. In doing so, organizations from different markets are put under pressure to develop faster and to close the

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[1] cf. Pagano, M.A. & Perry, D. (2008), Financing Infrastructure in the 21st Century City. *Public Works Management & Policy*, 13 (1), 22–38.

[2] cf. Baldwin, C.Y.,Clark, K.B. (2000), *Design Rules: The Power of Modularity*, MIT Press, Boston.

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gap. This phenomenon occurs as customers move between markets and bring their expectations about digitalization capabilities (e.g., customer experience or customer journey) with them[1].

We illustrate the proposed governmental interventions with the digitalization strategy of Germany[2]. One central aspect of the digitalization of Germany is the development of infrastructure[3] which involves a nationwide glass fiber network for the gigabit society, 5G for the fastest mobile communication standard, a nationwide telematics infrastructure as digital healthcare infrastructure, and IT security for critical infrastructure as a central protection task of the state (ibid). In the field of standards, the Government of Germany focuses on ethical aspects of artificial intelligence, yet also on aspects of data economy (legal, institutional, and regulatory; ibid). Furthermore, open access for research databases and open access standards for Internet of Things infrastructures for Smart Cities are targeted (ibid). The German strategy also focuses on one particular market. As the automotive sector in Germany is strong and very important from an economic standpoint, the government pools resources for autonomous and networked driving (ibid). Figure 3 depicts the possible interventions, the rationale therefore, and examples for three intervention categories infrastructure development, standardization, and resource pooling.

Intervention	Infrastructure development	Standardization	Resource pooling (market)
Rationale	Loosely coupled infrastructures enable the development of new and meaningful digital objects.	Standardization lowers transaction costs and coordinates autonomous agents. Standards help to organize business ecosystems and support the spreading of the digital objects.	In funding one special market and establish a new digital normal for customers other markets are out under pressure to adopt.
Example	E.g., artificial intelligence platforms, blockchain infrastructure, healthcare telematics, mobile networking, fast ethernet	E.g., ethics for autonomous algorithms and artificial intelligence, legal, institutional and regulatory standards for data economy, standards for internet of things development	E.g., autonomous and networked driving

Figure 3. Interventions, rationale, and examples for adaption push

When an adaption push within a market occurs, this market is ahead of other markets regarding digitalization. In other words, other markets do not fully fit with the environment (cf. Figure *2*, adaption-focus in the middle). The same applies if the adaption push focuses on infrastructure development. To support closing the gap, policymakers can focus on the leeway pull (cf. Figure 4). During the phases of leeway pull, it is important to enable laggers to bring

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[1] Chanias, S., Myers, M.D., Hess, T. (2019), Digital transformation strategy making in pre-digital organizations: The case of a financial services provider, *Journal of Strategic Information Systems*, Elsevier, Vol. 28 No. 1, pp. 17-33; Heumüller, E., Kossowski, J., Richter, S. (2022), Digital Fit(ness) – is ' being in a fit with ' enough?, *Proceedings of the 2022 IEEE 28th ICE/ITMC & 31st IAMOT Joint Conference, June 19-23, Nancy, France*, pp. 486–494.

[2] cf. Bundesregierung. (2019a), *Digitalisierung Gestalten*, Presse- und Informationsamt der Bundesregierung, Berlin, available at: https://doi.org/10.1007/s35746-019-0016-8.

[3] Bundesregierung. (2019a), *Digitalisierung Gestalten*, Presse- und Informationsamt der Bundesregierung, Berlin, available at: https://doi.org/10.1007/s35746-019-0016-8.

in their innovative potential. One strategy can be funding start-ups combined with innovation incentives to support providers of innovative complementarities for a business ecosystem[1]. Two aspects are particularly supportive in this situation. First, the actors must be coordinated to enable network innovations. This can happen via incubators and/or start-up accelerators organized by the state. Second, the state can provide funding for start-ups. The German strategy provides funds for networking in the field of artificial intelligence and blockchain and allocates funds for start-ups that develop digital technologies[2]. Additionally, this strategy supports DT endeavors of small and medium-sized incumbent enterprises (ibid).

	Intervention	Start-up funding and innovation advancement	Education	Digitalization of administration
Leeway pull	Rationale	Digitalization is about the creation of communities. That means that several actors must be coordinated for joint development. Especially the connection of actors from research, development and application is important.	The broad education of all people from children to elderly fosters digital integration and preserves from social (digital) divide, lowers transaction costs and is the seedling of future developments.	The access to public administration via digital means lowers transaction costs of organizations and people. It helps to connect stakeholders fast and seamlessly.
	Example	E.g., strategy for the networking of actors in the field of artificial intelligence, strategy for the networking of actors in the field of blockchain, funding of digital technologies for small and medium sized enterprises and start-ups, support of medium sized enterprises with their DT	E.g., Programs as 1) digital pact for school (digital education for children), 2) vocational training 4.0 (with focus on digitalization), 3) digital society that focuses on elderly people	E.g., Online Access Act, digital identity, digital invoice, digital certification

Figure 4. Interventions, rationale, and examples for leeway pull

Another field of action to close the gap of digital transformation and promote future development is education. Lifelong education is both a societal challenge and the most crucial answer to the speed of change imposed by digital transformation[3]. First, education helps people of any age to master the change in everyday life but also to perceive digital transformation as a chance and thus strengthen their self-efficacy. Second, digital education closes the digital divide (e.g., between younger and elderly persons) and lowers transaction costs as more people can consume digital services. Third, education enables and empowers people to innovate. That means that education in general focuses on capabilities to develop future digital objects. Thus, social as well as technical aspects must be addressed by educational interventions. In this context, the digitalization strategy of Germany schedules numerous projects of educational intervention. One central project to improve the education of children is the covenant for the

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[1] Jacobides, M.G., Cennamo, C., Gawer, A. (2018), Towards a theory of ecosystems, *Strategic Management Journal*, Vol. 39 No. 8, pp. 2255–2276.

[2] Bundesregierung. (2019a), *Digitalisierung Gestalten*, Presse- und Informationsamt der Bundesregierung, Berlin, available at: https://doi.org/10.1007/s35746-019-0016-8

[3] Brynjolfsson, E., McAfee, A. (2014), *The Second Machine Age. Wie Die Nächste Digitale Revolution Unser Aller Leben Verändern Wird*, Börsenmedien AG, Kulmbach.

digitization of schools ("Digitalpakt Schule"[1]). The goal here is to enable the digitalization of schools with the provision of digital infrastructure (hardware and software), especially to support learning and administrative processes. Another large-scale project is the digitalization of the education of the workforce. Germany pursues vocational training 4.0 ("Berufsausbildung 4.0"[2]), which means a renewal of lifelong education to support the development of workplace capabilities. A third major project focuses on the elderly and is named Digital Society ("Digitale Gesellschaft"; ibid). Its goal is to improve the digital skills of all parts of society with a particular focus on the elderly to close the digital divide.

The third field of action is the digitalization of administration. Based on innovation and education, it is possible and necessary to digitalize the services of public administration. This gap-closing action reduces transaction costs and enables better governance. Data-driven decision-making is not only desirable for businesses but also for governmental organizations[3]. Especially during the COVID-19 crisis, it was noticeable (e.g., in Germany) that policymakers lacked the data necessary to understand the effects of their decision[4].

To lower transaction costs, public services must be digitized and made seamlessly consumable. That lowers bureaucratic obstacles and often dramatically fastens processes. Additionally, public administration improves the database for digitalized processes. Another way to act is to legally declare digital invoices mandatory (e.g., for public payment services). That forces businesses to close the digital fitness gap on their part as they must reorganize their payment processes for transactions with public administration. In turn, this will foster the reorganization of respective payment processes among businesses as well. Such legal declarations can only be the result of innovative digital objects and standards. One part of the German digital strategy is the Online Access Act[5] which obliges the public administration to provide online access to its services before a certain deadline. This reform is a major step toward closing the digitalization gap of society in Germany and bringing digital fitness to a new equilibrium (cf. Figure *2*, Equilibrium N+1).

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[1] Bundesregierung. (2019b), *Digitalisierung Gestalten, Umsetzungsstrategie der Bundesregierung*, 4th editio., Presse- und Informationsamt der Bundesregierung, Berlin, https://doi.org/10.1007/s35746-019-0016-8.

[2] Bundesregierung. (2019b), *Digitalisierung Gestalten, Umsetzungsstrategie der Bundesregierung*, 4th editio., Presse- und Informationsamt der Bundesregierung, Berlin, https://doi.org/10.1007/s35746-019-0016-8.

[3] Kaisler, S., Armour, F., Espinosa, J.A. & Money, W. (2013). Big data: Issues and challenges moving forward. *Proceedings of the 46th Hawaii International Conference on System Sciences*, January 7-10, Wailea, Maui, USA, pp. 995–1004.

[4] cf. Kuhlmann, S., Franzke, J., Dumas, B.P. & Heine, M. (2021). *Daten als Grundlage für wissenschaftliche Politikberatung.* Potsdam: Universitätsverlag Potsdam.
Kuhlmann, S., Franzke, J. & Dumas, B.P. (2022). Technocratic Decision-Making in Times of Crisis? The Use of Data for Scientific Policy Advice in Germany's COVID-19 Management. *Public Organization Review*, 22 (2), 269–289. Springer US.

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To conclude our analysis, we propose that the digital fitness model can help to support the digital transformation journey of an economy. A statistical office can identify areas (markets or market segments) that do not fit with the expectations of their stakeholders. On this basis, it is possible to implement projects dedicated to promoting digital transformation by adaption push (cf. Figure 3) or leeway pull (cf. Figure 4).

Conclusion. This paper examines the applicability of the digital fitness model[1], which was originally introduced to guide the digital transformation of organizations, to the level of an economy undergoing digital transformation. We conclude that its application as a reporting tool can be equally useful at this level. A governmental agency can measure the digitalization fit of sectors of the economy and design tactics and policies to support their digital transformation. The contribution of the paper is hence twofold. First, it substantiates that the discussion about digital fitness at the macro level is fruitful and that it enables further insights. Second, it develops a framework for policy interventions to guide digital transformation.

The findings of this paper enable scholars to deepen their insights about the relationship of digital transformation at the organizational and macro levels. Additionally, practitioners at all levels of public administration are supported with instruments to ground their decisions regarding digital transformation.

Research is an open and dialectic endeavor. In this sense, our paper has two major limitations. First, it pursues an argumentative approach not grounded in empirics so far. Second, our framework of governmental interventions is preliminary rather than complete. However, to the best of our knowledge, the paper is the first theorizing piece of research to enable fruitful thoughts about digital fitness at the macro-level of an economy.

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VOLODYA MANASYAN
PhD in Geography, Associate Professor, ASUE
SHOGHIK MANASYAN
Assistant, ASUE

THE STATE AND ECONOMIC EFFICIENCY OF FRUIT GROWING INTENSIFICATION IN THE REPUBLIC OF ARMENIA

The present article discusses the intensity level of fruit growing and the economic efficiency of intensification in the Republic of Armenia. The main directions of the innovative development of the sub-branch are substantiated in the article as well. It is emphasized that the important direction of intensification of the sub-branch is the application of intensive resource-saving technologies of fruit and berry production in the direction of the reduction of material consumption and labor intensity of products, as well as the maximum result of production and profit. A comparison is made between the efficiency of intensive orchards and traditional orchards. The need for extensive development of the sector is also highlighted, driven by the increasing demand from both the population and agro-processing enterprises. The necessity for applying domestic scientific elaborations in the sub-branch of fruit growing is also substantiated, proceeding from the direct influence on the intensification of fruit growing under the conditions of the mountainous area of the republic, its justified distribution, and intra-branch specialization.

Introduction. The economic content of the factors of intensification of the fruit-growing sub-branch is the increase of additional inputs of production means and labor of unit plantations and orchards. To carry out intensification in the sub-branch, it is always necessary to assume that additional investments within a certain level of saturation with innovative technologies, chemicalization, effective management of the sub-branch, etc. are legal and economically justified.

The intensification of man-made production should naturally be combined with the scientifically based use of natural and technical factors, the agro-climatic potential of the specific agricultural zone of the republic, as well as the programs implementation with the aim of fruits and berries expansion providing high-added value and of formation an adaptive-landscape system for growing of improving the preferred specialization directions in different zones and low-intensity fruits and berries to replace with more valuable species. Such a strategy envisages not only the realization of the agro-climatic potential of the republic, the demands of the population, its historical, national-ethnic and other characteristics, the biological and agro-

ecological possibilities of various types of fruits and berries, but also the ecologically justified use of innovative technologies and means of intensification, the introduction of high-quality grafts, effective fertilization with fertilizers, soil protection, soil improvement and phytosanitary functions, as well as minimization of all production processes, means and labor input, ensuring higher reparability of fruit growing products.

Literature review. Summarizing the clarifications regarding the essence of the process of fruit growing intensification, it is necessary to emphasize K. Marx's classic definition. "By intensive cultivation we mean nothing but the concentration of capital on the same plot of land, instead of its distribution among neighboring plots of land."[1] If the Marxist theory considers the effectiveness of intensification from socio-political positions, then market economics proceeds from the economic justification of investments, assuming highly efficient production, thereby also solving social problems, especially now that there are owners who bear economic responsibility[2].

The complex study of the main processes and indicators of the biological and economic efficiency of fruit growing in the agricultural zones of RA was carried out in the case of various fruit and berry planting schemes and different situations of foliage formation, irrigation, and fertilization based on multifactorial experience.

The generalization of literature data and advanced agrotechnics, as well as calculations based on experimental data, proved that the potential efficiency of fruit and berry plantations at the modern stage of rooting of innovative technologies is 2-3 times or much higher than the results obtained in the currently operating in production masses of gardens.

It should be noted that although the problem of intensification of fruit growing is covered quite widely in the literature, however, individual issues of this problem have not yet been sufficiently studied. First, it refers to the economic efficiency of additional funds invested in the growth and development of perennial plantations, the determination of its indicators, and the ways of increasing them.

This issue is of economic importance and is related to the features of extended reproduction in fruit growing. It should be noted that methodological principles for the analysis of sub-sector intensification processes have not been developed so far. Thus, for example, studies of the experience of the Soviet phase of the development of the agricultural sector of the Republic of Armenia show that when evaluating the economic activity of fruit growing, the indicator of the gross output per thousand rubles of the main production funds cannot be widely used, because in the case of large differences in the fertility of the plots of perennial plantations and the equal concentration of the means of production, the gross the output per thousand

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rubles of the main production funds indirectly reflects the significant differences in the fertility of perennial plantings.

With different levels of concentration of means of production and qualitatively similar perennial plantations, it may turn out that an economy that is not sufficiently provided with fixed means of production may have a larger share of gross output per thousand rubles of fixed means of production[1].

Naturally, at the initial stage of the radical reforms implemented to replace the former (planning) system with a new (market) system, a significant drop in the economic efficiency indicators of the sub-branch was observed, many mistakes were made, and then, under the influence of market factors and due to the measures taken, there are signs and certain trends in recovery and rates of growth in the fruit growing sub-branch. In this context, improving market relations, raising the level of self-sufficiency in fruit and berry products, replacing low-intensity fruits and berries with more valuable species, as well as introducing species providing high added value, and mastering agro-techniques of cultivation are among the urgent problems of agrarian economics.

The implementation of new sub-sector intensification programs based on the principles of the "From water to market" sub-component of the "Millennium Challenges" Armenian program is aimed at promoting the production of fruits and berries with a high added value, for this purpose, the second program of the "Development of rural enterprises and small-scale commercial agriculture" within the framework of various fruit-growing development zones of the republic, complex measures of evaluation of preferred specialization directions and implementation of competitive grant programs were carried out[2]. In particular, the best example of this in the sub-branch of fruit growing is the "Tierras de Armenia" ("Lands of Armenia") project implemented on previously uncultivated lands in the Baghramyan region of Armavir marz, which aimed to organize the production of different types of fruits and preserve the best national-ethnic management traditions accumulated during thanks to the peculiarities of the agro-climatic conditions over the years.

During the Soviet phase of the development of the agrarian sector, when establishing new gardens, attention was paid to the expansion of the masses of the former gardens (most of which were very small, with an area of 0.1-0.2 ha). In the state farms, most of which were organized in the post-war period, orchards occupied a relatively large area, often tens of hectares. According to 1966 data, there were 26 state farms with more than 50 ha of orchards in the

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[1] Zurabyan A. A., Intensification is the fundamental question of agricultural development// "Armenia" publishing house. Yerevan 1968, p. 43; Ayrumyan A. K. Intensification is the main way of agricultural development, issues of intensification of agricultural production in Armenia// "Armenia" publishing house.- Yerevan 1966, pp. 9-10; Soghomonyan S. H. Several issues of intensification of viticulture and fruit growing, issues of intensification of agricultural production in Armenia// "Armenia" publishing house.- Yerevan 1966, pp. 150-151.

[2] Sustainable Development Strategy of the Village and Agriculture of the Republic of Armenia for 2010-2020, RA Official Gazette, 2010, N 60 (794), p. 92.

republic, and 18 of them had more than 100 ha of orchards, most of which were in large masses[1].

Research methodology. The theoretical-methodological basis of the research was the works of several Armenian and foreign economists, dedicated to the practical experience related to the study and development of measures aimed at increasing the efficiency of the most important circular types of fruits and berries, as well as the creation of high-performance constructions of plantations, the study and control of the most important indicators of the photosynthetic activity of fruits and berries, in plant communities, to the results of the research on the study of the biological cycle movement.

The research was carried out with a complex approach, as much as possible including the range of theoretical, methodological and practical issues related to the intensive development of the sub-branch of fruit growing and the extended reproduction process, taking into account their mutual connections, which makes it more possible to intensively develop the preferred specialization directions of fruit growing in different agricultural zones. The data of the State Committee of Statistics of the Republic of Armenia, gazette and expert evaluations of various organizations, the results of individual research, the legislative and normative acts developed and adopted in the republic, the materials of the Economy, Environment and other ministries and departments were the information basis for the research.

Various systematic and situational assessment approaches, as well as methods of logical, statistical, and comparative analysis, were utilized in the research. Actual materials of economic indicators of individual products in the fruit-growing sub-branch were analyzed and evaluated using different methods. The research was carried out with a systematic approach, as much as possible including all theoretical and practical issues related to the development of fruit growing, in their versatility and mutual connection, which makes the conclusions made in the article more reliable and valid.

Analysis. The economic essence of the intensification of fruit growing in RA is the additional investments per unit area of fruit and berry plantations exceeding the level of costs in the initial period or the base economy aiming to boost the yield of gardens and orchards. During intensification, the costs of material resources (materialization of labor) increase and live labor decreases, so that the sum of materialized and live labor costs per unit of output decreases.

Intensive orchards and berries gardens will prevail in the low-lying river valley areas and south-facing slopes of the Zangezur and Northeastern agricultural zones of the RA, and in some parts of the Ararat valley, because the conditions for their cultivation are more favorable there. In these agricultural zones, new or improved technological processes of establishing intensive orchards and berries gardens adapted to the agro-climatic conditions of the local landscape vertical zones are successfully implemented.

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[1] Avagyan G., Agriculture of Soviet Armenia// Yerevan University Press.- Yerevan 1970, pp. 230-231.

In this regard, the reality of providing the land in the Nrnadzor settlement of the Meghri community of the Syunik marz to the "Nrnadzor" agricultural cooperative without a tender is worthy of attention. Taking into account the location and agro-climatic conditions of the land and the request of the "Nrnadzor" agricultural cooperative, the local self-government bodies have mediated to the government to provide the "Nrnadzor" agricultural cooperative with a lease equal to the real estate tax, without a tender, to establish intensive orchards. It was also taken into account that the "Nrnadzor" cooperative was created by the residents of the given settlement and whose members are exclusively residents who have established permanent residence in the border village of Nrnadzor and expressed a desire to engage in intensive fruit growing (dry subtropical orchards). That is, according to the Ministry of Territorial Administration and Infrastructure of RA, their social condition will partially improve, it will create additional interest in not leaving the settlement and an additional incentive to keep the border stable.

Intensification does not exclude the extensive development of fruit growing, which is necessary in two situations: if it is impossible to meet the growing demand of the population and agro-processing enterprises for fruit and berry products at the expense of intensification alone and if the expansion of the area of perennial plantations allows to obtain more fruits and berries with less capital and current costs than in the case of intensification.

Intensive and extensive forms of crop production can be combined, preferably by someone who has favorable conditions for its development at that moment: the possibility of additional capital and current investments, demand for products, production efficiency, and availability of labor resources. It should be noted that the extensive form is not synonymous with ineffective management of the sub-branch. At the same time, the rich agricultural heritage of the majority of marzes and regions of the republic (Armenia as the motherland of apricot and cherry cultivation) and the most important, favorable agro-climatic conditions, high-quality water and high mountain areas, which provide the most delicious agricultural products, show that the main and main factors for the development of fruit growing the more promising direction is its intensification[1].

In addition, traditional orchards and berries-orchards will prevail in the agricultural zones of risky fruit growing of RA (Araratian Valley, Pre-mountainous, Central, Vaik, and some sub-zones of Zangezur), where sharp temperature fluctuations, snow melt, drought, and hailstorms are regularly observed. In these agricultural zones, the capital investment in establishing and growing intensive orchards and orchards is not always compensated. For this reason, refusing to establish and grow traditional orchards and orchards in favor of intensive ones is not economically justified in many agricultural zones of the Republic of Armenia.[2]

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[1] Avetisyan S., Agriculture and agro-cultivation of Armenia// "Limush" publishing house.- Yerevan 2010, p. 39

[2] Manasyan V., Features of division of work by area and branch in the fruit growing sub-branch of RA//Journal of Social Sciences 2018, 3 (654), p. 180.

The concentration of means of production in the sub-branch of fruit growing indicates the efficiency of its level of intensification of the sub-branch, the increase in the production of fruit and berry products from each hectare in the case of a simultaneous decrease in the level of its intensity, the cost of labor and resources per unit of useful output.

The economic efficiency of intensification is determined by the ratio of the obtained result and production costs or resources. Depending on the ratio of output and costs (resources), there are three options for changing the intensification of fruit growing:

- the additional output associated with intensification exceeds the additional costs: the intensity increases and the invested resources provide enhanced reproduction in the sub-sector;
- the additional output is equal to the costs of intensification, efficiency remains the same,
- only simple reproduction is possible,
- additional output is less than additional costs: intensification is inefficient.

The level of intensification of fruit growing in agricultural enterprises of RA has increasing trends (see Table 1[1]).

<div align="right">Table 1</div>

The level of fruit growing intensification and economic efficiency in RA agricultural enterprises

Indicators	2015	2016	2017	2018	2019	2020	2021	2022
Production costs of plantations of 1 ha of fertility, thousand AMD	199,1	227,1	225,5	304,7	381,1	413,6	555,5	738,6
The cost of mineral and organic fertilizers per 1 ha of plantations, AMD	4438,5	4961	4147	8855	9394	12490,5	15070	23133
The share of intensive gardens, in % of their total area	5,1	5,4	7,0	8,3	12,9	15,0	20,4	21,6
In the area of fertility height	2,6	2,6	2,9	5,1	5,8	6,3	12,3	12,0
The value of the gross product of fruit growing per 1 ha of plantations	303,0	395,4	330,0	538,4	587,9	574,7	839,3	1360,1
Yield, cents/ha	103,0	66,1	93,5	87,7	76,2	71,4	157,9	87,1
1 cents production cost of the product	3498	3630	5362,5	5346	4994	4559,5	5874	7392
The profit of plantations of 1 ha of fertility height	31,9	50,6	50,0	100,1	52,8	84,7	178,7	167,2
The level of profitability	18,7	22,3	19,2	36,3	12,6	16,4	29,7	62,9

From 2015 to 2022, the production costs on plantations of 1 ha of fruiting height increased by 3.7 times, and the cost of applied fertilizers (mineral and organic) per 1 ha of plantations - 5.2 times. The growth of these value indicators indicates that more perfect means of production, more fertilizers, and other material resources have started to be used in fruit growing. At the same time, the increase in value indicators is to some extent due to devaluation processes.

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[1] The table was compiled from materials provided by the Ministry of Territorial Administration and Infrastructure of RA; https://armstat.am/file/article/f_sec_4_2022_3pdf

In the southern regions of the Russian Federation, intensive gardens prevail, because the conditions for their cultivation are more favorable there. Thus, in the agro-firm "Garden-giant" of the Krasnodar region, where there are more than 2000 hectares of fruit and berry plantations, including 90% fruit trees - gardens of the intensive type, the gross harvest of fruits and berries amounted to more than 50 thousand tons, the yield is about 300 centner/hectare. In those farms, foreign technologies for creating intensive orchards, adapted to local agro-climatic conditions, and imported varieties of fruit and berry crops are successfully used[1].

Indicators such as the share of intensive orchards (more than 800 trees per 1 ha) in their total area, which increased from 5.1 to 21.6%, were not affected by the devaluation, and the area of plantations of fruiting height also increased from 2.6 to 12%. During the period under discussion, the areas to establish intensive gardens increased annually from 1021 to 4732 ha, or 4.6 times.

Most of the indicators of the economic efficiency of fruit production in agricultural enterprises have improved. Although in 2015-2022 the yield of the orchards has undergone some fluctuations, however, the value of the gross product of the sub-sector per 1 ha of plantations at the fruiting stage has increased by 4.5, the profit per 1 ha of the plantation at the fruiting height has increased by 5.2 times, the level of profitability of the fruits has increased by 44.2 statistical points. However, it should be noted that the average yield of gardens and orchards in marzes and regions of the republic fluctuates dramatically. From 1 ha to 76 cents in Lori, up to 152.9 cents and 108.6 cents in Shirak and Ararat marzes, respectively. The higher yield of gardens and orchards in Shirak and Ararat marzes is explained by the level of intensification of the sub-branch, the formation of large-scale areas of commercial production of individual types of fruits, its concentration, the selection of the species composition of fruits and berries, etc. Generalizing the above, it should be emphasized that the rate of growth of the value indicators of production efficiency is higher than the value indicators of fruit growing intensification.

Crop production intensification factors can be grouped into three groups. The factors of the first group predetermine the growth and stability of the yield of fruits and berries based on the use of their biological potential; densification of the distribution of trees and shrubs, application of fertilizers, improvement of agrotechnical practices, use of new high-yielding varieties, application of drip irrigation and fertigation, etc. Moreover, properly organized regular irrigation allows to increase the efficiency of fruit and berry plantations by up to 2 times.

The second group of factors ensures the reduction of labor costs and resources for growing fruits and berries; the complex mechanization of production, the use of intensive resource-saving technologies in the production of fruits and berries, the reduction of labor and material consumption, the maximum result of production and profit.

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[1] Minakov I. A., Formation of the market for fruits and vegetables and their processed products // Economics of agricultural and processing enterprises. 2012, N11, p. 57 (in Russian).

The factors of the third group create favorable conditions for the efficient use of agricultural production resources (land, material, labor), as well as for the acceleration of the rooting of innovative technological achievements, the deepening of intra-branch specialization, the concentration of the production of fruit and berry products and inter-economic cooperation and agro-industrial integration, for the ways of managing fruit and berry farms and improvement of economic mechanisms, improvement of working conditions and remuneration of employees.

At the same time, the historical experience of most countries of the world shows that the main and most promising direction of the development of fruit growing is its intensification.[1] Thus, for example, in the agro-industrial type developing specialized farms of the Slobodceiski region of the Republic of Moldova, on average, over 10 years, 163 centners were collected from 1 hectare of apple plantations and up to 400 tons in agro-firm type workshops.[2]

The whole production process is characterized by the relationship between the factors of production and the volume of product production, which has a positive and negative effect on them. The output of the product depends to a significant extent on the combination of intensification factors. Limiting factors inhibit the increase in the yield of fruit and berry plantations. Thus, the effectiveness of fruit growing intensification lies in ensuring the balance of factors or eliminating the imbalance between them.

In mountain fruit growing of RA, some issues of technology are solved differently than in plain regions, for example, the system of soil cultivation in gardens. The traditional harrow system is not suitable for mountain gardens, especially those located on slopes of different acclivity and orientations. The system of soil cultivation is promising. Cultivation of soils in gardens, feeding with fertilizers, application of pesticides, and other agricultural practices should be aimed at combating soil erosion, forming complex anti-erosion measures to use and preserve the agro-production resources of the mountainous area of the republic.

Conclusion. Taking into account the features of the vertical zonal distribution of the RA fruit growing sub-branch, when determining its intensification, it is necessary to use the system of mutually related indicators, and to implement the correct pairing of fruits and berries, apply the following economic organizational measures:
   a) fully and more productively use perennial plantations and orchards,
   b) use agricultural machinery rationally,
   c) the economically expedient combination of different types of fruits and berries, which will enable the more efficient use of labor resources and machines and will contribute to the mitigation of seasonality,

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[1] Minakov I. A., Kuryakov A. V. Increasing the efficiency of gardening in the context of the transition to market relations // Gardening and viticulture. 1995, N3, p. 43 (in Russian).

[2] Kulikov I., Minakov I. Features of the territorial-sectoral division of labor in horticulture // AIC: Economics, management. 2016, N6, p. 9 (in Russian).

d) productively use every production waste, which will contribute to the sub-branch through the organization of secondary and auxiliary production increasing the general level of economic efficiency,

e) create necessary conditions for obtaining high and environmentally friendly products (irrigation, species change, siderization, etc.),

f) increase the quality of products, from this point of view, the main masses of fruit plantations must be located in soils poor in organic matter (for example, gray semi-desert), therefore, in this regard, the application of both local fertilizers and siderization is important. A large place should be devoted to the use of organic-mineral complex fertilizers.

In this context, the organization of the sub-branch in an intensive way, especially for our arable republic, where the further growth of the production of fruits and berries must be ensured in the only way, that is, through the intensive management of the sub-branch.

The higher yield is not only due to the type of garden but also to the concentration of intensive gardens on specialized fruit-growing farms, where the conditions for the development of fruit-growing are more favorable. The intensification of the sub-branch will lead to expanded fruit and berry production, supporting the country's food program.

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11. https:/mtad.am

ZARUHI MELKUMYAN
Associate Professor of the Chair of Microeconomics of the Armenian State Univeristy of Economics, Candidate of Economic Sciences

UNFAIR COMPETITION AND REGULATORY ANALYSIS IN THE FIELD OF DISCOUNTS: A COMPARATIVE STUDY OF RA AND EUROPEAN EXPERIENCE

Keywords: *unfair competition, competitive environment, competitive advantages, misleading the public, protection of consumer rights*

The article presents the essence of the concept of "promotion" as a flexible marketing tool used by business entities, types of promotions, cases of unfair competition with the use of discounts by economic entities for specific manifestations, RA and EU regulations related to discounts, in particular, amendments to the law "On Trade and Services", which entered into force on July 31, 2022 (Chapter 4.3, Article 15.4-15.7), general regulations of the EU, regulations of the French Republic and the Federal Republic of Germany, which derive from the general regulations of the EU, as well as the comparative analysis of above mentioned regulations.

In the article, it is proposed to introduce the idea of "progressive discount" in the regulations related to RA discounts, as well as to establish exceptions for products with a short shelf life.

Introduction. Promotions have a unique role in the marketing policy of business entities and are always widely used. Regardless of the type of promotion used, they aim to dramatically boost sales during a specific period of time.

Economic entities quite often use the tool of discount in a not so conscientious way, harming the interests of consumers and causing unequal competitive conditions.

Regarding the application of discounts, certain regulations are defined in the EU member states, including the discount calculation method, discount notification requirements, etc. From July 31, 2022, such regulations are also in effect for economic entities of the Republic of Armenia. Nevertheless, as the statistics show, the cases of unfair competition with the demonstration of misleading the public through the application of the discount still continue.

Literature review. Descriptions of the essence and purpose of application of sales are available in the works of many scientists. Sales promotion may be good-looking for highly promotion prone customers for reason beyond price savings indicated that Chandon, Wansinks, and Laurent (2000)[1].

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[1] Chandon, P., Laurent, G. and Wan sink, B., A benefit congruency framework of salespromotion effectiveness, Journal of Marketing. 2000, Vol. 64, No. 4, pp. 65-81.

Sales promotion is any activity that is being used by the producer to promote trade (retailer, whole seller, or network partners), as well as for customers to buy the brand and activate aggressive sales force to sell.

According to (Totten & Block, 1994) Alpha the term sale promotion refers to numerous kind of selling incentives and technique intended to yield urgent sales effects[1].

Priya Raghubir, J. Jeffrey Inman and Hans Grande raised the issue of the importance of carrying out effective promotions. In their opinion, consumer promotions can be considered as "pull" promotions in that they directly entice the consumer to purchase the product, thereby pulling the brand through the channel[2].

Robert C. Blattberg and Scott A. Neslin also point out the importance of promotions noting that consumer promotions now account for almost a quarter of the marketing budget of consumer product companies[3].

In the early stages of their popularity, consumer promotions typically had a positive short-term impact on brand sales[4]. However, this increase may be temporary as brand switchers may be deal loyal and will follow the next deal that comes along[5].

Sales may also increase as a result of existing customers purchasing more products (stockpiling) or accelerating purchases. One study of 175 large-scale promotions found that sales increases were primarily from existing customers[6]. One study of 175 large-scale promotions found that sales increases were primarily from existing customers.[7] Unless these customers who have larger inventory increase their levels of consumption, they would be less likely to continue to buy the brand after the deal was retracted[8]. Promotions may also encourage sales of complementary or other-related products (e.g., a coupon for cake mix might also spur frosting sales)[9].

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[1] Totten, J.C. and Block, M.P., Analysing Sales Promotion: Text & Cases: How toProfit from the New Power of Promotion Marketing, 2nd ed., Dartnell Corp., Chicago, IL., 1994,

[2] Priya Raghubir, J. Jeffrey Inman and Hans Grande, The Three Faces of of Consumer Promotions, California Review Management, University of California, Berkeley, Haas School of Business, CMR 289, 8/1/04, https://www.researchgate.net/publication/283464527_The_three_faces_of_price_promotions_Economic_informative_and_affective

[3] Robert C. Blattberg and Scott A. Neslin, Sales Promotion: Concepts, Methods, and Strategies (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1990)

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[9] Francis J. Mulhern and Robert P. Leone, Implicit Price Bundling of Retail Products: A Multiproduct Approach to Maximizing Store Profitability, Journal of Marketing, 55/4 (October1991): 63-76.

As for the regulations regarding discounts, let's note that the regulations in force in the EU member states derive from the European Union Directive 98/6/EC and are specified by national legislation. In particular, in the Republic of France, regulations regarding discounts are defined by the law "On Consumers", and in the Federal Republic of Germany, the "Price Marking" regulation is in effect.

Regulations on promotions in RA are defined by the Law "On Trade and Services".

Research methodology. The basis for the research was the works of various foreign authors dedicated to the promotions, the data of the official website of the Commission for the Protection of Competition (hereinafter refers as the Commission), the RA and EU regulations regarding the discounts.

In the article, the comparison as the empirical research method was used, with the help of which the features of the RA and EU regulations related to the promotions were presented, a comparative analysis was carried out, and proposals were presented.

The article also used the analysis method, through which the activities carried out by business entities in the field of discount application, which may lead to unfair competition, were analyzed. At the same time, the article analyzes violations identified by the Commission in the first quarter of 2023 after the entry into force of the law "On Trade and Services" on July 31, 2022, concerning the sphere, cases of unfair competition through discounts on specific manifestations.

Analysis. Promotions are an integral part of the advertising policy of business entities around the world, which are aimed at increasing the attractiveness of products or services among consumers and aimed at increasing the sales volume.

Depending on the nature of implementation, the following two types of promotions are distinguished:

1. price promotions: discount, coupons, etc.,
2. Non-price promotions such as free samples, giveaways, etc.

The use of discount is the most popular among business entities all over the world, including in RA.

"Discount" is a flexible marketing tool of short-term nature, through which business entities are able to promote the sale of products and get rid of the product balance without making a change in the list price. It follows from the above that the discount is implemented for a certain limited period, during which consumers are offered the most attractive conditions for purchasing the product, in particular a lower, discounted price, and after the end of the discount, it becomes impossible to purchase the product with such attractive conditions, that is, from the end of the discount then the product price is assumed to recover.

There are many publications with similar content. "Hurry, 2 days until the end of the discount" or "Quantity is limited, order now". Statements of this nature affect the psychology of consumers, forcing them to rush after the offered products without much thought, because they create the perception that if they are a little late, they may be deprived of an exclusive opportunity.

The problem is that in a number of cases, business entities use the discount tool unfairly, mislead the public, as a result of which they gain an unnecessary competitive advantage over honest business entities on the one hand, and harm the interests of consumers on the other hand.

Thus. in some cases, business entities carry out a "perpetual discount", offering to purchase the goods during the discount at such a price, which is the usual selling price of the business entity before the discount is applied. In another case, entities increase prices a few days before the discount is applied and apply the discount to the increased price, resulting in the price offered under the discount essentially not differing significantly from the price to which consumers are accustomed. There are also situations when business entities, with the aim of increasing the attractiveness of products, announce a fairly high discount range, for example, "10%-70% discount" or "up to 70% discount", and it turns out that the maximum amount of announced discount applies to only 1-2 products.

It was not possible to evaluate the above-described behavior of economic entities for quite a long time due to the lack of legal regulations in the field. In other words, it was not defined in the legislative sphere how the discount should be calculated, how long the discount can last, how discounts should be informed, etc.

On July 7, 2022, the Law "On Trade and Services" was amended, in particular, the concept of "promotion", the types of promotions, the price from which the discount should be calculated, the maximum period of discount implementation, and other regulations were defined.

These regulations came into force on July 31, 2022, after which, as a result of monitoring the behavior of economic entities, it became clear that the fixed problems persist, therefore, the negative impact on the competitive environment continues.

From the Commission's decisions on measures of responsibility for discounts in the first quarter of 2023, it becomes clear that a significant part of the identified problems is related to the incorrect choice of the discount calculation base and non-compliance with the requirements for informing about discounts (See: Figure 1).
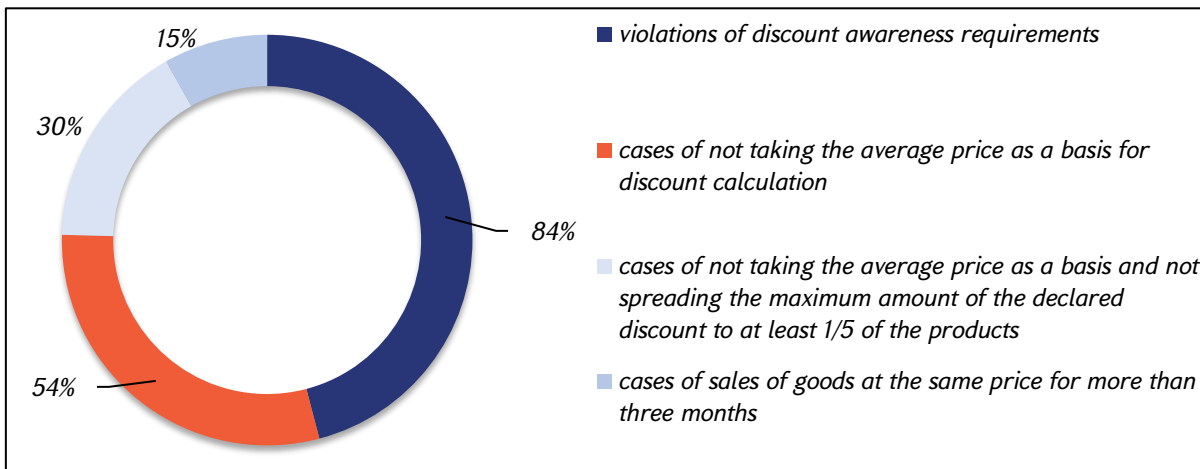
Figure 1. Issues identified in relation to discounts in the first quarter of 2023 by specific manifestations[1]

It should be noted that violations were common in the sale of clothing, shoes, perfumery and cosmetics, household appliances and other household goods. The majority of violations fixed in the first quarter of 2023 were related to the field of sales of clothes and shoes (See: Figure 2).
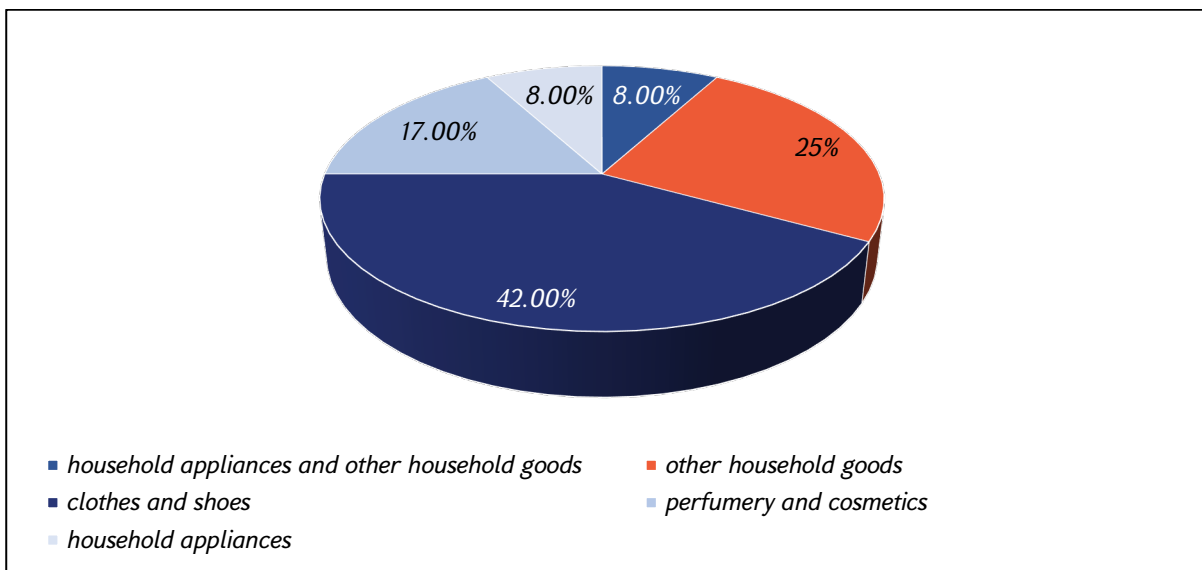
Figure 2. Distribution of cases of unfair competition fixed by the Commission in the first quarter of 2023

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[1] The figure was built on the basis of the analysis of the decisions available on the official website of the Commission and some of the problems were recorded at the same economic entity at the same time.

To illustrate the behavior of business entities and specific violations identified by the Commission, let's look at the following examples.

"Zenni" LLC, a shoe sales company, which represents "Sali" brand in Armenia, announced promotions in November and December 2022. Thus, in November 2022, the company made the following announcement: "BIG SALE, BLACK FRIDAY 30-50% ON THE ENTIRE RANGE OF SHOES". In addition, in December 2022, the company announced the following promotion for the New Year: "NEW YEAR'S DISCOUNTS OF 25-50% ON THE ENTIRE RANGE OF SHOES: ADDITIONAL + 10% TO THE NEW ASSORTMENT". The Commission, in cooperation with the State Revenue Committee, analyzed the company's price policy within the framework of the mentioned promotions, as well as in the months preceding the promotions, and concluded, that the company did not apply the discount from the average price of the months preceding the promotions. It turned out that the discount was calculated based on a higher price, and in fact, on Black Friday, the discount of 30-50% was fake. That is, it is possible that the company sold goods at a price above the average price during the discount, perhaps there really was a discount, but not in the declared amount. The same applies to the company's behavior in December. In addition, if the discount was not actually calculated from the average price, the Commission concluded, that the stated maximum discount percentage was not applied to one-fifth of the products either. At the same time, the company did not inform consumers properly about the discount conditions. In particular, the company did not provide any information about the days of the start and end of discounts, which did not allow consumers to get a complete picture and structure their behavior. The Commission qualified the above-mentioned behavior of the company as unfair competition, misleading the public, and a fine was imposed on the company[1].

Another example of unfair competition is the behavior of "PC Electronics" LLC, a company that sells household appliances. In November 2022, the company announced the following promotion: "Black Friday All Week, Black Friday sale.", but the company did not disclose the essence of the promotion, as well as did not specify which products are covered by the Black Friday promotion.

The problem is that from the content of this promotion, it is not clear to consumers what exactly they expect from the company. It is unclear whether there will be a discount or another promotion or which specific products this will apply to. For example, when consumers come to the store, they may be disappointed because there is no promotion for the product they like. In addition, it turned out that the company sold some goods during the promotion at a price higher than the average price for the previous month. The Commission qualified the above-mentioned behavior of the company as unfair competition, misleading the public, and a warning was given to the company[2].

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[1] Decision of the Commission No. 87-A dated February 21, 2023,
https://ef.competition.am/#/ep/clientcontrol/decision-list
[2] Decision of the Commission No. 81-A dated February 21, 2023,
https://ef.competition.am/#/ep/clientcontrol/decision-list

It should be noted that within the framework of the proceedings the companies admitted the fact of violations.

As for the conduct of companies before the entry into force of the regulations on promotions, it should be noted that before the regulations came into force, the Commission accused organizations, for example, that the discount was announced for the entire range, while it applies only to a part, or that the sale was made at the current price the day before the discount. However, situations where companies artificially raised prices 1-2 days before the discount, and then applied a discount to the high price, were outside the scope of the Commission's regulation, since there was no regulation on which price the discount should be calculated.

Violations identified by the Commission from January 1 to July 31, 2022 are presented in Table 1.

Table 1

Violations identified by the Commission in the period from January 1 to July 31, 2022, before the entry into force of regulations[1]

No.	Economic entity	Brand	Violation
1	"Master Riteyl" LLC	Mexx Armenia	the absence of a discount or the application of a discount in a smaller amount than announced
2	"Vega Uorld" LLC	Vega	the discount was announced for the entire range, but was applied to some part, incomplete information about the discount was indicated in the announcement
3	Private Entrepreneur Sona Bulgadaryan	Prime wear	the absence of a discount or the application of a discount in a smaller amount than announced

As for the impact of the regulations, let's note that after the regulations, the number of decisions of the Commission in the field increased, which does not mean that the violations increased, but it means that the legal grounds for fixing the violations were created. The real impact of regulation can be assessed in the long term.

Now, let's present the experience of some European countries regarding the application of discounts, which mainly derive from the directive 98/6/EC of the European Parliament and the Council, and then discuss the possibilities of their localization in relation to some provisions[2].

In accordance with Article 6A of Directive 2019/2161 of the European Parliament and of the Council On Amendments to Council Directive 93/13/EEC aimed at better applying and modernizing the directives of the Consumer Protection Union of 27 November 2019, Directive 98/6/EC of the European Parliament and of the Council, Directive 2005/29/EC and Directive 2011/83/EU from 2019/2161:

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[1] The table was built on the basis of the analysis of the decisions available on the official website of the Commission
[2] https://eur-lex.europa.eu/eli/dir/1998/6/2022-05-28

1. Any announcement of a price reduction must contain the previous price, which is applied by the seller for a certain period of time before the discount is implemented.
2. The previous price is the lowest price applied by the seller at least 30 days before the price reduction.
3. Member States may provide different rules for goods that may deteriorate quickly or have an expiration date.
4. If the goods are on the market for less than 30 days, Member States may also provide for a shorter period than the period specified in paragraph 2:
5. Member States may provide that when the price reduction gradually increases, the initial price is the price to which the first discount was applied.

Republic of France: Under the heading "Information on sales prices and conditions", Chapter 2 (Articles L112-1 to L112-9) of the French Consumer Law regulates relations related to price reduction. The changes made in this law entered into force on May 28, 2022[1]:

Article L112-1-1 of the Law "On Consumer" defines that:

1. Any announcement of a price reduction must also show the previous price that applied before the price reduction.

The previous price corresponds to the lowest price charged by the seller to all consumers during the last thirty days before the price reduction.

The Law "On Consumers" has established an exception from paragraph 2 of part 1 of article L112-1-1, in particular, in case of successive price reductions in a certain period, the previous price is considered the price that was applied before the first price reduction.

Paragraph 3 provides that the regulations regarding price reduction announcements do not apply to perishable goods.

Federal Republic of Germany: On November 21, 2021, changes were made to the Regulation "On Marking Prices"[2], which entered into force on May 22, 2022, according to which Article 11 under the heading "Obligation to provide additional price information in the event of a reduction in product prices" stipulates that

1) Anyone announcing a price reduction must indicate the lowest total price they applied to consumers in the last 30 days prior to the price reduction.
2) In the case of a gradual, constantly increasing decrease in the price of the total price of the goods, the lowest total price specified in paragraph 1, at the time of the price reduction, the price applied to consumers of this product before the beginning of the gradual price reduction may be indicated.
1. Individual price reductions or

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[1] https://www.legifrance.gouv.fr/loda/id/LEGIARTI000044549406/2021-12-24/
[2] https://www.bgbl.de/xaver/bgbl/start.xav#__bgbl__%2F%2F*%5B%40attr_id%3D%27bgbl121s4921.pdf%27%5D__-1674198787251

194

2. In the case of price reduction of perishable products or products with a short shelf life, if the price reduction is due to the risk of spoilage or the shelf life is about to expire.

The study of the legislation of the EU member states allows us to make generalizations that lead to the following:

1. "Previous price" is the lowest price of the 30 days preceding the implementation of the discount in the above member states of the European Union.

2. If the discount increases progressively (for example` 20%, 50%, 70%) then the initial price is the price at which the first discount was applied.

3. The legislation identifies a rapidly deteriorating commodity group, assuming its shelf life of up to 30 days. In this regard, in some cases, exceptions to the discount regulations are provided for the above-mentioned products or the application of such regulations is excluded.

If we compare the EU and RA rules on discounts, we will see that, firstly, unlike the RA rules, the EU offers a stricter approach to calculating discounts. secondly, an exception has been established for perishable goods, and thirdly, the idea of a "progressive discount" has been introduced, when in the case of consecutive discounts for the same product group, a different discount calculation mechanism is established that allows organizations to offer a higher percentage of discounts in consecutive periods. The latter allows firms to apply large discounts on the same products and get rid of the product balance.

Conclusion. Generalizing the results of the analysis, it can be concluded that despite the existence of relevant regulations on discounts, the manifestations of unfair competition in the sector are still numerous. Taking into account that the regulations came into force only on July 31, 2022, we believe that in order to prevent violations, it is necessary to carry out large-scale awareness activities among business entities.

It is also noteworthy that most organizations admitted the fact of the offenses and noted that they were due to the fact that the regulations were new. Organizations also noted that there will be no violations in the future.

Admitted regulations allow the Commission to control the business environment, forcing organizations to act honestly. In addition, in a fair competitive environment the interests of consumers are also protected.

At the same time, it is proposed to introduce legislative changes. In particular, the idea of a "progressive discount" can be implemented in the RA, and the regulations of the RA concerning the discount should be supplemented with a provision on a "progressive discount", since this is a fairly flexible tool which allows firms to apply large discounts on the same products and get rid of the product balance.

We believe that the mentioned comprehensive regulations and the implementation of proper control over them will make it possible to prevent cases of unfair competition and significantly improve the competitive environment in the markets.

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13. https://eur-lex.europa.eu/eli/dir/1998/6/2022-05-28
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16. https://wetten.overheid.nl/BWBR0015104/2023-01-01
17. https://zoek.officielebekendmakingen.nl/stb-2022-485.html
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VAHE MIKAYELYAN
PhD, associate professor, ASUE
ARGAM ARTASHYAN
PhD, associate professor, ASUE
GURGEN ARAKELYAN
PhD, professor, ASUE

ARTIFICIAL INTELLIGENCE IN THE FINANCIAL SECTOR: WHAT CHALLENGES AND OBSTACLES THE FINANCIAL INDUSTRY FACES

Artificial intelligence has ushered in a revolutionary era in the financial sector, using machine learning algorithms and sophisticated data analysis tools to revolutionize decision-making processes completely. This article examines the distinctive applications of AI in key areas such as fraud detection, customer service, personalization, investment management, stock markets, and risk management, aiming to identify the factors influencing the development of this niche.

In this research, we meticulously examine AI's profound impact on finance, substantiating its influence through the proliferation of fortified internet servers over time. This increase in fortified servers is tangible evidence of the burgeoning integration of AI technologies into the financial landscape.

Furthermore, an examination of venture capital investments in AI provides invaluable insights into the financial reinforcement that AI technologies have accumulated. The dynamic trends observed in venture capital investments illustrate the industry's recognition of AI's central role in shaping the future of finance.

This article highlights a fascinating aspect of AI talent, with a particular focus on gender dynamics within the industry. Examining the evolving gender composition of AI professionals sheds light on the concerted efforts within the industry to promote inclusivity and diversity.

Additionally, this research explores the dynamic nature of AI job postings, providing a comprehensive view of the evolving career opportunities in AI. It underscores the increasing demand for skilled professionals and the increasing importance of AI expertise in the financial sector.

Introduction. Artificial intelligence has been transforming the world of finance, and in recent years, its use in banking has really mushroomed. Whether trading, risk management, fraud detection, customer service, or personal financial management, AI applications are available across finance. However, this progress also brings new challenges and obstacles that must be addressed.

This article examines how artificial intelligence has revolutionized the financial sector and its future. Our objectives are to understand the current state of AI integration in financial services and identify patterns in how AI is revolutionizing the industry.

Since the issues of AI adoption differ country-wise and from organization to organization, this article will provide insight into cybersecurity, the AI job shifts and applications it is adopting, and recommend some effective actions for most of them.

Literature review. Since the 1950s[1], early implementations of machine learning methods were also used to automate crucial processes such as credit scoring and fraud detection, opening the doors for implementing AI in finance. Only a great deal has changed through all those years. In "Machine Learning in Finance"[2], authors introduce all aspects of ML's current use in the segment. The rule-based systems were formulated in the 1970s[3], where decisions were based on a predetermined set of rules. These programs were initially used to judge creditworthiness and give authorization for loans.

In the 1980s and 1990s, greater use of neural networks[4] was used to make judgments based on an increasing number of abstract inputs. Some uses of Neural networks have been used to detect fraud and predict stock prices

In the early 2000s [5], big data catalyzed the development of machine learning algorithms, leading to improved results and enhancing predictions and decision-making.

Within financial services, investment managers have applied AI approaches in either the form of designing portfolios, risk management, or algorithmic trade. However, this has started to change recently and natural language processing (NLP)[5] is now an important financial tool that allows analyzing tremendous amounts of unstructured data, such as social media plaids or news articles. Applications of NLP are found in subfields like sentiment analysis and customer feedback analysis. Even though financial management is applicable to a great deal more than simply business finance, most authors are inclined to use corporate finance for business finance.

According to Al Breiki and Nobanee, different company arrangements focus on various financial strategies, including partnerships, sole proprietorships, and corporations. One of the several solutions, before incorporating AI, is proper finance management, which must be found

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[1] Sanjiv Das, Michele Donini, Jason Gelman, Kevin Haas, Mila Hardt, Jared Katzman, Krishnaram Kenthapadi, Pedro Larroy, Pinar Yilmaz, Bilal Zafar, Fairness Measures for Machine Learning in Finance, The Journal of Financial Data Science, 14 September 2021, p. 1.

[2] Matthew F. Dixon, Igor Halperin, Paul Bilokon, Machine Learning in Finance, 2020

[3] Ivar Timmer, Rachel Rietveld, Rule-Based Systems for Decision Support and Decision-Making in Dutch Legal Practice. A Brief Overview of Applications and Implications, Dans Droit et société 2019/3 (N° 103), p. 518

[4] Niko Hauzenberger, Florian Huber, Karin Klieber, and Massimiliano Marcellino, Enhanced Bayesian Neural Networks for Macroeconomics and Finance, April 4, 2023, p. 27. https://arxiv.org/pdf/2211.04752.pdf

[5] Fisher, Ingrid E., Margaret R. Garnsey, and Mark E. Hughes. Natural language processing in accounting, auditing and finance: A synthesis of the literature with a roadmap for future research. Intelligent Systems in Accounting, Finance and Management 23.3 (2016), p. 160.

to achieve its objective for corporate finance. For example, according to Kaur et al[1] some financial institutions have tried and found that artificial intelligence chatbots have helped them engage their day-to-day customers. Effective compliance and administrative techniques are necessary for financial management plans that determine a company's future productivity.

Some technical skills in financial management help to track how successful or unsuccessful an organization is. Also, these skills help identify money problems and create exciting chances for risk mitigation and forecasting. Because not every organization can reach a long-term approach easily, Cao indicates that every organizational company should have profound techniques and an understanding of financial management. An artificial intelligence application could provide numerous finance-related benefits. The literal sources used to support this claim state that an organizaton must attain high success.

Moreover, any company's finance department may decide to implement AI with the support of its highly capable IT department despite the costs associated with ensuring proper financial management. Many scholars have observed that various marketplaces are becoming increasingly competitive over time, with firms often likened to running a marathon to keep pace with recent technological advancements aiding trade operations. This led the researchers to conclude that companies will have to plan to go beyond their initial goals and devise new ones to remain competitive.

Research Methodology. This article captures findings that were made from an extensive literature review, data analysis through graphical presentations, and several years of professional experience.

Due to rapid developments in the past 2-3 years, particularly in AI advancements, our research required updated data and further analysis. The increasing significance of AI across various financial institutions and organizations globally is a central focus of our research.

Further tracking worldwide trends, we interviewed the local IT managers at banks and financial institutions using their global professional networks. These discussions provided important insights into the financial services sector and how AI is applied.

In addition, our study has adopted a relatively heavy dependence on visual representation in the form of charts as a core tool. The visual tools were useful in identifying patterns, trends, and comparative assessments that can be ascertained from the data collected, hence broadening the findings in the whole nature of the research.

Analysis. Due to the huge amounts of data required for AI in its training and processing, there are certain things all researchers and developers should plan. For instance, inherent AI

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[1] Kaur, Dr. Navleen and Sahdev, Supriya Lamba and Sharma, Dr. Monika and Siddiqui, Laraibe, Banking 4.0: The Influence of Artificial Intelligence on the Banking Industry & How AI Is Changing the Face of Modern-Day Banks (2020). International Journal of Management, 11 (6), 2020, pp. 577-585, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3661469

within the system must provide a resilient and safe digital and traditional data transformation[1]. Whether to adopt AI methods in the financial sector, with the necessary data protection and system maintenance provisions or to continue using traditional methods has never been easy to decide. However, participation in big data and its related analytics seems to ensure revenue growth that is 1.5 times bigger than that of the rest of financial services[2]. This is valid for the statistics on secure internet servers:
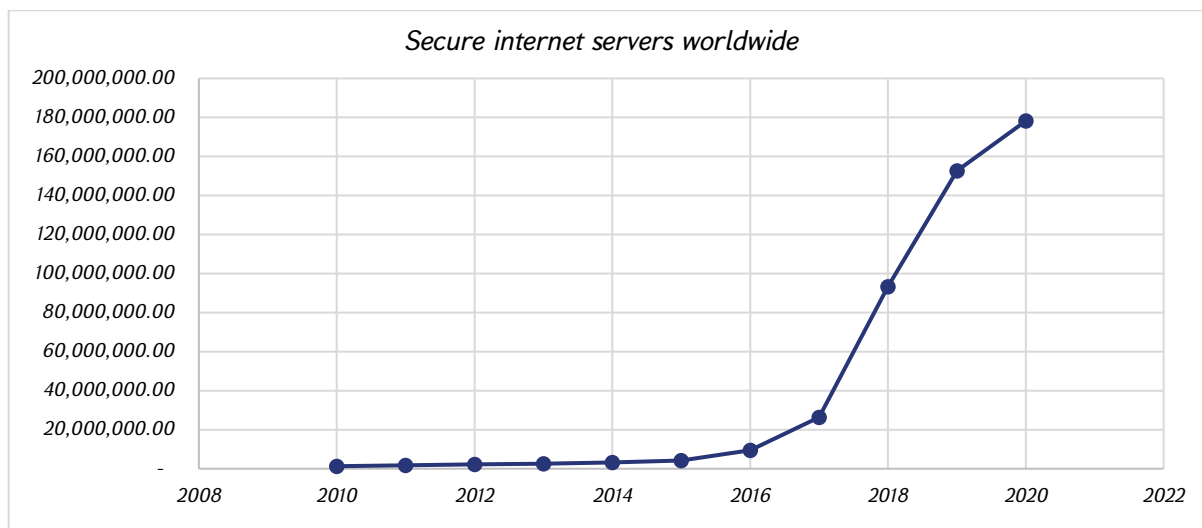
Figure 1. **Secure internet servers**

Financial institutions and organizations interconnect the multiple social media accounts of their current and future customers. This approach helps AI-classified systems to interact with vast amounts of data, thereby enhancing their capabilities and becoming 'smarter'. Data from these sources comes in a non-structured manner and are raw data. So, to measure such risk factors, experts have coined a variety of algorithms, including RepRisk, Truvalue Labs, and Arabesque S-Ray. AI is used in businesses often as a major or the only tool to assess and forecast future performance[3].

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[1] Chi Chan, Dr Christine Chow, Janet Wong, Nikolaos Dimakis, and others, Artificial intelligence applications in financial services: asset management, banking and insurance, 2019, p. 9.

[2] FIS (2018). Readiness Report 2018: The Pursuit of Growth across Asset Management. Retrieved from https://www.fisglobal.com/-/media/fisglobal/files/pdf/report/the-readiness-report-2018-the-pursuit-ofgrowth.pdf

[3] Dan Esty, Todd Cort, The Journal of Environmental Investing, State of ESG Data and Metrics, Volume 8, No. 1, (2017), p. 120, https://www.thejei.com/wp-content/uploads/2017/11/Journal-of-Environmental-Investing-8-No.-1.rev_-1.pdf

In your view, what are the greatest risks of your organisation associated with AI adoption?

Risk	Percentage
Rgulatory noncompliance	16.10%
Ethical risks	16.60%
Losing customer trust	17.60%
Workforce/labour displacement	19.50%
Legal responsibility from AI decisions	32.20%
Failure of AI system	40.50%
Security and privacy breaches	46.80%

*Figure 2. **Risks associated with AI adoption**[1]*

This kind of strategy lets them make questionable decisions. For example, when a company invests its savings in something, there might be several alternatives simultaneously. While some of those circumstances could result in success, others might not. The ultimate outcome, or return on investment optimized by corporations, depends on various factors, including but not limited to the actions of managers, external market forces, climate change, and the political environment, etc. It is unattainable for humans because no individual or group of people can process enough data, synthesize the results, and make reasonable conclusions. Thus, artificial intelligence can take its predicted value from various data sources, including YouTube, academic articles and publications, tweets, leaks, etc. It is also noteworthy that each of these cited data sources influences alpha generation.

The banking system is usually the first thing that comes to mind when discussing AI applications in the financial industry. While it is not the only sector utilizing AI, it is undoubtedly a primary user in the market. However, by 2030, AI participation is expected to reduce costs by 22% and save the whole system more than $1 trillion.

The engagement of AI in the baking system is essential[2]. This means that many banks have begun implementing AI chatbots and virtual assistants in their customer support service. Such a business spends a few million dollars yearly on staff training, providing the necessary paperwork and recommendations for assistance, etc. Moreover, the whole process should be automated to pay exclusively for system maintenance.

Decision-making systems for granting credit are being implemented based on artificial intelligence in banks and other financial institutions. Calculations demonstrate that 94% of credit analysis results are correct[3].

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[1] Banking on a game-changer: AI in financial services, The Economist Intelligence Unit Limited, 2022, pp. 5.

[2] The Financial Brand (2018). Artificial Intelligence and The Banking Industry's $1 Trillion Opportunity. Retrieved from https://thefinancialbrand.com/72653/artificial-intelligence-trends-bankingindustry/

[3] Chi Chan, Dr Christine Chow, Janet Wong, Nikolaos Dimakis, and others, Artificial intelligence applications in financial services: asset management, banking and insurance, 2019, p. 20.

All the above-mentioned facts indicate that many financial institutions heavily invest in this technology. Recent data shows that VC investments into AI, especially in the field of financial and insurance services, have grown a lot and reached 20 billion and more:
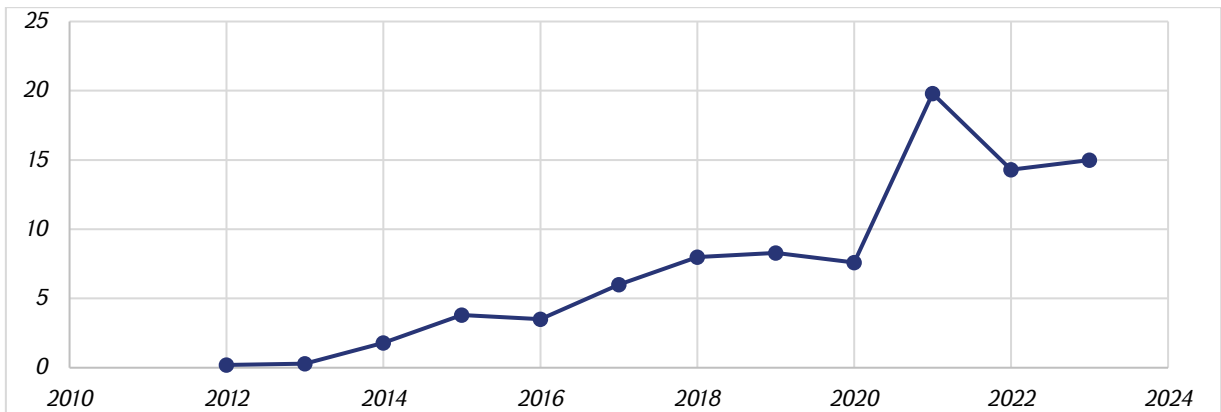
Figure 3. VC investments in AI (Financial and Insurance services), USD millions

With the use of technology in finance and banking, an increase is also seen in the number of banking frauds and scams. Analytic firms have observed an annual increase of over 40% in this field. As a result, the highest priority is placed on fraud mitigation in banks and other financial organizations. It should be noted that traditional methods of combating fraud are ineffective, as they can only catch a small fraction of cases. One of the most helpful tools here is AI. It is not surprising that among all AI use cases, fraud detection undoubtedly ranks as a top priority in banking. AI's capability to analyze millions of data points enables it to detect fraudulent transactions that a human cannot detect.
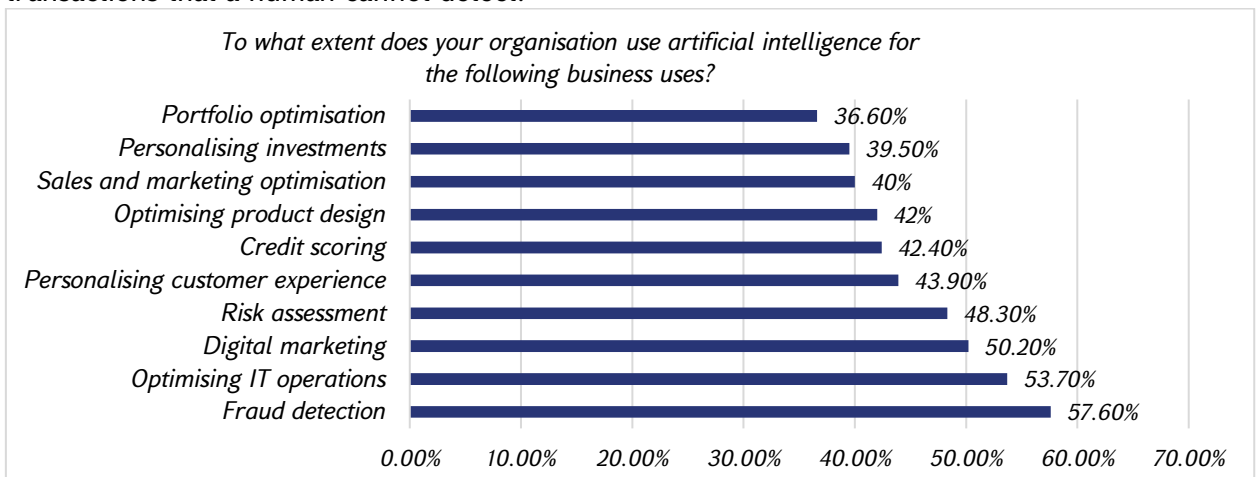
Figure 4. AI use in organizations[1]

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[1] Banking on a game-changer: AI in financial services, The Economist Intelligence Unit Limited, 2022, pp. 3.

All financial organizations encounter significant issues regardless of the niche, and practically all the study articles indicate that AI applications are more beneficial. Accordingly, every AI algorithm must first undergo extensive training and use much data.

All data should be included in a single pool or database, which is sourced from various origins, each with its unique structure. Secondly, there should be a uniform policy for data access. Lastly, a regulatory body should oversee this process. All businesses, particularly those in the financial industry, aim to integrate as much technology as possible into their business activities. However, many employees perceive this integration as a threat rather than a support. Therefore, senior management must convincingly demonstrate to their staff why AI should be there to supplement them. Different genders may approach this issue differently.
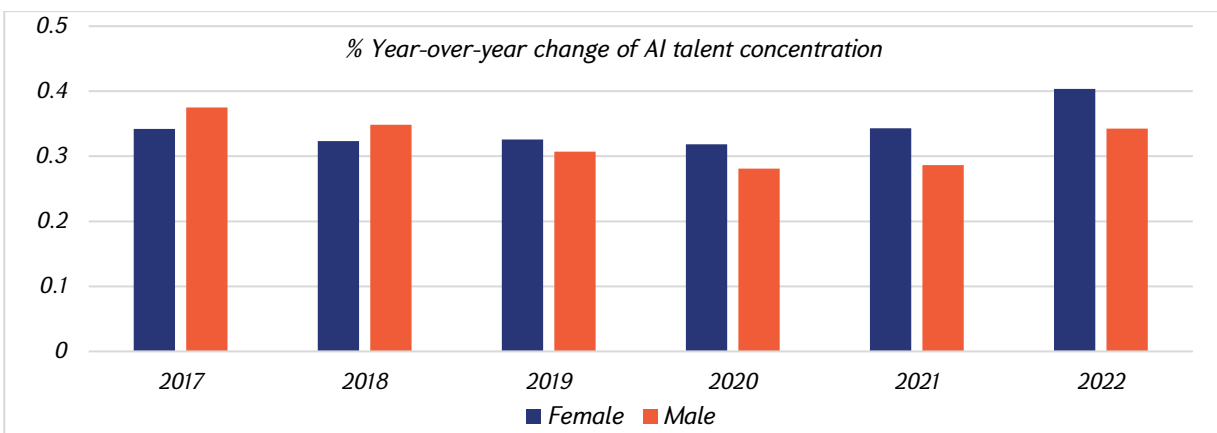
Figure 5. AI talent change

Elsewhere, the issue of gender is seen in how different genders perceive AI. As you can see, over the past 5-6 years, females have shown more interest in AI jobs than men. However, upon closer examination, we observe a significant increase in the number of jobs related to AI in recent years:
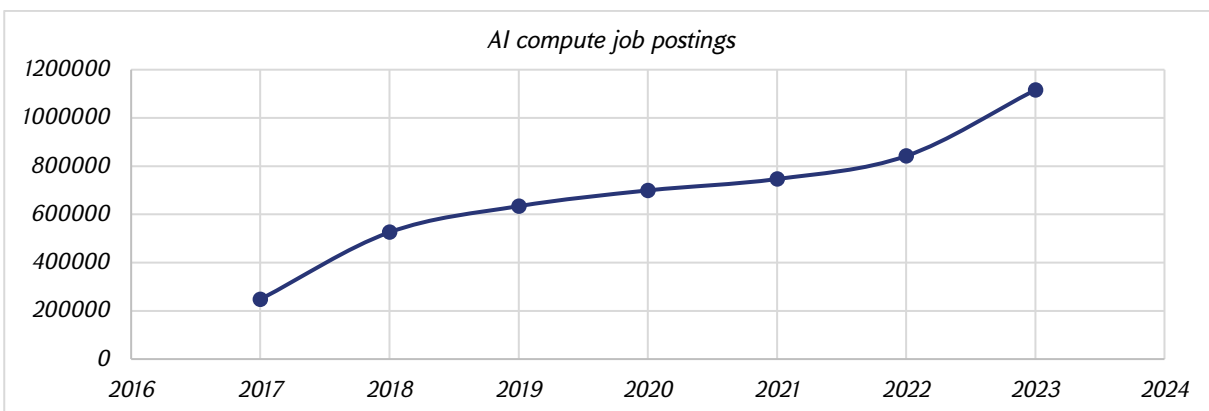
Chart 6. AI job postings

However, there is a more complicated challenge that we still do not know how to solve, which is the ethical part of using AI in the financial sector. Despite all the mentioned challenges, serious problems still require solutions from experts. So, while discussing the question, we should consider whether the AI algorithms are reliable, work transparent and have just goals. Certainly, each financial institution addresses such concerns individually[1]. Therefore, they should believe in the efficiency of those algorithms when integrating AI-driven systems. Not in vain, many academics believe that ML models, despite the most efforts, may provide biased and discriminatory findings toward definite groups of individuals. In connection to that, it is worth noting that ML models are usually trained based on high-quality data so that they would provide the most correct results. However, in practice, it is likely to have access only to insufficient data. Hence, many questions will arise in their assessments. AI applications, while offering advantages, also come with disadvantages. To exemplify, it obliterates competition. Companies driving on big data and using AI technologies have the upper hand over their rivals[2].

Conclusion. The financial sector has undergone enormous development in recent times due to the introduction of artificial intelligence technologies. Like any other novelty technology, AI has brought both positive results and difficulties.

The first question regards the ethical aspect of AI in finance. In fact, the use of AI in decision-making can lead to biased or discriminatory outcomes. This poses more concern, considering that financial decisions are very sensitive and may potentially affect societal welfare at large. In this regard, it is necessary to guarantee that AI systems will be designed, developed, and implemented ethically.

Another issue is security. Due to the huge amount of sensitive data that banks access and store while using artificial intelligence, they can easily become targets for cyber-attacks. Therefore, every organization involved should do its best to ensure customer data safety.

The objectivity that AI relies upon to make decisions is also a significant point of contention. While AI is supposed to make objective conclusions from defined facts, it only draws its objectivity from the data that it is being fed. To prevent this, AI systems should be exposed to many representative and diversified datasets that will eliminate the bias.

Despite these challenges, numerous benefits accrued from the use of AI in banking. Thanks to AI applications in finance, firms operating in the sector can make decisions much faster than before, perform operations at lower costs, and significantly enhance the level of customer experience they provide. In this regard, the development and utilization of artificial intelligence in finance are critical to the growth and success of the industry.

Despite these challenges, numerous merits accrued to the use of AI in banking. Thanks to AI applications in finance, firms working in this sector will be able to stem their decisions

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[1] White & Case (2017), Algorithms and bias: What lenders need to know
https://www.jdsupra.com/legalnews/algorithms-and-bias-what-lenders-need-67308/
[2] ACPR (2018), Artificial intelligence: challenges for the financial sector
https://acpr.banque-france.fr/sites/default/files/medias/documents/analyse_et_synthese_public_en.pdf

remarkably faster than before, perform at smaller costs the same operations they have always done, and bring to a maximum order of magnitude the level of customer experience they provide. In this regard, the development of uses of artificial intelligence in finance is critical to the growth and success in the industry.

With the rapid evolution of AI technology, academe and industry professionals must work hand in hand to overcome difficulties and achieve the benefits brought upon by the disruptive technology early. The earlier we realise how to regulate it, the earlier we will harness the benefits as we mitigate problems that may arise.

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ROXANA-GABRIELA MOZOLEA
PhD Student, Alexandru I. Cuza University
Finance Department, Faculty of Economics and
Business Administration, Iasi, Romania

THE DRIVERS (PREDICTORS) OF GREEN MANAGEMENT PRACTICES AND GREEN INVESTMENT. EMPIRICAL EVIDENCE FROM CENTRAL AND EASTERN EUROPEAN FIRMS

There is a continuous need to understand and develop green practices and investments in order to emphasize the environmental focus. This article's purpose is to analyze how firms from Central and Eastern Europe approach the topic of green management and to correlate their decisions with their eco- friendly actions. The methodology applied is in binary logistic regression and our data sample consists of

5.472 businesses from 12 countries. The results show us firms that have mentioned objectives regarding ecological aspects in their strategy and have set up a management position dedicated to those objectives, are more likely to monitor their energy consumption, to set targets on energy consumption and CO_2 emissions and to invest in more eco-friendly machinery or heating and cooling devices. On the other hand, if they are experiencing losses due to pollution, there is no significant probability to implement the above-stated actions. This paper offers interesting implications for stakeholders and managers to understand the predictability of their actions and to assess in depth the correlations between inside firm actions.

Introduction. The accelerated effects of climate change have encouraged an increasing number of both public and private entities, as well as international organizations, to develop and implement green management practices. The aim of this study is to identify and evaluate the drivers of green management practices and green investment using 5.472 firms' data from 12 Central and Eastern European countries: Albania, Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, Estonia, Lithuania, and Latvia. The data sample subject of our paper was accessed through the EBRD-EIB-WBG Enterprise Surveys conducted in 2018-2020 that covered almost 28,000 enterprises in 41 economies of EU, Eastern Europe, Central Asia and the Middle East and North Africa.

The statistical model is developed based on the objectives of this study, respectively, understanding the drivers of green management practices and green investment regarding two core aspects: monitorization and targets on energy and CO2 and resource allocation for upgrading eco related aspects. The dependent variables are focused on internal monitorization,

external audits, implementing targets and investments that focus on environmental benefits. As drivers of the above, there were selected 7 variables that we tested through binary logistic regression: if the firms have a written business strategy, if the business strategy includes aspects regarding environmental issues, if there exists a management position devoted to environmental issues, if there exist investments in R&D inside or outside the business, if there exist losses caused by pollution or by extreme weather events.

The results show that the drivers (predictors) that have significant predictability likelihood on both management practices and green investment are the presence of a management position devoted to environmental issues and strategic objectives that mention environmental or climate change issues. With less predictability intensity are the R&D investments in the business, the written business strategy, and the losses from extreme weather events. Investments in R&D outside the business have a lower predictability power on the majority of the selected dependent variables. On the other hand, the losses from pollution either are non-significant in our model, or they reduce the likelihood to adopt green practices or investments.

This study highlights the main predictors of green management practices and green investment from Central and Eastern European firms, with significant implications for practitioners. Companies are accountable for not just making profit, but also for improving the society and the economy in a way that is environmentally friendly and that is why it is essential to understand what internal aspects have positive influence on the "green" oriented actions and sustainability. Understanding which aspects of the firms can increase the predictability of green practices or investments can create a model in which actions are strongly related and emphasized with a focus on environmental aspects.

The paper is organized as follows. Section II is based on the analysis of existing literature regarding green management practices and the third part describes the data and methodology employed in the empirical study and the motivation. Section IV presents the empirical results and the final part highlights the conclusions, the limitations and future research opportunities.

Literature review. In a broad sense, sustainable investments describe responsible investments, socially conscious investments, and investments with an eye toward the environment (Utz et al., 2015). The term "*green*" is a very broad definition for numerous types of activities and assets, either by absolute ideas (a technology is green or not green) or by the relative idea (firm X has lower CO2 emissions than firm Y). Regarding some industries (such as renewable energy), products (such as renewable energy credits), services (such as waste management), and technologies, there appears to be a sizable common intersection of the different definitions that are in the existing literature.

The effects of climate change on institutional asset allocation are assessed by Mercer (2011). It indicates that traditional strategic asset allocation (SAA) does not take climate change into account. Three dimensions make up an evaluation framework for climate change risk: low-carbon technology; the effects of climate change; and the price of emissions brought on by policy changes. The use of green investments to strengthen sustainable development and

address environmental issues results in changes in consumer behavior, as more and more consumers choose to purchase organic over conventional goods (Yen, 2018). In addition, companies whose management inform society of the advantages of the green investments they make are more likely to attract investors (Martin & Moser,2016).

Using green technology reduces specific taxes, helps in meeting customer demands to consume green products and protect the environment, and rises the stakeholder satisfaction, especially investor satisfaction, these being just a few of the benefits of implementing green investments. The reasons for making green investments vary as well. Understanding the various driving forces behind green investors is crucial because it will influence how they define and interpret the term "green investment".

Earlier studies have examined the effects of green practices on organizational performance and identified both beneficial and significant correlations between them (Cankaya & Sezen, 2019). However, there are several internal and external aspects that encourage firms to go green and thereby enhance their performance in terms of sustainability. Even though there are numerous external and internal drivers that influence the investments and practices regarding environmental actions, it's complicated to assess them, especially regarding the strength and feasibility (Table 1).

Table 1

Classification of the drivers of sustainable supply chain management

External Drivers	Internal Drivers
Market Pressure	Corporate Strategy
Social Pressure	Organization's Culture
Regulatory Pressure	Organizations' Resources
	Organizations' Characteristics

Source: Saeed & Kersten, 2019

Enterprises that rely on external inputs to change, take advantage of possibilities by making more sustainable investments. According to a study that examined over 5300 investment decisions at the level of 462 companies in the field of energy efficiency showed that there is no impact in using simultaneously internal and external change agents, on the effect of external drivers (Hoppman et al., 2018). Government pressure, competitor pressure, consumer pressure, and supplier pressure are the primary external variables affecting green investment (Paul et al., 2017).

According to Du et al. (2019), the main factors influencing green investments are political, economic, and environmental. By building infrastructure and putting laws and norms into place to safeguard the environment, political issues have a significant impact on green investments. These include environmental taxes, giving discounts to customers who purchase organic items, providing subsidies to businesses, making green investments, and finding businesses that violate pollution restrictions.

One of the most important topics in the literature on corporate sustainability is what motivates businesses to invest in activities linked to sustainability (Bansal & Roth, 2000; Ervin et al., 2013). Most studies assume that businesses are more motivated to invest in sustainable activities if there is a direct economic benefit like cost reduction or profit increase. For example, energy efficiency measures contribute both to helping the environment and to the business financials, but not all companies choose to do this kind of investments even though there are plenty of benefits in doing so. (Lyneis & Sterman, 2016; Backlund et al., 2012).

According to Marcus and Geffen (1998), a company's internal capabilities (such as organizational learning and looking for outside people, technology, and ideas) can aid in the acquisition of external skills, which are then helpful in enhancing environmental performance. Process innovation and implementation are necessary for pollution avoidance technologies to provide the firm with a low-cost advantage (Christmann, 2000). According to Sharma et al. (2004) organizations that can integrate shareholders, organizational learning, cross-functional integration, continuous innovation, shared vision, and strategic proactivity are more likely to develop green strategies.

The existing studies analyze from numerous perspectives the green actions that companies perform to fight the climate changes. In addition, we can subtract the drivers that give the highest impulses to implement green practices and investments. On the other hand, up to my knowledge, there isn't any existing study pointing to main drivers (predictors) to impact green investments and practices in the businesses in Central and Eastern European countries.

Data & Methodology. The European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB), and the World Bank Group collaborated to create the EBRD-EIB-WB Enterprise Surveys. Nearly 28,000 businesses were surveyed as part of the EBRD-EIB-WBG Enterprise Surveys between 2018 and 2020 in 41 countries across the EU, Eastern Europe, Central Asia, the Middle East, and North Africa. The Green Economy module of the EBRD-EIB-WBG Enterprise Surveys covered green investments and green management techniques.

After data cleaning procedures and selection of the firms from Central and Eastern European countries (Albania, Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, Estonia, Lithuania, and Latvia), the data sample consists in information for 5.742 businesses.

The purpose of the survey is to gather opinions from businesses about how they view the environment in which they operate in EBRD operational countries (and beyond), as well as to contribute to the development of a panel of business data that will enable the monitoring of changes in the business environment over time.

The statistical model applied in this study is **binary logistic regression** which predicts the probability that an observation falls into one of two categories of a dichotomous dependent variable. In regression analysis, logistic regression (also known as logit regression) estimates a logistic model's parameters (the coefficients in the linear combination). In binary logistic regression, there is a single binary dependent variable with two values denoted by the numbers

"0" and "1," whereas the independent variables can each be either binary variables or continuous variables (any real value). The choice of this model is based on the format of the data, mainly questions with Yes/No answers.

The article model is developed in accordance with our motivation: to understand which are the internal drivers of the businesses from CEE selected countries regarding green management practices and investments. We selected 7 independent variables (IV) as internal drivers that may influence the environmental-oriented actions: if the firms have a written business strategy, if the business strategy includes aspects regarding environmental issues, if there exists a management position devoted to environmental issues, if there exits investments in R&D inside or outside business, if there exist losses caused by pollution or by extreme weather events.

The chosen dependent variables (DV) focus on 7 important aspects regarding green practices and investments: if businesses monitor the energy consumption, if there exist targets for energy consumption and on CO_2 emissions and if they allocated resources to heating and cooling improvements, climate-friendly energy, machinery upgrades or energy management.

Motivation. The motivation of this article focuses on the need to understand if there are internal drivers that may influence green investments and practices for the businesses in Central and Eastern European countries. The objective of this study is to assess if particular actions inside the firm have the capacity to predict on specific environmental aspects and to provide an answer for the question: do any of the selected independent variables predict the probability of the actions from dependent variables?

In this study, I have identified two primary directions: green investments, focused on upgrades or changes and green practices that analyze and constantly evaluate the consumption and the pollution made during the firms' activity.

Independent Variables (Yes/No ?)	Dependent variables (Yes/No ?)
Does Firm have Formalized Written Business Strategy?	Over Last 3 Years, Did This Establishment Monitor Its Energy Consumption?
In Last FY, Strategic Objectives Mention Environmental or Climate Change Issues?	Over Last 3 Years, Did This Establishment Have Targets On Energy Consumption?
In Last FY, Have Manager Responsible For Environmental or Climate Issues?	Did This Establishment Have Targets For CO2 Emissions?
During Last 3 Yrs, Establishment Spent On R&D Within The Establishment?	Over Last 3 Years, Adopt Heating And Cooling Improvements?
During Last 3 Yrs, Establishment Spent On R&D Contracted Outside Establishment?	Over Last 3 Years, Adopt More Climate- Friendly Energy Generation On Site?
Over Last 3 Years, Experienced Monetary Losses Due To Extreme Weather Events?	Over Last 3 Years, Adopt Machinery Upgrades?
Over Last 3 Years, Experienced Monetary Losses From Pollution?	Over Last 3 Years, Adopt Energy Management?

IV predict the actions from DV

Results.

Descriptive statistics. The first part of the analysis consists of data understanding, the qualitative information, and the distribution across clusters, considering both the whole sample and the split by country. In the sample we have 1.215 large firms, 1.706 medium firms and 2.551 small firms (Figure 1), the distribution across countries being uneven (Figure 2). The highest number of surveyed businesses is from Poland (1.001) and the lowest number is from Estonia (254).

Figure 1. **Number of firms by size**
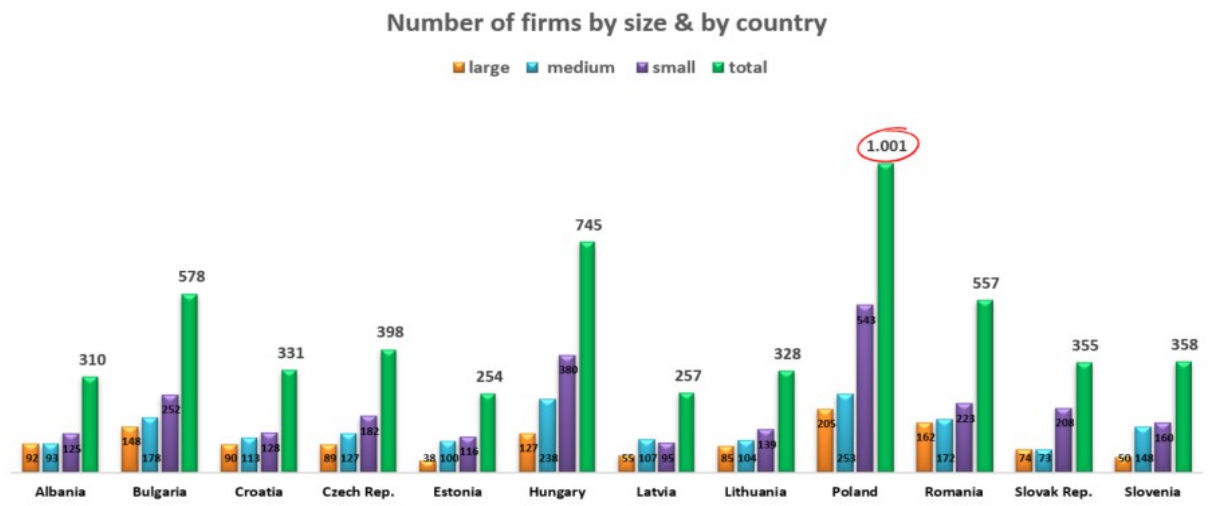
Figure 2. **Number of firms by size & by country**

The highest number of firms, 1.244, are in the *other services,* followed by *retail, manufacturing, food & beverages,* with the lowest number, 97, being in the *textile* industry (Figure 3).
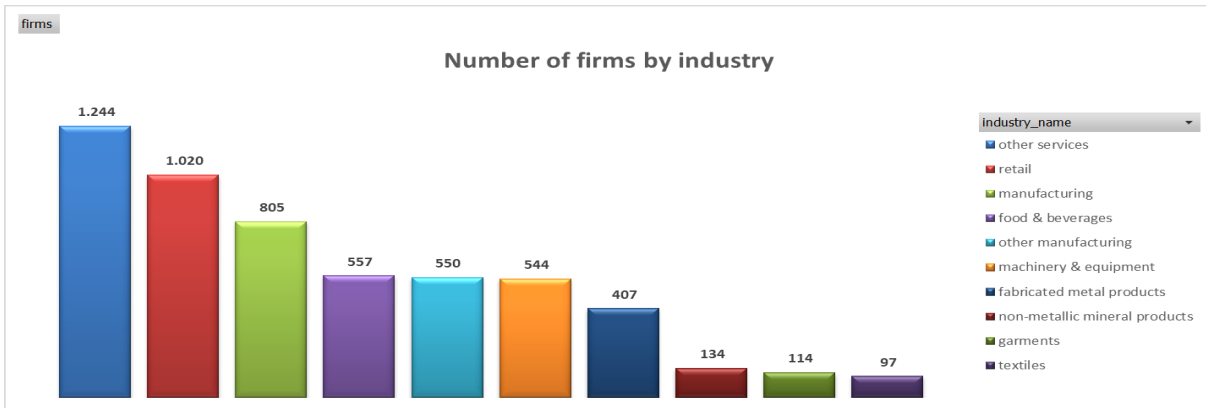
Figure 3. *Number of firms by industry*

A key aspect in developing our analysis and our statistical model is understanding the distribution of the answers from the independent and dependent variables (Figure 4 and Figure 5).

Around 40% of the surveyed businesses have a written strategy, but only 23% of them include in their objectives a focus on environmental aspects and only 15% of the firms have a dedicated manager for green aspects. 18% of them invest in R&D inside the business and 9% invest in R&D outside the business. The percentages of the interviewed companies that experienced losses due to extreme weather events or pollution are only 10%, respectively 2%.

By analyzing the green practices and investments, we can observe that 57% of the firms monitor their energy consumption, but only 30%, respectively 7%, have targets on energy consumption and on CO_2 emissions. 38% of businesses adopt heating and cooling improvements, 14% of them adopt more climate-friendly energy generation on-site and 30% adopt energy management. The highest percentages of green investments are observed in machinery upgrades with 51%.

Firms with strategic objectives on environmental aspects
- yes: 23%
- no: 77%

strategic_environment ▾

Firms with a dedicated manager for environmental aspects
- yes: 15%
- mo: 85%

environment_manager ▾

Firms with losses due to extreme weather
- yes: 10%
- no: 90%

losses_weather ▾

Firms with losses due to pollution
- yes: 2%
- no: 98%

losses_pollution ▾
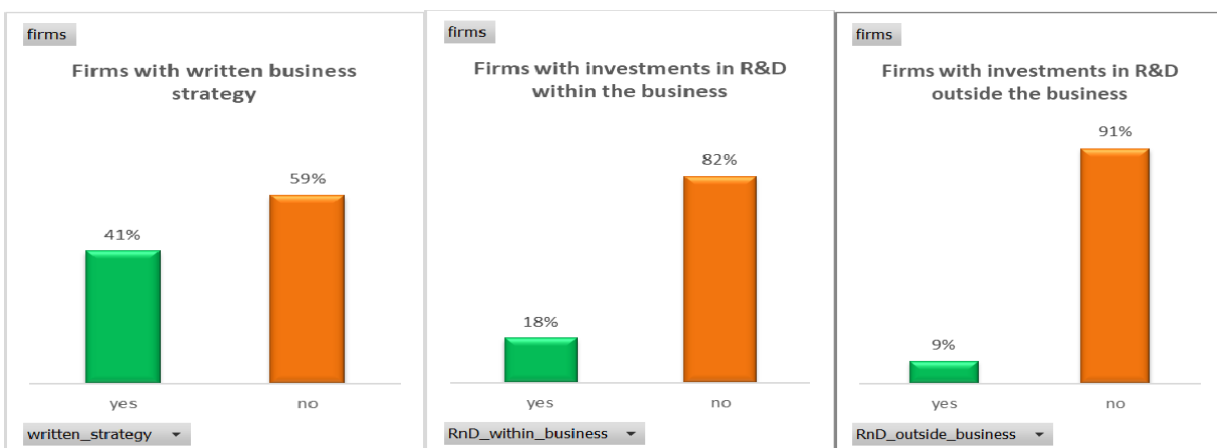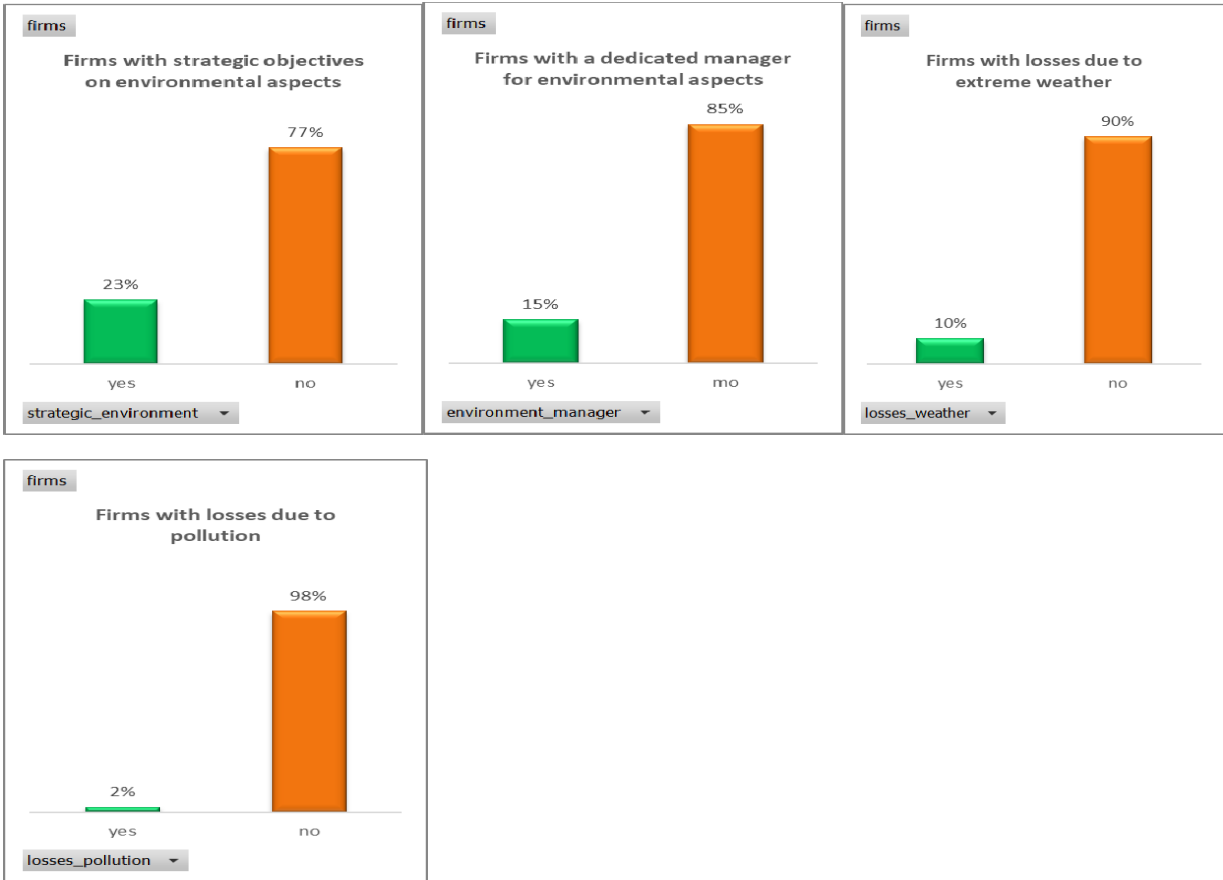
Figure 4.   Distribution of answers from the independent variables

Firms that monitor energy consumption
- yes: 57%
- no: 43%

monitor_energy_consumption ▾

Firms that have tragets on energy consumption
- yes: 30%
- no: 70%

targets_energy_consumption ▾

Firms that have tragets on CO2
- 1: 7%
- 2: 93%

targets_CO2 ▾
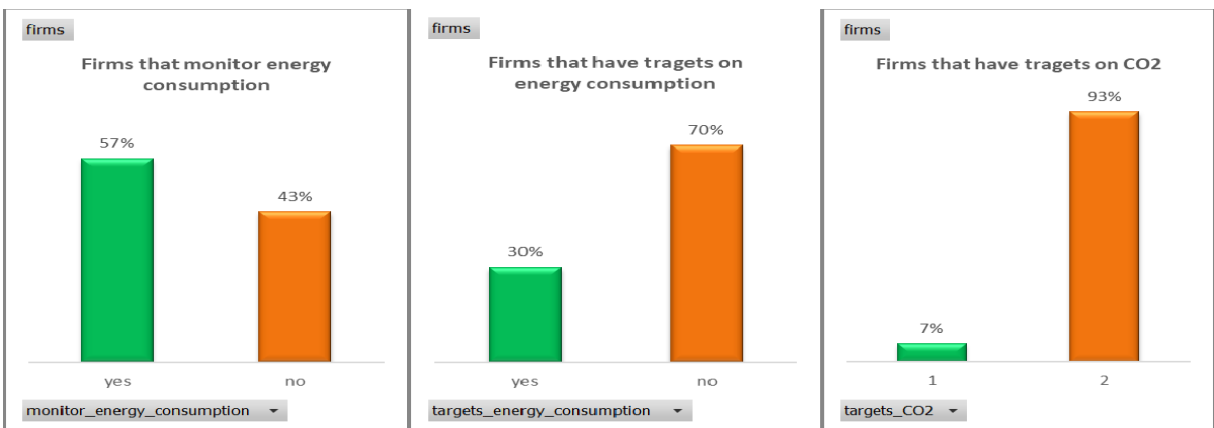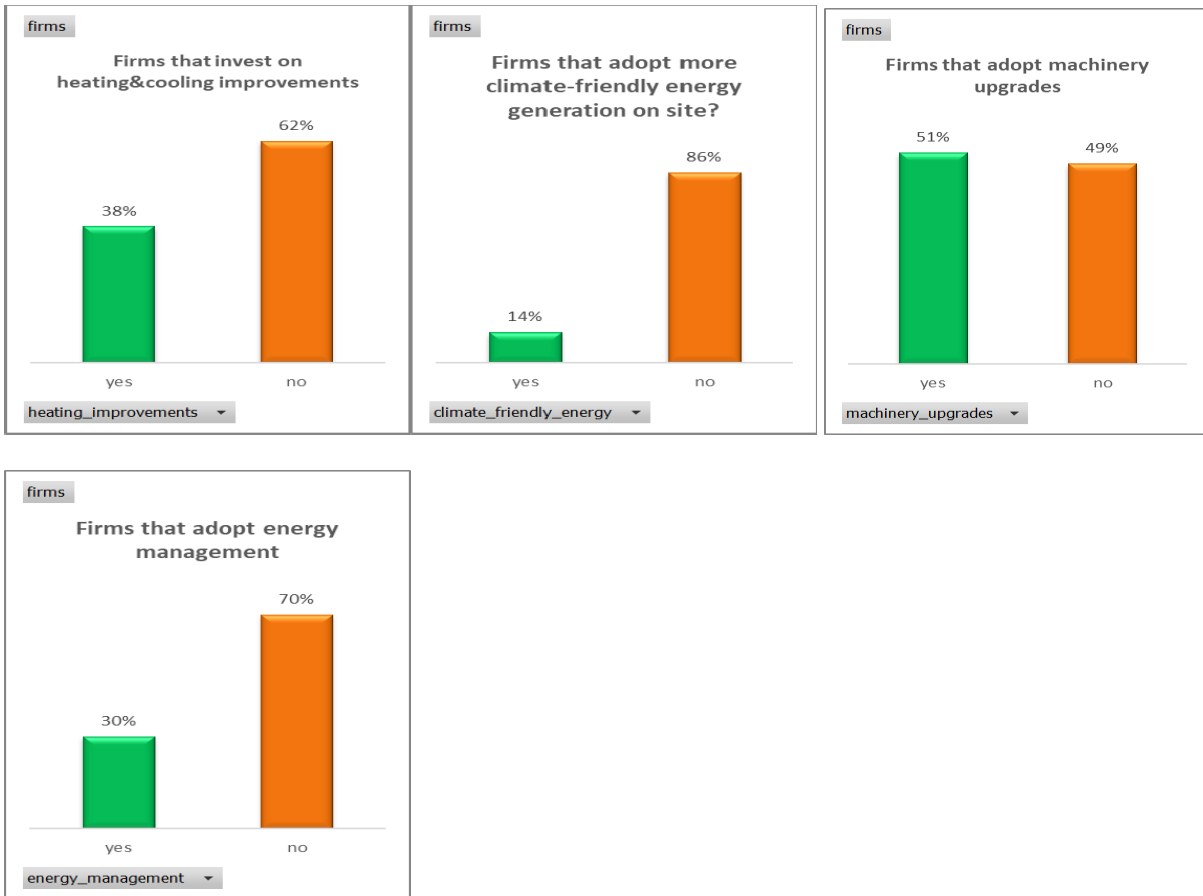
Figure 5. Distribution of answers from the dependent variables

Binary logistic regression. In this part of the study will be presented the results of the binary logistics regression applied for each of the selected dependent variables.

1. Over last 3 years, did this establishment monitor its energy consumption?

Research question: Can we predict if the establishment did monitor its energy consumption based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

Table 2

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.301	.027	121.361	1	.000	1.352

Table 3

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	589.514	7	.000
	Block	589.514	7	.000
	Model	589.514	7	.000

We can observe a statistically significant result in Sig. value, lower than 5% (Table 2.). The overall model is statistically significant, $\chi2(7) = 589.514$, p < .05 (Table 3.).

Table 4

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	6873.548a	.102	.137

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Both Cox & Snell and Nagelkerke R Square values, which are used to calculate the explained variation, are listed in Table 4. Sometimes referred to as "pseudo R2 values," these values are interpreted the same, the explained variation in the dependent variable based on our model ranges from 10,2% to 13,7%, depending on whether we reference the Cox & Snell R2 or Nagelkerke R2 methods, respectively.

Table 5

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	4.994	5	.417

The Hosmer-Lemeshow test examines the null hypothesis that the model's predictions match the observed group memberships exactly. When comparing the observed frequencies to those predicted by the linear model, a chi-square statistic is calculated. A non-significant chi-square and Sig mean that the data were well fitted to the model (Table 5).

Table 6

Classification Table^a

	Observed		Predicted		Percentage Correct
			monitor_energy_consumption		
			no	yes	
Step 1	monitor_energy_consumption	no	1310	1017	56.3
		yes	1014	2131	67.8
	Overall Percentage				62.9

a. The cut value is .500

With the independent variables added, the model now correctly classifies 62,9% of cases overall (see "Overall Percentage" row) à Percentage accuracy in classification.

- 67,8 % of businesses that monitor the energy consumption were also predicted by the model to monitor the energy consumption (see the "Percentage Correct" column in the "Yes" row of the observed categories) - Sensitivity
- 56,3 % of businesses who did not monitor the energy consumption were correctly predicted by the model not to monitor the energy consumption (see the "Percentage Correct" column in the "No" row of the observed categories) - Specificity

<div align="right">Table 7</div>

Categorical Variables Codings

		Frequency	Parameter coding (1)
written_strategy	no	3210	1.000
	yes	2262	.000

Table 7 shows us that the written strategy was parameter coded as no (1) = 1 and yes (1)=0.

<div align="right">Table 8</div>

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	written_strategy(1)	-.316	.062	25.945	1	.000	.729	.645	.823
	RnD_within_business	**.790**	**.097**	**66.685**	**1**	**.000**	**2.204**	1.823	2.665
	RnD_outside_business	.600	.146	16.939	1	.000	1.821	1.369	2.423
	strategic_environment	.428	.087	24.452	1	.000	1.534	1.295	1.818
	environment_manager	**.758**	**.109**	**48.594**	**1**	**.000**	**2.134**	1.724	2.641
	losses_weather	**.793**	**.116**	**47.023**	**1**	**.000**	**2.210**	1.762	2.773
	losses_pollution	-.025	.231	.012	1	.913	.975	.620	1.534
	Constant	.084	.055	2.309	1	.129	1.088		

a. Variable(s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution.

As Table 8. presents, The Wald test ("Wald" column) is used to determine statistical significance for each of the independent variables. The statistical significance of the test is found in the "Sig." column. From these results you can see that written strategy (p = .000), R&D within the business (p = .000), R&D outside the business (p= .000), strategic_environment (p= .000),

environment_manager (p= .000) and losses_weather (p = .000) added significantly to the model/ prediction, but losses_pollution (p = .913) did not add significantly to the model.

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and of the experienced losses due to extreme weather or pollution on the likelihood that participants did monitor the energy consumption in the last 3 years. The logistic regression model was statistically significant, $\chi^2(7) = 589.514$, $p < .05$. The model explained 13,7 % (Nagelkerke R^2) of the variance in monitoring energy consumption and correctly classified 62,9% of cases.

Firms without a written business strategy were associated with a reduction (0.729) in the likelihood of monitoring energy consumption. On the other hand, firms that invest in R&D within and outside the business are 2.204, respectively 1.821 times more likely to monitor their energy consumption. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (1.534), a dedicated manager for environmental issues(2.134) and that have experienced losses due to extreme weather events(2.210). However, the losses due to pollution have no statistically significance on the model (Sig = .913).

2. Over last 3 years, did this establishment have targets on energy consumption?

Research question: Can we predict if the establishment has targets on energy consumption based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

We will apply the same binary logistic regression interpretation as in the subchapter 1.

Table 9

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.829	.029	795.055	1	.000	.437

Table 10

Omnibus Tests of Model Coefficients

		Chi - square	df	Sig.
Step 1	Step	914.898	7	.000
	Block	914.898	7	.000
	Model	914.898	7	.000

Table 11

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5806.268a	.154	.218

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 12

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	13.687	5	.018

Table 13

Classification Table[a]

	Observed		Predicted		
			targets_energy_consumption		Percentage Correct
			no	yes	
Step 1	targets_energy_consumption	no	3536	273	92.8
		yes	1109	554	33.3
	Overall Percentage				74.7

Table 14

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	written_strategy	.624	.067	85.846	1	.000	1.866	1.636	2.130
	RnD_within_business	.602	.091	44.281	1	.000	1.827	1.530	2.181
	RnD_outside_business	.247	.123	4.037	1	.045	1.280	1.006	1.627
	strategic_environment	1.062	.082	166.939	1	.000	2.892	2.461	3.397
	environment_manager	.597	.096	38.983	1	.000	1.817	1.507	2.192
	losses_weather	.611	.105	33.568	1	.000	1.842	1.498	2.265
	losses_pollution	-.366	.210	3.037	1	.081	.694	.460	1.047
	Constant	-1.706	.049	1199.733	1	.000	.182		

a. Variable(s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution.

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and of the experienced losses due to extreme weather or pollution on the likelihood that participants have targets on energy consumption in the last 3 years. The logistic regression model was statistically significant, $\chi 2(7) = 914.898$, $p < .05$. The model explained 21,8% (Nagelkerke R^2) of the variance in targets on energy consumption and correctly classified 74,7% of cases.

Firms with a written business strategy were associated with an increase (1.866) in the likelihood of having targets on energy consumption. Firms that invest in R&D within and outside the business are 1.827, respectively 1.280 times more likely to target their energy consumption. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (2.892), a dedicated manager for environmental issues (1.817) and that have experienced losses due to extreme weather events (1.842). On the other hand, the losses due to pollution have no statistically significance on the model (Sig = .081).

3. Did this establishment have targets for CO2 emissions?

Research question: Can we predict if the establishment has targets for CO2 based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

We will apply the same binary logistic regression interpretation as in the subchapter 1.

Table 15

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-2.618	.054	2376.513	1	.000	.073

Table 16

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	535.099	7	.000
	Block	535.099	7	.000
	Mode l	535.099	7	.000

Table 17

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	2183.266a	.093	.238
a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.			

Table 18

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.465	5	.092

Table 19

Classification Table^a

	Observed			Predicted		
				taregets_CO2		Percentage correct
		no		no	yes	
Step 1	taregets_CO2			5094	6	99.9
		yes		367	5	1.3
	Overall Percentage					93.2
a. The cut value is .500						

Table 20

Variables in the English

		B	S.E	WALD	df	Sig.	Exp(B)	95% C.I. for EXP (B)	
								lower	upper
Step a	written_strategy	.524	.133	15.621	1	.000	1.689	1.302	2.189
	RnD_within_business	.415	.144	8.259	1	.004	1.514	1.141	2.010
	RnD_outside_business	.262	.170	2.371	1	.124	1.299	.931	1.814
	strategic_environment	1.419	.144	97.535	1	.000	4.134	3.119	5.479
	environment_manager	.926	.136	46.377	1	.000	2.524	1.933	3.294
	losses_weather	.441	.157	7.905	1	.005	1.555	1.143	2.115
	losses_pollution	.441	.248	3.173	1	.075	1.555	.957	2.527
	Constant	-4.033	.118	1174.101	1	.000	.018		

a. Variables (s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the firm, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and the experienced losses due to extreme weather or pollution on the likelihood that participants have targets on the CO_2 emissions. The logistic regression model was statistically significant, $\chi2(7) = 535.099$, $p < .05$. The model explained 23,8% (Nagelkerke R^2) of the variance in targets on CO_2 emissions and correctly classified 93,2% of cases.

Firms with a written business strategy were associated with an increase (1.689) in the likelihood of having targets on CO_2 emissions. Firms that invest in R&D within the business are 1.514 times more likely to target their CO_2 emissions. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (4.134), a dedicated manager for environmental issues(2.524) and that have experienced losses due to extreme weather events(1.555). On the other hand, the investments in R&D outside the business and losses due to pollution have no statistically significance on the model (Sig = .913, respectively Sig = .075).

4. Over last 3 years, adopt heating and cooling improvements?

Research question: Can we predict if the establishment adopted heating and cooling improvements based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

We will apply the same binary logistic regression interpretation as in the subchapter 1.

Table 21

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.487	.028	305.621	1	.000	.615

Table 22

Omnibus Tests of Model Coefficients

		Chi- square	df	Sig.
Step 1	Step	532.689	7	.000
	Block	532.689	7	.000
	Model	532.689	7	.000

Table 23

Model Summary

	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
Step 1	6738.382a	.093	.126

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 24

Hosmer and Lemeshow Test

	Chi-square	df	Sig.
Step 1	12.682	5	.027

Table 25

Classification Table^a

	Observed		Predicted		
			heating_improvements		Percentage Correct
			no	yes	
Step 1	heating_improvements	no	2997	392	88.4
		yes	1385	698	33.5
	Overall Percentage				67.5

a. The cut value is .500

222

Table 26

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	written_strategy	.330	.062	28.061	1	.000	1.392	1.231	1.573
	RnD_within_business	**.610**	**.086**	**50.547**	**1**	**.000**	**1.841**	1.556	2.178
	RnD_outside_business	.511	.119	18.426	1	.000	1.667	1.320	2.105
	strategic_environment	**.639**	**.080**	**63.152**	**1**	**.000**	**1.895**	1.618	2.218
	environment_manager	.436	.094	21.702	1	.000	1.546	1.287	1.857
	losses_weather	.385	.101	14.592	1	.000	1.470	1.206	1.791
	losses_pollution	-.257	.199	1.662	1	.197	.774	.523	1.143
	Constant	-1.043	.042	624.108	1	.000	.353		

a. Variable(s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution.

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and of the experienced losses due to extreme weather or pollution on the likelihood that firms have adopted healing and cooling improvements. The logistic regression model was statistically significant, $\chi2(7) = 532.689$, $p < .05$. The model explained 12,6% (Nagelkerke R2) of the variance of firms that have adopted healing and cooling improvements and correctly classified 67,5% of cases.

Firms with a written business strategy were associated with an increase (1.392) in the likelihood that firms have adopted healing and cooling improvements. Firms that invest in R&D within and outside the business are 1.841, respectively 1.667 times more likely to adopt healing and cooling improvements. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (1.895), a dedicated manager for environmental issues(1.546) and that have experienced losses due to extreme weather events(1.470). On the other hand, losses due to pollution have no statistically significance on the model (Sig = .197).

5. Over last 3 years, adopt more climate-friendly energy generation on site?

Research question: Can we predict if the establishment adopted more climate-friendly energy generation on site based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

We will apply the same binary logistic regression interpretation as in the subchapter 1.

Table 27

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-1.832	.039	2184.829	1	.000	.160

Table 28

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	501.238	7	.000
	Block	501.238	7	.000
	Model	501.238	7	.000

Table 29

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	3890.269a	.088	.159

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Table 30

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	6.640	4	.156

Table 31

Classification Table[a]

	Observed		Predicted		Percentage Correct
			climate_friendly_energy		
			no	yes	
Step 1	climate_friendly_energy	no	4697	20	99.6
		yes	740	15	2.0
	Overall Percentage				86.1

a. The cut value is .500

Table 32

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step1a	**written_strategy**	**.438**	**.090**	**23.551**	**1**	**.000**	**1.549**	1.298	1.848
	RnD_within_business	.396	.110	13.070	1	.000	1.486	1.199	1.843
	RnD_outside_business	.125	.139	.812	1	.367	1.133	.863	1.488
	strategic_environment	**1.242**	**.100**	**153.778**	**1**	**.000**	**3.463**	2.846	4.215
	environment_manager	.366	.109	11.337	1	.001	1.441	1.165	1.783
	losses_weather	.200	.127	2.504	1	.114	1.222	.953	1.566
	losses_pollution	.301	.217	1.919	1	.166	1.351	.883	2.069
	Constant	-2.696	.070	1496.708	1	.000	.067		

a. Variable(s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution.

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and of the experienced losses due to extreme weather or pollution on the likelihood that firms have more climate-friendly energy generation on site. The logistic regression model was statistically significant, $\chi2(7) = 501.238$, $p < .05$. The model explained 15,6% (Nagelkerke R2) of the variance of firms that have adopted more climate-friendly energy generation on site and correctly classified 86,1% of cases.

Firms with a written business strategy were associated with an increase (1.549) in the likelihood that firms have adopted more climate-friendly energy generation on site. Firms that invest in R&D within the business are 1.496 times more likely to adopt more climate-friendly energy generation on site. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (3.463) and have a dedicated manager for environmental issues (1.441). On the other hand, investments in R&D outside the business, losses due to extreme weather events and pollution have no statistically significance on the model (Sig = .367; Sig= .114; Sig= .166).

6. Over last 3 years, adopt machinery upgrades?

Research question: Can we predict if the establishment adopted machinery upgrades based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

We will apply the same binary logistic regression interpretation as in the subchapter 1.

Table 33

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.053	.027	3.789	1	.052	1.054

Table 34

Omnibus Tests of Model Coefficients

		Chi- square	df	Sig.
Step 1	Step	631.482	7	.000
	Block	631.482	7	.000
	Model	631.482	7	.000

Table 35

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	6950.531a	.109	.145
a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.			

225

Table 36

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	27.987	5	.000

Table 37

Classification Table^a

	Observed		Predicted		
			machinery_upgrades		Percentage Correct
			no	yes	
Step 1	machinery_upgrades	no	2031	633	76.2
		yes	1289	1519	54.1
	Overall Percentage				64.9

Table 38

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	written_strategy	.277	.061	20.391	1	.000	1.319	1.170	1.488
	RnD_within_business	**.928**	**.093**	**99.066**	**1**	**.000**	**2.530**	2.108	3.038
	RnD_outside_business	.415	.134	9.545	1	.002	1.514	1.164	1.969
	strategic_environment	.553	.084	43.363	1	.000	1.739	1.475	2.050
	environment_manager	**.733**	**.103**	**50.868**	**1**	**.000**	**2.081**	1.701	2.545
	losses_weather	.567	.107	28.065	1	.000	1.762	1.429	2.174
	losses_pollution	-.734	.207	12.583	1	.000	**.480**	.320	.720
	Constant	-.490	.039	159.070	1	.000	.613		

a. Variable(s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution.

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and of the experienced losses due to extreme weather or pollution on the likelihood that firms adopt machinery upgrades. The logistic regression model was statistically significant, $\chi2(7) = 631.482$, $p < .10$. The model explained 14,5% (Nagelkerke R2) of the variance of firms that have adopted machinery upgrades and correctly classified 64,9% of cases.

Firms with a written business strategy were associated with an increase (1.319) in the likelihood that firms have adopted more climate-friendly energy generation on site. Firms that invest in R&D within and outside the business are 2.539, respectively 1.514 times more likely to adopt machinery upgrades. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (1.739), have a dedicated manager for environmental issues (2.081), and for the firms that experienced losses due to extreme weather

events (1.762). On the other hand, losses due to pollution reduce the likelihood to adopt machinery upgrades by 0.480 times.

7. Over last 3 years, adopt energy management?

Research question: Can we predict if the establishment adopted energy management based on if: it has a written business strategy, it invests in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, there exists a management position devoted to environmental issues and it experienced losses due to extreme weather or pollution?

We will apply the same binary logistic regression interpretation as in the subchapter 1.

Table 39

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	-.840	.029	813.178	1	.000	.432

Table 40

Omnibus Tests of Model Coefficients

		Chi- square	df	Sig.
Step 1	Step	720.638	7	.000
	Block	720.638	7	.000
	Model	720.638	7	.000

Table 41

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	5978.835a	.123	.175

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than .001.

Table 42

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	14.703	6	.023

Table 43

Classification Table^a

	Observed		Predicted		
			energy_management		Percentage Correct
			no	yes	
Step 1	energy_management	no	3516	306	92.0
		yes	1107	543	32.9
	Overall Percentage				74.2

Table 44

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
								Lower	Upper
Step 1a	written_strategy	.389	.067	33.707	1	.000	1.476	1.294	1.683
	RnD_within_business	.607	.089	46.492	1	.000	1.835	1.541	2.184
	RnD_outside_business	.310	.120	6.655	1	.010	1.364	1.077	1.726
	strategic_environment	**.861**	**.082**	**110.694**	**1**	**.000**	**2.367**	2.016	2.779
	environment_manager	**.748**	**.094**	**63.312**	**1**	**.000**	**2.112**	1.757	2.539
	losses_weather	.329	.105	9.791	1	.002	1.389	1.131	1.707
	losses_pollution	-.416	.207	4.050	1	.044	**.660**	.440	.989
	Constant	-1.550	.047	1082.366	1	.000	.212		

a. Variable(s) entered on step 1: written_strategy, RnD_within_business, RnD_outside_business, strategic_environment, environment_manager, losses_weather, losses_pollution.

A binary logistic regression was performed to ascertain the effects of written business strategy, investments in R&D inside or outside the business, the business strategy includes aspects regarding environmental issues, a management position devoted to environmental issues and of the experienced losses due to extreme weather or pollution on the likelihood that firms adopt energy management. The logistic regression model was statistically significant, $\chi2(7) = 720.638$, $p < .05$. The model explained 17,5% (Nagelkerke R2) of the variance of firms that have adopted energy management and correctly classified 74,2% of cases.

Firms with a written business strategy were associated with an increase (1.476) in the likelihood that firms have adopted more climate-friendly energy generation on site. Firms that invest in R&D within and outside the business are 1.835, respectively 1.364 times more likely to adopt machinery upgrades. The same increased likelihood can be observed for the firms that have strategic objectives regarding the environment (2.367), have a dedicated manager for environmental issues (2.112), and for the firms that experienced losses due to extreme weather events (1.389). On the other hand, losses due to pollution reduce the likelihood to adopt machinery upgrades by 0.660 times.

Conclusions. People anticipate managers to use resources smartly and responsibly, safeguard the environment, reduce the amount of air, water, energy, minerals, and other materials found in the finished goods people consume, recycle these goods to the fullest extent possible, and reuse them as much as possible rather than depending on nature to resupply them. The requirement for environmentally friendly management is unavoidable from a moral or normative standpoint, and whether becoming green "pays" is only partially relevant (Marcus & Fremeth, 2009).

The need to determine whether there are internal forces that might have an impact on green investments and business practices in countries in Central and Eastern Europe is the motivation behind this article. This study aims to determine whether specific business activities may anticipate certain environmental factors and to answer the question: Which of the chosen independent variables can predict the likelihood of actions from dependent variables?

The findings demonstrate that the presence of a management position dedicated to environmental issues and the presence of environmental or climate change issues in strategic objectives are the drivers (predictors) with significant predictability likelihood on both management practices and green investment. The firm's R&D expenditures, documented business strategies, and losses from extreme weather incidents, all have lower predictability indices. The bulk of the chosen dependent variables is less predictable when R&D investments are made outside of the firm. On the other hand, the costs associated with pollution either don't matter in our model or make adopting green investments or activities less likely.

There are several limitations of this study, mainly due to the chosen variables that may not consist of all essential green practices and investments. For example, the article can be extended by choosing more predictors or other examples of variables, like other environmental targets, diversity of employees, financial practices etc. In addition, there can be extended the sample to other countries in Europe or other continents.

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NERSES NERSISYAN
PhD Student of the Chair of Banking and Insurance of Armenian State University of Economics

BEEKEEPING SECTOR DEVELOPMENT IN RA

The bee provides the opportunity to heal all our ills, That's the bestand little friend that man has on earth.

D. Mor

Keywords: *beekeeping, insurance, agriculture, challenges, sustainability*

In the modern era, numerous countries in the world are facing economic issues caused by intensely emerging challenges. Those issues can be addressed by the use of more systemic and effective models. Acknowledging the significance of various branches for the normal operation of the country's economic life, several mechanisms are being developed to first maintain the current level and then try to improve it.

Our country's agriculture sector is constantly observing, developing, and eventually putting pilot or permanent functions of innovative programs into practice in order to keep up with the current challenges and achieve new horizons.

It is no secret that agriculture is a vital industry for our country. Aside from being considered to be the primary supplier of food, it's also risky and vulnerable industry, particularly in the case of a natural disaster. Beekeeping, as one of the most profitable branch,

plays a significant and unique role in our country's agricultural sector. Since ancient times, the mother bee has been associated with mother worship, fertility, and honey, and beeswax with purity and integrity.

The article presents in details the insurance experiments carried out in various countries of the world in the field of beekeeping, and the possible options for their localization in the agrarian sector of our Republic.

Introduction. Browsing the pages of history, we will uncover the numerous and diverse facts concerning the profession of beekeeping, which has a special place in our country dating back to 300 BC and earlier. In his book "Anabasis," Xenophon described how the Greek warriors were poisoned with "intoxicating honey" in the territory of Armenia. There is a great deal of information on bee families in Barsegh Mets' book "Rebirth." During the more well-known Urartian empire, Armenians drank honey water and regarded it as a divine beverage[1].

Honey was highly regarded as the food of the Gods. According to the legend, the Armenian god Tir used to sit on the slope of Mount Tirkatar and eat honey specially prepared by bees for him which was stored in ten jars in a nearby cave. In the epic poem "Daredevils of Sassoun," David refuses to accept Ismil Khatun's breast.[2]

Apart from observing pathetic historical sources, we can confidently assert that beekeeping is playing a crucial role in the growth and sustainable rise of our country's agricultural sector. Beekeeping in Armenia can grow rapidly at the expense of flora diversity and become one of the most stimulating branches of agriculture. However, beekeeping has its own particular risks and challenges, just like other areas of agriculture.

The overarching goal of this article is to analyze the beekeeping sector in the Republic of Armenia, find out the sales and export volume, and finally understand whether by introducing an insurance system in the beekeeping sector, we will be able to ensure the sustainable development of this branch and, therefore, entire agriculture sector.

Literature review. Both in the past and nowadays, agricultural insurance has always been at the center of attention of the countries' state authorities. Some of the main types of agricultural insurance are agricultural crops, perennial plants, agricultural animals, as well as the property of farmers in agriculture and car insurance [3].

In the world there are various simplified insurance species of the agricultural sector, one of which is indexical insurance. In the 40th anniversary report of the establishment of agro insurance in Spain beekeeping insurance is also addressed. One of the insurance types of beekeeping in Spain is especially indexical insurance of beekeeping territories[4].

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[1] "Beekeeping" N. M. Hakobyan, K.M. Nalbandyan, A. H. Markosyan, Yerevan, 2003
[2] A. Gasparyan - article: "Bee, honey and beeswax in Armenian folk beliefs"
[3] Shakhov V.V. Insurance, textbook for universities, M., UNITI, 2003,p. 256
[4] https://www.mapa.gob.es/es/enesa/publicaciones/40anosenesa_ingles_tcm30-513821.pdf

They include the insurance line for compensation of loss of pastures and the beekeeping insurance, to cover drought risk. These insurance policies allow us to indirectly estimate the damage covered by these lines for all holdings located in each of the defined regions. To that effect, a vegetation index based on satellite measurements is used to measure the quantity, quality and vigor of the vegetation present on the surface. This surface refers to the use of pastureland or fallows, for the insurance for compensation of loss of pastures, and to the vegetation areas used for beekeeping, for the beekeeping insurance.

Why did we choose to cover the insurance practices carried out in the beekeeping sector of Ukraine in our research? That's because Ukraine is among the three biggest honey exporters, second only to China and Argentina according to the data for 2017 [1]. Besides that, we are all aware of Ukraine being in a war, a sad reality that unfortunately has its implications on us as well.

The British Czapp consultancy company, which acts in the global food and energy sector, has established a study related to beekeeping conditions and future prospects in Ukraine. The study used materials from the United States Department of Agriculture (USDA) and the United Nations. Some data are provided hereby [2].
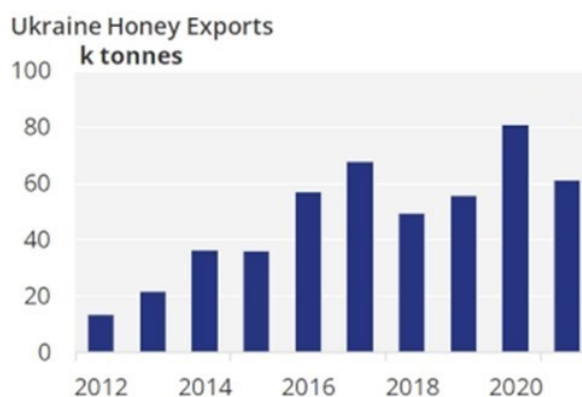
Diagram 1. *The volume of Ukraine's honey exporting, 2012-2021, thousand tons*

Until 2022 Ukraine was one of the ten largest honey producers and exporters. Most of the honey was produced in the northern and southern parts of the country; in sunflower growing areas. Four hundred thousand bee breeders have annually produced 76 thousand tons of honey on average[3].

Prices have not been defined after the start of the project. It should also be noted that only one insurance agent IC Brokbiznes, offered insurance services during the initial period. It

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[1] https://justicon.ua/blog/posts/kak-pcelovodam-polucit-dotacii-iz-gosbudzeta.html
[2] https://www.apiworld.ru/1664269662.html
[3] The same place

was planned that bee breeders will be able to receive and experiment with the new service until the new season of beekeeping. In the beekeeping community of Ukraine, all disputes are planned to be coordinated until March and April 2019, after which everyone can make an agreement contract [1]. A number of legislative projects have been proposed and adopted in Ukraine to protect the beekeeping industry and ensure its sustainable operation [2].

During our research, we found out that despite the excessive interest, not all bee breeders had the appropriate documents on the bee family, making it impossible to conclude a legally balanced contract, which became one of the reasons why beekeeping insurance in Ukraine did not develop. The sad event of 2018, announced by the Union of Beekeepers of Ukraine, has not yet faded from memory, when more than 45,000 bee colonies died in the country during the season, mainly due to the use of pesticides of dubious origin.[3] Damage to beehives amounted to millions, which beekeepers are still unable to recover from. Of course, the rest of the reasons are connected to the on-going war. We should always keep this "bitter" experience in the center of attention when developing an insurance model in the field of beekeeping in our republic.

In Canada exact insurance is not carried out in the beekeeping industry, but there are some elements that ensure the normal operation of the beekeeping sector. For farmers in order to provide a stable level of income and protect against the risk of crop failure, the government of Canada has developed and implemented a number of programs and projects, which are based on the following three most important programs:
- Net Income Stabilization Account (NISA)
- Crop Insurance (CI)
- Agricultural Income Protection from Natural Disasters[4]

The Honey Production Insurance Program is strictly for yield loss; there is no coverage for loss in quality.

The coverage is determined using individual average yields per hive, based on 10 years of verified production information. For new producers or producers missing production years, the long-term area average yield will be used, based on provincial data. The provincial long-term area average yield for 2023 is 190 lbs/hive. Honey producers may select coverage at 50, 60 or 70 percent of their average yield. Colonies must be viable honey producing colonies, and all producing colonies in an operation must be insured.

Insurance features and beekeeping practices are included in the terms and conditions a producer receives following insurance selection.

Honey Production Claim Calculation Example.

[1] https://www.dracaris.org/2019/01/23/s-vesny-v-ukraine-startuet-strahovanie-pchel/
[2] https://kurkul.com/spetsproekty/1056-kritika-ta-porivnyannya-proyektiv-zakonu-pro-bdjilnitstvo-vid-deputativ-batkivschini-doviri-slugi-narodu
[3] https://kurkul.com/spetsproekty/1261-strahuvannya-silskogospodarskih-tvarin-ukrayina-sche-u-poshukah-modeli
[4] Agriculture and Agri-Food Kanada, Performance Report, www.agra.ca

The following is only an example and reflects a calculation of individual yield and claim payment.

Suppose you have 70% coverage on 500 hives and the long-term individual yield is 190 lbs/hive. Your production guarantee is: 190 lbs x 70% = 133 lbs/hive. Your total production guarantee is: 133 lbs/hive x 500 hives = 66,500 lbs

In the fall, you harvest 45,000 lbs. To calculate your yield-loss:

66,500lbs (total production guarantee) - 45,000 lbs (actual harvested production) = 21,500 lbs yield loss

Your yield-loss claim payment is: 21,500 lbs x $3.00 ($/lb) = $64,500

As to the attempts and studies to introduce insurance to the agrarian sector in our country, let me note that in the Republic of Armenia various pilot programs have been implemented in the agrarian sector. In particular, it can be mentioned that in 2005, the Tolors cooperative of Syunik region implemented a mutual pet insurance program. [1] As well as cattle insurance with a pilot (experimental) program in the Shahumyan and Taperakan communities of the Ararat Region. This pilot project was implemented by the Ministry of Agriculture and the Food and Agriculture Organization of the United Nations (FAO) within the framework of the ENPARD-ARMENIA project. A study and comprehensive analysis of agricultural risks in the Republic of Armenia was carried out by Clemence Tatin-Jalera. [2] A pilot program of agricultural insurance has been implemented in RA since 2019 by the coordinating organization of the agricultural risk insurance system (National Agency of Agricultural Insurers). [3] This pilot program is still running today.

Research methodology. Agricultural insurance is an important tool in the agricultural policy system. Agricultural insurance can help on minimizing the impact of adverse circumstances and events. But even with the rapid development of the agricultural sector, agricultural insurance generally occupies a low place in the insurance system. The same picture prevails in our republic. The beekeeping branch of the agricultural sector is not free from various risks, for the study of which it was necessary to select a certain tool set.

Research methods are ways to achieve a specific goal. The essence of the methods lies in the fact that any analysis from which a result is expected, in addition to the definition of the object, the subject, it is also necessary to define what means are used. The quality of the performed work also largely depends on the research methodology. Choosing the most appropriate method is what encourages the research to be carried out effectively. During the study, we used a number of methods.

In order to form a complete reflection of the data in the beekeeping branch of the agrarian

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[1] Kirakosyan K., "Organization of mutual insurance of agricultural animals", Yerevan, 2007, p. 43

[2] A. Martirosyan, Problems of Systematic Evaluation of Agricultural Insurance Effectiveness, "History and Politics" Scientific Journal N4, 2019, Yerevan, p. 180

[3] N. Nersisyan, "Fertility" of agricultural risk insurance in Armenia, «Messenger of ASUE», 2022, N5

sector of the Republic of Armenia, certain elements of induction and reduction methods were used in the research process.

During the analysis, we also used statistical and mathematical methods, without which it would be impossible to study the indicators we need in the field of beekeeping and their changes. It can be said that a number of methods were used during the research, which would be more clearly described as a complex group. In addition, we used the comparative method while conducting the analysis.

Analysis. Beekeeping is one of the most important fields of agriculture. On the one hand, it stands out for its high yield, and on the other hand, the bee, as the main pollinator of a number of agricultural crops, increases the yield and seeding of fruit trees, herbs, vegetables and cotton. It was found out by the researchers that the bee increases the yield of corn by 100%, alfalfa by 40-50%, and apple fruiting by 60%. Thus, it is estimated that bees provide 15 times more income to the economy indirectly than the honey and wax they provide directly. Honey is an expensive food obtained from beekeeping, it also serves as a means of treating a number of diseases.[1]

Beekeeping in Armenia has a centuries-old history and is of strategic importance for the reasons mentioned above. This article examines the dynamics of the natural indicators of honey production in the Republic of Armenia and the latter's export from the country, as well as the causal relationship between these two indicators for the period 2012-2021. Below we present a table in which the relevant indicators are shown.

Table 1

The volume of honey produced in the Republic of Armenia and exported from the Republic of Armenia in 2012-2021[2]

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Volume of honey produced in the Republic of Armenia, tons									
2000	*2100*	*2100*	*2100*	*2100*	*2200*	*2200*	*2100*	*2200*	*2100*
Volume of honey export from the Republic of Armenia, tons									
4,3	*6,7*	*4,3*	*12,0*	*11,1*	*55,4*	*34,4*	*17,4*	*20,0*	*92,0*

From the data in Table 1, it becomes clear that the amount of honey produced in the Republic of Armenia has not changed significantly in the last decade. It ranges from 2000 to

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[1] C. S. Mkrtchyan, H. C. Pepelyan "Beekeeping", Yerevan 2015, Page: 3

[2] The table was compiled by the author in response to letters N SR78-A1DA-E687-254A, dated 27.03.2023 and No. 770964 dated 27-03-2023

2200 tons per year. However, the picture is more variable in the export sector. In 2021, compared to 2012, the export of honey from Armenia increased about 21 times.

In order to better study the changes of these two studied indicators in the last decade, let's calculate the analytical indicators of the dynamics series. Among those indicators are absolute growth, growth and growth rates, the absolute value of one percent growth. The calculation of most of them is based on comparing the levels of the dynamics series with each other. The level with which the comparison is made is called the base level, and the compared level is called the reporting level. By comparing each subsequent level of the series with the previous one, we get the chain indicators of dynamics.

The absolute increase is the difference between the levels of the dynamics series, which shows how many units the level of the series has increased or decreased in a certain period of time. Absolute growth can be calculated both with respect to the initial level and with respect to the immediately preceding level. For this reason, the basic and chain absolute increase of the dynamic series is distinguished. The absolute increase in the base is equal to the difference between the comparison (yi) and the base (yi-t) levels, expressed in the same units in which the levels are measured;

$$\Delta y_{i/i-t} = y_i - y_{i-t} \tag{1}$$

Absolute chain growth is equal to the difference between the next (yi) and previous (yi-1) levels:

$$\Delta y_{i/i-1} = y_i - y_{i-1} \tag{2}$$

Growth and incremental growth rates. Absolute growth reflects the absolute rate of growth. The intensity of the change in the levels of the dynamics series is evaluated by the relationship between the current and previous or base levels. This indicator is called the growth rate, and in percentage terms it is called the growth rate. In the basic method, the growth rate is calculated by relating the comparative level (yi) to the baseline (y1);

$$T_{P_{i/1}} = \frac{Y_i}{Y_1} \, 100\% \tag{3}$$

If the immediately preceding level is taken as the base, we get the chain growth rate:

$$T_{P_{i/i-1}} = \frac{Y_i}{Y_{i-1}} \, 100\% \tag{4}$$

The growth factor shows how many times the compared level is greater (if the factor is greater than one) than the base level or what part of it it is (if it is less than one). In order to express the change in the magnitude of the absolute increase in the levels of the dynamics series with relative magnitudes, the rate of increase is determined, which is also basic and chain. The base growth rate is calculated by the following formula:

$$T_{npy_{i/1}} = \frac{Y_i - Y_1}{Y_1} \, 100 \tag{5}$$

The formula for calculating chain increment is:

236

$$T_{npy_{i/i-1}}= \frac{Y_i - Y_{i-1}}{Y_{i-1}} \cdot 100 \qquad (6)$$

The rate of increase is one unit less than the rate of growth, and the rate of increase is 100% of the rate of growth, i.e.

$$T_{npyi/i-1} = T_{pyi/i-1} - 100\% \qquad (7)$$

The value of 1% absolute growth of the dynamics series is determined by relating the absolute growth to the growth rate:

$$A\left|\%\right| = \frac{\Delta Y_{i/i-1}}{T_{npy/y-1}100} = \frac{Y_i - Y_{i-1}}{\frac{Y_i - Y_{i-1}}{Y_{i-1}}100} = \frac{1}{100}Y_{i-1} = 0{,}01Y_{i-1} \qquad (8)$$

This indicator makes economic sense only in the case of chain calculation.[1] Let's choose the indicators of 2012 as a base level.

Let's make the calculations with the data of table 1 and reflect the result in table 2.

Calculation of analytical indicators of the volume dynamics of honey produced in the Republic of Armenia and exported from the Republic of Armenia[2]

Date	Volume, tons	An absolute plus ☒		Growth rate☒, %		Growth rate☒, %		1% growth rate☒
		base	chain	base	chain	base	Chain	
Volume of honey production in the Republic of Armenia, tons								
2012	2000	0	-	100	-	0	-	-
2013	2100	100,0	100,0	105,0	105,0	5,0	5,0	20,000
2014	2100	100,0	0,0	105,0	100,0	5,0	0,0	21,000
2015	2100	100,0	0,0	105,0	100,0	5,0	0,0	21,000
2016	2100	100,0	0,0	105,0	100,0	5,0	0,0	21,000
2017	2200	200,0	100,0	110,0	104,8	10,0	4,8	21,000
2018	2200	200,0	0,0	110,0	100,0	10,0	0,0	22,000
2019	2100	100,0	-100,0	105,0	95,5	5,0	-4,5	22,000
2020	2200	200,0	100,0	110,0	104,8	10,0	4,8	21,000
2021	2100	100,0	-100,0	105,0	95,5	5,0	-4,5	22,000

[1] A. N. Petrosyan "General theory of statistics" textbook, updated second edition, Yerevan 2009, p. 209-211

[2] The calculations were made by the author according to the data of the RA Statistical Committee:

Volume of honey export from the Republic of Armenia, tons								
2012	4,3	0	-	100	-	0	-	-
2013	6,7	2,4	2,4	155,8	155,8	55.8	55,8	0,043
2014	4,3	0,0	-2,4	100,0	64,2	0,0	-35,2	0,067
2015	12,0	7,7	7,7	279,1	279,1	179,1	179,1	0,120
2016	11,1	6,8	-0,9	258,1	92,5	158,1	-7,5	0,111
2017	55,4	51,1	44,3	1288,4	499,1	1188,4	399,1	0,554
2018	34,4	30,1	-21,0	800,0	62,1	700,0	-37,9	0,344
2019	17,4	13,1	-17,0	404,7	50,6	304,7	-49,4	0,174
2020	20,0	15,7	2,6	465,1	114,9	365,1	114,9	0,200
2021	92,0	87,7	72,0	2139,5	460,0	2039,5	360,0	0,920

The calculations of the analytical indicators of the dynamics series prove that the volumes of honey production in the Republic of Armenia have not changed much during the period of the study. A decline was recorded in the sector in 2019 and 2021. In both years, the decrease was 4.5% or around 100 tons. The picture becomes more interesting in terms of honey export indicators. In 2021, 92 tons of honey were exported from the Republic of Armenia, which is 2039.5% or about 87.7 tons more than the figure of 2012. The volume of honey export in 2012-2021 has decreased compared to the previous year in 2014, 2016, 2018 and 2019. The biggest drop, 49.4 percent, was recorded in 2019. Compared to the previous year, the largest percentage increase in the volume of honey exports from the country was recorded in 2017: 399.1%. And the largest increase in natural terms, 72 tons, was recorded in 2021.

Since our work examines the volume of honey produced in the Republic of Armenia and exported from the Republic of Armenia in the years 2012-2021, we consider it quite logical to highlight the relationship between the above indicators using the correlation coefficient.

Correlation is a statistical dependence between random variables, which does not have a strictly functional nature and the change of one random variable leads to a change in the mathematical expectation of the other variable. In the case of pairwise connections, the purpose of correlation analysis is to determine the density of the connection between two features, which is expressed quantitatively through the correlation coefficient [1]. In the theory of statistics, various calculation formulas have been developed and used in practice. We will use the following formulas:

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[1] G.V. Vardanyan Basics of Econometrics, Yerevan 2003, p. 11-12.

$$r_{xy} = \frac{\overline{XY} - \bar{X}\bar{Y}}{\sigma_x \sigma_y}$$ (9)

$$\sigma_x = \sqrt{\overline{X^2} - (\bar{X})^2}$$ (10)

$$\sigma_y = \sqrt{\overline{Y^2} - (\bar{Y})^2}$$ (11),

Where X is the factor indicator, and Y is the result indicator. Let's choose the volume of honey export from the Republic of Armenia as a factor indicator, and the volume of honey production in RA will be the performance indicator. Let's choose the years 2012-2021 as the reporting period. Below, in table 3, we present the results of the relevant calculations.

Table 3

Calculation of the correlation coefficient of the volume of honey produced in the Republic of Armenia and exported from the Republic of Armenia [1]

	Volume of honey export from the Republic of Armenia, tons	Volume of honey production in the Republic of Armenia, tons	▢	▢	▢
2012	4,3	2000	18,5	8600,0	4000000,0
2013	6,7	2100	44,9	14070,0	4410000,0
2014	4,3	2100	18,5	9030,0	4410000,0
2015	12,0	2100	144,0	25200,0	4410000,0
2016	11,1	2100	123,2	23310,0	4410000,0
2017	55,4	2200	3069,2	12188,0	4840000,0
2018	34,4	2200	1183,4	75680,0	4840000,0
2019	17,4	2100	302,8	36540,0	4410000,0
2020	20,0	2200	400.0	44000,0	4840000,0
2021	92,0	2100	8464,0	193200,0	4410000,0
sum	257,6	21200,0	13368,5	441818,0	44980000,0
Average value	25,8	2120,0	1485,4	44181,8	4498000,0

Based on the data in Table 3, as well as with the help of formulas 9, 10 and 11, the correlation coefficient calculated was 0.34. Therefore, we can record that the connection between honey export from the Republic of Armenia and the volume of honey production in the Republic of Armenia is of medium or weak level.

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[1] The calculations were made by the author according to the data of the RA Statistical Committee.
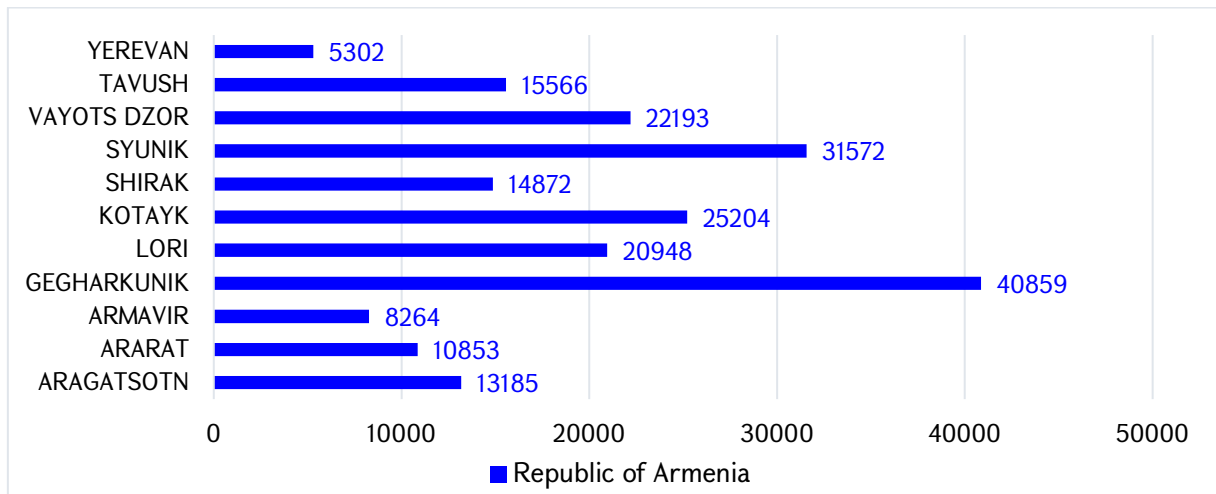
Diagram 2. ***Number of beehives in RA as of January 1, 2022 (units)[1]***

The analysis shows that the amount of honey produced in Armenia has hardly increased in the last ten years. Taking into account the strategic importance of beekeeping for the agrarian sector of our country, as well as studies of international experience, we propose to implement certain steps for its development. Since agriculture itself is a risky economic activity, we consider the introduction of beekeeping insurance in our republic to be one of the most important ways to reduce the risk of beekeeping farmers. As we can see, in RA in 2021 beekeeping is most actively engaged in Gegharkunik marz (number of beehives: 40,859). Accordingly, we suggest to start beekeeping insurance in Gegharkunik, Syunik and Kotayk marzes, because it is in these marzes that the number of beehives actually increased. Based on studies of international experience, we can state that it is more appropriate to start beekeeping insurance not with insurance of beekeeping itself, but with insurance of related components. Thus, before implementing the insurance process in the field of beekeeping, we can carry out widespread accounting of beehives, as well as certification of honey with state support. In this way, we can present ourselves to the world with a higher quality and unique product. It will further facilitate the implementation of the beekeeping insurance program from the contractual and accounting point of view. In addition, taking into account the agricultural insurance pilot program already implemented by AINA, we can also offer to insure the areas where the beehives are located. Thus, the many problems facing our republic and the current growing challenges force us to use the resources that are created in our country effectively.

Summarizing the analysis, we can state that beekeeping is of strategic importance for the agrarian sector of our country, and its sustainable development must be ensured by the introduction of certain tools, particularly by the use of insurance mechanisms.

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[1] The chart was prepared by the author in response to the letter N 09.4.1/6221-202 dated 06.04.2023.

Conclusion. Beekeeping is one of the most important fields not only for our national agrarian sector but also for many countries of the world. If we look at the climatic conditions, our country is a wonderful place for beekeeping. In addition, Armenia's dry climate and large variety of flowers make it possible to obtain higher quality honey.

As we saw in the examples of the countries we studied, there is still no clear and systematic approach in the field of beekeeping insurance in the world. The reasons are many according to the specificities of the countries. In Spain, according to our studies, the insurance in the field of beekeeping is carried out only at the level of territories, that is, they insure the areas where the bee colonies are located, but here in Canada, the insurance is carried out in the beekeeping sector according to the logic of crop loss, that is, in case of low yield of the insured hives, the compensation is carried out by the insurance company. Beekeeping insurance in Ukraine was encouraged by the government and eventually introduced in 2019. Moreover, it aroused great interest among farmers. The basis for beekeeping insurance in Ukraine was primarily the apiary registration process, which was encouraged by the government and provided many advantages to beekeepers. Since not all beekeeping owners in Ukraine had appropriate documents on beekeeping, and without it it was impossible to conclude a legally balanced contract, this became one of the reasons in the process of inhibiting the development of beekeeping insurance.

According to our studies, we noted that the amount of honey produced in the Republic of Armenia has not changed significantly in the last decade. It ranges from 2000 to 2200 tons per year. However, the picture is more variable in the export sector. In 2021, compared to 2012, the export of honey from Armenia increased about 21 times.

The calculations of the analytical indicators of the dynamics series showed that the volumes of honey production in the Republic of Armenia did not change much during the period under study. A decline was recorded in the sector in 2019 and 2021.

Based on our calculations, the calculation of the more precise correlation coefficient, we can state that the connection between honey export from the Republic of Armenia and the volume of honey production in the Republic of Armenia is of medium or weak level. Being the most profitable branch of the agrarian sector of our republic, beekeeping is not free from various risks. That is why we suggest investing in insurance in the beekeeping sector. At the same time, in the field of beekeeping, we suggest to start the insurance not from the insurance of individual elements of the beekeeping field itself.

Having reached certain conclusions as a result of the conducted analyzes and studies, we suggest starting beekeeping insurance with at least the following steps:

- carry out a widespread census, encouraging beekeepers to provide even a small amount of support, be it in the form of vaccination of bees, supply of medicines or other options
- carry out honey certification with state support

To insure the areas where bees are located, using the agricultural insurance pilot program coordinated by AINA.

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TATIANA PETROVA

PhD student at Moscow State Institute of International Relations (MGIMO University), Junior Associate at Rybalkin, Gortsunyan, Dyakin and Partners Advocates, Moscow, Russia

CARBON EMISSION TRADING: PRIVATE AND INTERNATIONAL ECONOMIC LAW ASPECTS OF AN EMERGING MARKET

Carbon emission trading is one of the legal and economic mechanisms aimed at climate change prevention and environment preservation. The author presents the existing models of carbon pricing and means of trade in carbon emissions developed in the world practice. Moreover, the author analyses the dynamics of the development of carbon emission trading legal framework in EAEU countries as well as the perspectives of the carbon emission markets

integration. The article also addresses the interplay between carbon emission trading initiatives in EAEU countries and the EU Emission Trading System as well as the EU initiative of the Carbon Border Adjustment Mechanism. The conclusion is made that EAEU countries are actively implementing carbon emission trading projects. At the same time the new obligations for EU importers imposed by the European Carbon Border Adjustment Mechanism together with current trade restrictions could be rather burdensome for EAEU countries as EU importers. Harmonization of the approaches to the carbon emission trading could be helpful not only for climate preservation, but also for the integration in the global carbon emission trading market and for building the regional emission trading markets.

Introduction. Carbon emission trading is one of the mechanisms aimed at achieving the carbon neutrality goal stipulated in the Paris Agreement. EAEU member states are currently developing the legal framework for the national emission trading systems. In light of the fact that the prevention of climate change is a global challenge which needs the synergy of efforts and coordinated actions, it would be more efficient to establish emission trading systems which would go beyond the national boundaries. In this article the author addresses the features of the national emission trading systems in EAEU countries, considers the joint climate policy steps at the EAEU level and elaborates on the perspectives of the prospective EAEU emission trading system as well as challenges it may face.

Literature review. The idea of an emission trading system and examples of their implementation in the USA, in the EU and within the Kyoto Protocol were considered by such scholars and practitioners as M. Gutbrod, S. Sitnikov, E. Pike-Biegunska. The private law issues relating to carbon emissions trading were also subject to discussion in the framework of the 55th session of UNCITRAL in June-July 2022. The key legal problems relating to the civil law status of carbon units and divergencies of approaches to their legal treatment are reflected in the respective UNCITRAL Note by Secretariat.

The features of the national emission trading systems of EAEU member states were considered in this article on the basis of the legal instruments establishing and regulating the emission trading system in a particular country. The problematic aspects of the national regulation of the carbon trade are discussed in the works of the scholars specializing in this field of law, for example, in the works by S. Sitnikov, N.G. Zhavoronkova, V.B. Agafonov dedicated to the carbon regulation in the Russian Federation, and in the works by Eserkepova I.B., Tsoi S.K. with respect to the carbon regulation in the Republic of Kazakhstan. Moreover, the information on the websites of the national registries of the carbon units allows to find out the current status of emission trading systems operation and the stages of the key climate projects implementation.

The political steps and measures undertaken at the EAEU level in the area of common climate policy are reflected in the EAEU legislative acts. In particular, in the Joint Statement by the Heads of EAEU member states on the economic cooperation in the sphere of the climate

policy dated 14 October 2021 and the acts of the Eurasian Economic Commission and Eurasian Intergovernmental Council aimed at the establishment of the Working Group on climate policy issues within the EAEU.

Research methodology. The methodology of the article involves predominantly the doctrinal method, since the author reviewed the regulation of carbon emission trading systems in the EAEU member states and in the EU. The author also reviewed and analyzed the factual and numerical information presented at the official web sources of the national carbon registries. In order to illustrate the difference between the carbon crediting models the author resorted to the comparative method.

On the basis of the not clearly regulated aspects of carbon emission trading at the national level the author identifies the potential challenges for the carbon emission market integration at the EAEU level. Then, by identifying the potential scope of application of the Proposal for the Regulation on the Carbon Border Adjustment Mechanism the author fetched out its relevance for the importers of carbon-intensive goods from EAEU member states to the EU.

Analysis. Carbon emission trading allows to control the amount of greenhouse gas emissions in order to achieve carbon neutrality. Conceptually, carbon emission trading is the circulation of permits entitling their holders to emit certain amounts of CO_2 (as a rule, the equivalent of such permits is 1 tonne of CO_2).

The two most popular carbon crediting models are emission allowances and carbon credits (or carbon offsets)[1].

The emissions allowances are regulated at a national or supranational level. The allowances can be allocated by national governments free of charge or on the basis of a sale contract. This carbon crediting model is applied within the EU Emission Trading System (EU ETS) operating since 2005. In the EU, a limit is set on the annual amount of emissions that is allocated to the companies whose activities are subject to regulation. If the allocation is insufficient, a company may purchase additional emission allowances on the auction market. The annual amount of emissions allocated free of charge to the enterprises is reduced each year. This model is often referred to as a cap-and-trade system.[2]

The carbon offsets are generated by projects that aim to reduce carbon emissions or increase the absorption of emissions from the atmosphere. An example of such model is the carbon cap-and-trade programme that has been in operation since 2013 in California. In order to meet the legal requirements for an emissions cap, a business entity can "offset" exceeding

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[1] Gutbrod M., Sitnikov S.L., Pike-Biegunska E. Trading in air: mitigating climate change through the carbon markets — Moscow: Infotropic Media, 2009. — p. 7-8 — ISBN 978-5999800046.

[2] Free Allocation. Climate Action - European Commission, 2023. URL: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/free-allocation_en (date of access: 21.01.2024).

the cap through participation in accredited climate projects aimed at reducing carbon emissions[1].

Emissions trading can take place on so-called mandatory (regulated) or voluntary (unregulated) markets. The difference between the two is that mandatory markets are regulated and supervised by the competent state authorities.

All EAEU member states became parties to the Paris Agreement, thereby they expressed their commitment to the climate neutrality goal. In order to reach it they tend to develop their national carbon emission markets.

The Republic of Kazakhstan was the first EAEU member state which started developing its national carbon emission trading mechanisms. The model of carbon crediting in Kazakhstan is based on the EU ETS concept[2]. The system of carbon emission allowances was launched in Kazakhstan in 2013. Similarly, on the national level a limit is set on the annual amount of emissions. The allowances are allocated between the companies operating in the carbon-intensive industries. If the allocation is insufficient, a company may purchase additional emission allowances on the auction market. At the same time if a company increases its production capacity, it may request the competent state authority for the issuance of the additional carbon emission allowances above the allocated amount. As follows from the website of the operator of the national register of carbon units 7 542 307 emission allowances in total were issued above the set limit[3].

In the Russian Federation the national emission trading system is developing as well. On 30 December 2021 the Federal Law of 02 July 2021 No. 296-FZ "On Limiting Emissions of Greenhouse Gases" came into force. The law introduces the obligation to submit an annual report on greenhouse gas emissions for organizations subject to special criteria and emitting more than 150 000 CO_2 tonnes per year (since 2024 the threshold will be reduced to 50 000 CO_2 tonnes per year). The law also established a register of carbon units, which includes information from organizations' reports on greenhouse gas emissions and consolidates the data on climate projects.

Climate projects involve voluntary activities aimed at reducing emissions and/or increasing their absorption. Climate projects may result in the issuance of carbon units, which are credited to the account of the project implementer. These carbon units can be sold on the carbon units market. According to the Russian Carbon Registry website, as of April 2023, four climate projects have been registered in Russia under the Federal Law "On Limiting Greenhouse Gas

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[1] California Offset Program. American Carbon Registry, 2023. URL: https://americancarbonregistry.org/california-offsets/california-offset-program (date of access: 21.01.2024).

[2] Eserkepova I.B., Tsoi S.K. Establishment of a carbon trading system in the Republic of Kazakhstan / Journal of Almaty Technological University, 2013, Vol. 1 (97), p.67.

[3] System of carbon emission trading / Zhasyl Damu, 2023. URL: https://recycle.kz/en/parnikovye-gazy (date of access: 21.01.2024).

Emissions"[1]. The carbon units issued from these climate projects have been sold in commodity auctions conducted by the Moscow Exchange[2].

Another important legislative milestone aimed at creating a carbon trading market in Russia is the adoption of the Federal Law No. 34-FZ of 06 March 2022 "On conducting an experiment on limiting greenhouse gas emissions in the selected subjects of the Russian Federation". The law introduces an experiment in the territory of the Sakhalin region from September 1, 2022 to December 31, 2028 to achieve the goal of carbon neutrality by 2025. As part of the experiment, a list of regional organizations subject to the experiment was developed. The enlisted organizations are required to submit carbon emission reports annually. In addition, an emission limit for regulated entities is to be approved at the regional level. In case of exceeding the emission limit, an organization participating in the experiment will be obliged to pay a fee of 1,000 RUB per tonne of CO_2.

In the Republic of Belarus there is currently no legal framework regulating carbon emission trading on the national level. Still, legal and organizational mechanisms have been formed in Belarus to ensure that greenhouse gas inventories are carried out on an annual basis[3]. The greenhouse gas inventories in the Republic of Belarus are regulated by the Resolution of the Council of Ministers of the Republic of Belarus No. 137 of 9 March 2021 "On the Implementation of the Paris Agreement to the United Nations Framework Convention on climate change". Furthermore, several cooperation agreements in the sphere of environment protection were signed between ministries, regional authorities and scientific institutions of the Republic of Belarus and the Russian Federation[4]. It has also been reported in October 2023 that regional authorities, civil society and educational organizations are elaborating on the establishment and development of the carbon trading system on the regional level[5].

Similarly, Armenia has developed its national greenhouse gas inventory system in accordance with the 2006 IPCC (Intergovernmental Panel on Climate Change) Guidelines[6].

[1] Russian Carbon Units Registry, 2023. URL: https://carbonreg.ru/ru/ (date of access: 21.01.2024).

[2] NTB started trading in carbon units / National Mercantile Exchange, 26 September 2022. URL: https://www.namex.org/n/51710 (date of access: 21.01.2024).

[3] Fifth Biennial Report of the Republic of Belarus submitted in accordance with decision 1/CP.16 of the Conference of the Parties to the United Nations Framework Convention on Climate Change, 2022. URL: https://unfccc.int/sites/default/files/resource/5BR_BLR.pdf (date of access: 21.01.2024).

[4] Forum of Regions of Russia and Belarus, materials of the section "Cooperation between Belarus and Russia in the conditions of New International Climate Agenda", 2022. URL: https://eec.eaeunion.org/upload/medialibrary/cd7/Zelenaya-povestka-v-mezhregionalnom-razvitii.pdf (date of access: 21.01.2024).

[5] Belarus' Regions Pay More Attention to Carbon Trade / UNDP, 31 October 2023. URL: https://www.undp.org/belarus/news/belarus-regions-pay-more-attention-carbon-trade (date of access: 21.01.2024).

[6] Third Biennial Update Report of the Republic of Armenia under the United Nations Framework Convention on Climate Change, 2021. URL: https://unfccc.int/sites/default/files/resource/BUR3_Armenia.pdf (date of access: 21.01.2024).

Importantly, Armenia is a party to the Comprehensive and enhanced Partnership Agreement between the EU and the European Atomic Energy Community and their Member States dated 26 January 2018 (CEPA). The document provides that Armenia and the EU shall *inter alia* implement joint activities at regional and international level in the sphere of climate action. Furthermore, Armenia is obliged to carry out approximation of its legislation to the EU acts in this sphere. For this purpose, the EU-funded organization EU4Climate prepared the Roadmap to Monitoring, Reporting and Verification (MRV) of GHG emission at the installation level in Armenia in 2022[1]. The Roadmap was designed to provide the guidance for the approximation of the Armenian laws and regulations to the CEPA obligations.

At the same time, the prerequisites for establishing the regional EAEU emission trading markets were expressed in October 2021 in the Joint Statement of EAEU member states. The document sets out the intentions of the member states to develop the international cooperation in the sphere of climate agenda, to strive towards the mutual recognition of carbon emission trading mechanisms and to harmonize the approaches of monitoring and verification of greenhouse gas emissions[2]. Moreover, in September 2021 a special Working Group was established within the EAEU which is responsible for bringing together the positions of member states on climate change prevention issues[3]. Further cooperation between EAEU member states in this sphere could result in the extension of carbon emission markets beyond their national boundaries.

Thereon the harmonization of national regulation of carbon emission markets seems to be crucial for the perspectives of cross-border trade in carbon units. One of the burning issues in this regard is the question of the legal nature of carbon units from the civil law perspective. The main approaches to legal qualification of carbon units may be distinguished as follows: as intangible assets or as a set of contractual rights in relation to parties of the climate project (such as the holder or operator of the carbon units registry, the organization verifying the amount of emissions, etc.)[4]. Another problematic issue is the definition of the owner of the

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[1] The roadmap to MRV of GHG emissions at the installations level in Armenia, June 2022.
URL: https://eu4climate.eu/download/the-roadmap-to-mrv-of-ghg-emissions-at-the-installations-level-in-armenia/ (date of access: 21.01.2024).

[2] Joint Statement by the Heads of EAEU member states on the economic cooperation in the framework of the climate policy, 14 October 2021. URL: https://eec.eaeunion.org/upload/medialibrary/ec0/Zayavlenie-ramka-.pdf (date of access: 08.04.2023).

[3] Order of the Eurasian Economic Commission No. 150, 28 September 2021.
URL: https://eec.eaeunion.org/upload/medialibrary/ffc/Rasporyazhenie-150.pdf (date of access: 08.04.2023).

[4] UNCITRAL Note by the Secretariat, Work Programme: Possible future work on climate change mitigation, adaptation and resilience, 15 May 2022, p. 7 URL: https://documents-dds-ny.un.org/doc/UNDOC/GEN/V22/015/62/PDF/V2201562.pdf (date of access: 08.04.2023).

carbon units, *i.e.* determining the scope of persons who are entitled to own the carbon units as well as the set of rights and duties of those persons[1].

In the Russian legislation the legal status of the carbon units has not been clearly defined yet[2]. Nonetheless, the legal certainty on the civil law nature of the carbon units as well as on the scope of persons entitled to own and manage the carbon units (at least on the national level) seems to be important for the prospective transnational carbon emission trade. Thus, harmonization of legal approaches with respect to the legal status of carbon units and other legal issues concerning carbon trading procedures are necessary for the integration of carbon emission markets at the EAEU level.

Establishing the carbon trading market at the EAEU level may be especially relevant in light of the EU Carbon Border Adjustment Mechanism (CBAM). CBAM targets the non-EU importers of carbon-intensive goods obliging them to report the carbon emissions amount and to sale certain number of CBAM certificates depending on the amount of carbon emissions resulting from the production of imported goods. The transitional period of CBAM started on 1 October 2023 and is going to last until 31 December 2025. During the transitional period the obligations of importers are limited to reporting obligations.

Article 9 of CBAM Regulation provides an opportunity to claim a reduction in the number of CBAM certificates to be surrendered, if a declarant paid for carbon emissions in the country of origin.[3] It appears that having a developed emission trading system both at the national and EAEU level could help EAEU companies to offset the domestic price paid for carbon emissions when importing the goods from EAEU countries to the EU.

Conclusion. Overall, EAEU countries are actively developing carbon emission trading systems at the national level. At the same time at the EAEU level the political willingness was expressed to align the climate policy and strive towards the establishment of the transnational emissions trading mechanisms. In its turn, Armenia has an obligation to the EU to align its legislation with the EU acts in the sphere of climate action, which means that building the legal infrastructure of the EAEU carbon trading market would need to be in line with the international obligations of Armenia.

The establishment of the EAEU emission trading market would require the harmonization of the national approaches to the carbon emission trading. Due to the relatively short period of national emission trading systems operation, there is still a lack of legal certainty with respect

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[1] Zhavoronkova N.G., Agafonov V.B. The Role of the National Climate Law in Ensuring "Energy Transition". Actual problems of Russian Law. 2022;17(2), p. 156.

[2] Sitnikov S.L. *Carbon regulation in Russia: origins and peculiarities.* The Eurasian Scientific Journal, 14(6): 44ECVN622, p. 15.

[3] Regulation (EU) 2023/956 of the European Parliament and of the Council establishing a carbon border adjustment mechanism, 10 May 2023. URL: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32023R0956 (date of access: 21.01.2024).

to the legal qualification of carbon units and the legal status of persons involved in the carbon emission trading procedures.

The obligations for EU importers imposed by CBAM together with current trade restrictions could threaten the competitiveness of the carbon-intensive goods imported from EAEU countries on the EU market. The reporting obligations and the necessity to additionally pay for the attributed carbon emissions could make the trade rather burdensome for EAEU companies exporting carbon-intensive goods to the EU. The possibility to offset the price paid for the carbon emissions at the national or at the EAEU level would simultaneously decrease the exportation costs and would allow to direct the domestically paid price for the carbon emissions to the domestic climate projects. Thus, the harmonization of the approaches to the carbon emission trading could be helpful not only for climate preservation, but also for the integration in the global carbon emission trading market and for building the regional emission trading market.

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URL: https://unfccc.int/sites/default/files/resource/BUR3_Armenia.pdf (date of access: 21.01.2024).
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18. Regulation (EU) 2023/956 of the European Parliament and of the Council establishing a carbon border adjustment mechanism, 10 May 2023. URL: https://eur-lex.europa.eu/legal-content /EN/TXT/?uri=CELEX%3A32023R0956 (date of access: 21.01.2024).

ALEXANDRA RALUCA JELEA
Alexandru Ioan Cuza University of Iaşi, Romania

SMARTLY CONNECTED BRANDS. A SUSTAINABLE PERSPECTIVE (ANALYSIS AS A BIBLIOMETRIC STUDY)

The understanding of the term "smart consumer" has changed over time. A few years ago, it used to mean that someone was getting the best deal while shopping. Nowadays, technology plays an important role in this issue. The present article uses a qualitative method which is based on bibliometric analysis. With this technique, we wanted to analyse the existing literature. We took 5 terms which are smart objects, smart brands, smart consumers, sustainable consumers and smart sustainable consumers and we computed the timeline of

articles over a period of time, the trend in keywords and the most cited articles using VOSviewer. For the term smart sustainable consumers, we created a table in which information regarding the number of authors, study attribute, study type, analysis unit, sample size and data collection method can be found.

Introduction. In this day and age, people tend to use the term "smart" a lot. We came to have a smart home, to use smart objects. We have smart brands, and we call ourselves smart consumers. However, the understanding of the term "smart consumer" has changed over time. A few years ago, it used to mean that someone was getting the best deal while shopping. Nowadays, technology plays an important part. So, the meaning of smart consumer has broadened its meaning. It is more than someone that find the best deal, it is someone that knows exactly how much one is willing to spend[1], they start comparing prices and tech specs, they are reading reviews and decide how to buy the product (online or going to the physical store) (Reformat, 2013). However, the proposed research is not going to analyse what a smart consumer is, but mostly is going to explore the existing literature by using bibliometric analysis.

Bibliometric indicators are especially significant for researchers, as these measurements are often used in finding decisions, appointments, and promotions of researchers. As more scientific discoveries occur and published research results are read and then quoted by other researchers, bibliometric indicators are becoming increasingly essential (Sen, 1999). In our research, the main bibliometric indicators used are quality indicators and structural indicators. As a basic bibliometric indicator, this paper used citations and mapping.

This work was motivated by the bibliometric analysis conducted by Z. Çelik. He studied flow theory in his research. The definition of a "smart consumer" has evolved throughout time. We aim to do the same, but for smart sustainable consumer. The design of table 1 is from Çelik's article (ÇELİK, 2021), his work is very exciting and from his table design we got inspired creating the one found here.

Data and Methods. This research aims at conducting a bibliometric analysis for the following terms: smart consumer and smart sustainable consumer. Besides, there are 3 more terms: smart brands, smart objects and sustainable consumer for which we want to see the trends in keywords, number of articles written over a period of time and the most cited authors in that period of time. The sample size of articles, keywords varies because not all of them have the same number of articles or keywords.

The main objectives of this research are:
- O1. To identify the timeline for the following terms: smart brands, smart consumer, smart object, sustainable consumers and smart sustainable consumer.
- O2. To identify the rank of smart brands, smart consumer, smart object, sustainable consumers and smart sustainable consumer articles by the number of citations.

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[1] Accessed on June 30th, https://www.fcnb.ca/en/guides/being-a-smart-consumer

- O3. To identify the keywords used in articles regarding smart brands, smart consumer, smart object, sustainable consumers and smart sustainable consumer.

Results and Discussion

1. Smart objects. In order to identify the timeline of the neuromarketing articles, we wanted to see which years have the most published articles on this topic. However, VOSviewer does not provide such an analysis, so we computed the number of articles in Excel. The initial sample size was 1000, but some of the articles did not have the year so the final sample size was 968 articles from years starting from 1990 to 2022.
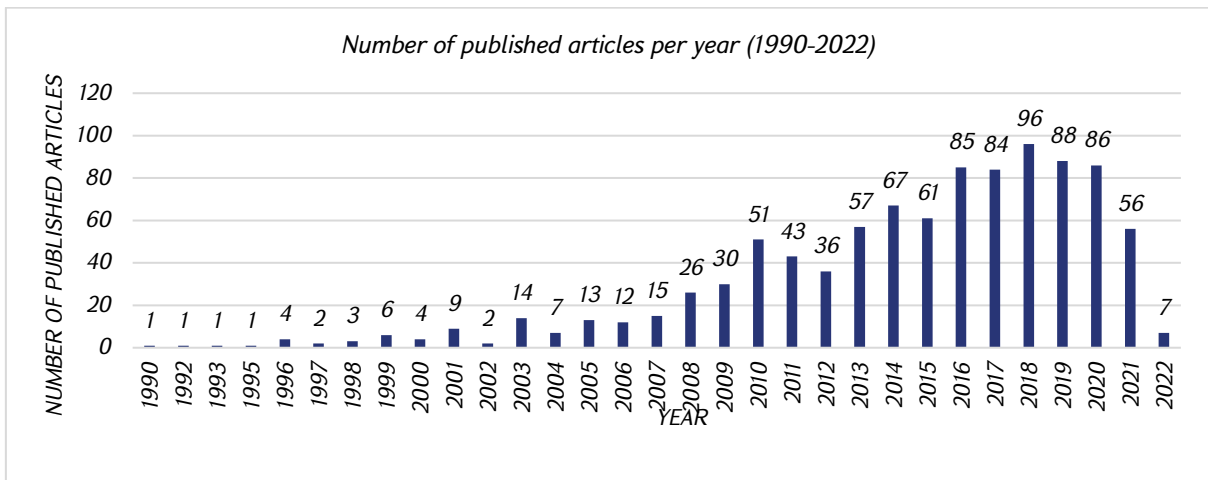
Source: own processing in Excel

Figure 1. *Number of published articles over the years 1990 – 2022 for "smart objects"*

The number of articles published on the topic "smart objects" have risen significantly starting with the year 2016. In the early 2000s, only a few articles were published, but from 2010 until 2020 the interest in this topic grew significantly. Overall, the trend was rising and decreasing, for example rising for two years in a row (2013 and 2014) after which a drop occurred in 2015.

Our next objective for smart objects was to identify which is the most cited document and the main keywords that showed up. We uploaded in VOSviewer a database with 1000 records.

When looking into citations, from 1000 records only 627 have at least one citation. So, from those, we may observe from figure 2 that Gerd Kortuem has the highest number of citations with 1201 citations, in the second place there is Juan Rodríguez-Hernández with 703 citations followed by Dariu M. Gavrila with 604 citations in the third place and Luigi Atzori in the fourth place with 422 citations.
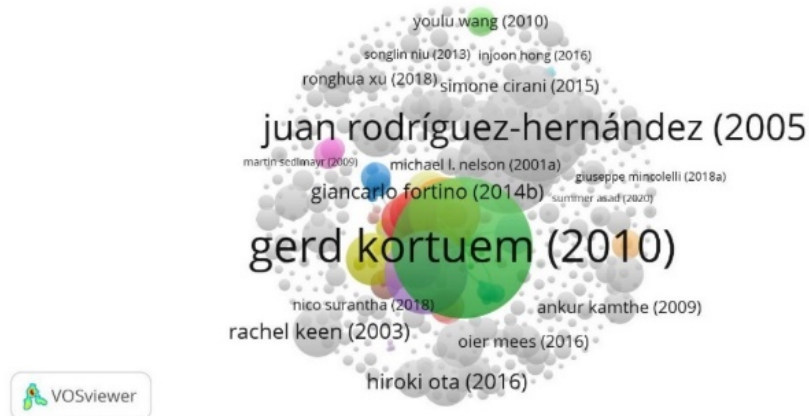
Source: own processing in VOSviewer
*Figure 2. **Smart objects article citation with outliers***

In figure 3 we may observe only linked articles, which are not numerous. From 627 documents only 119 items are connected.
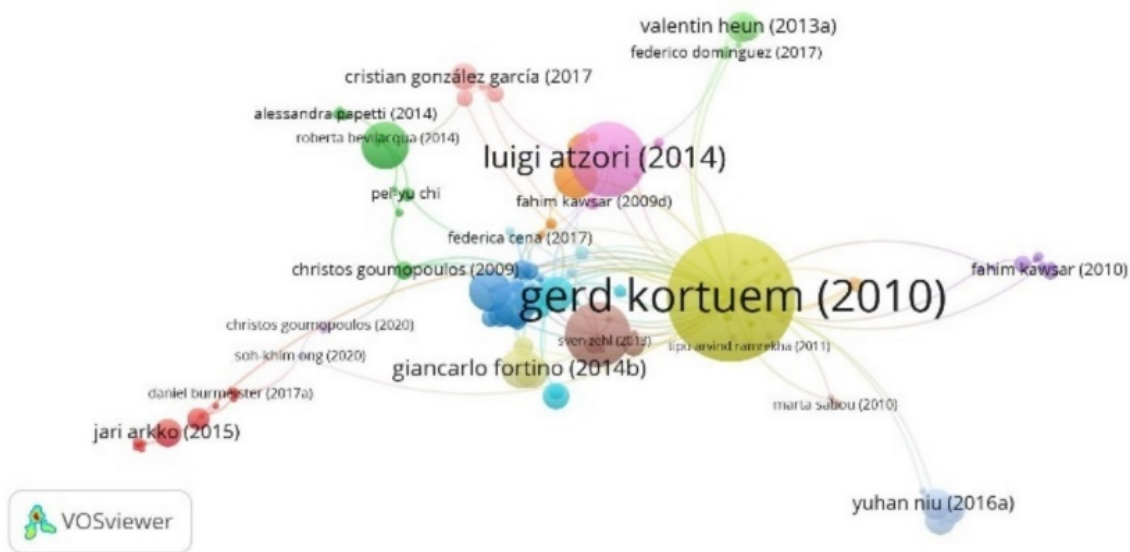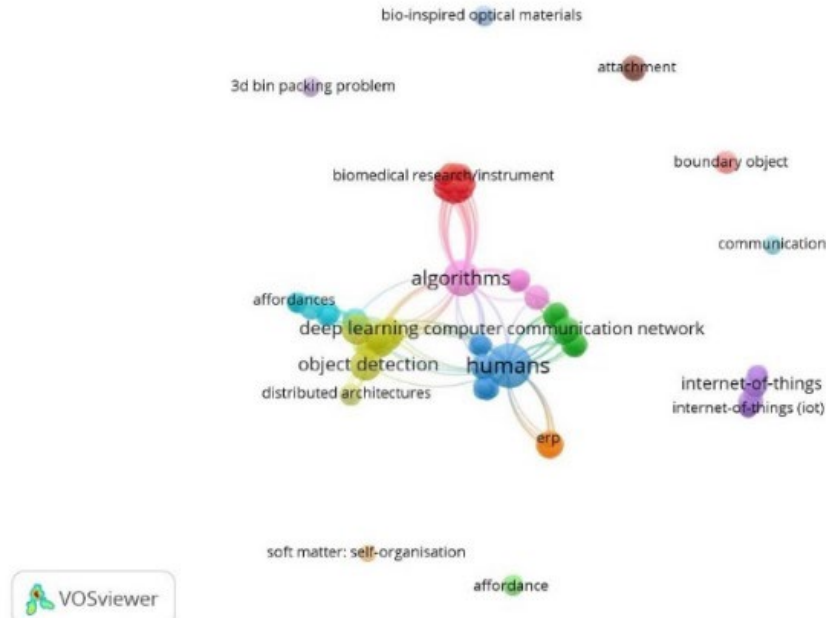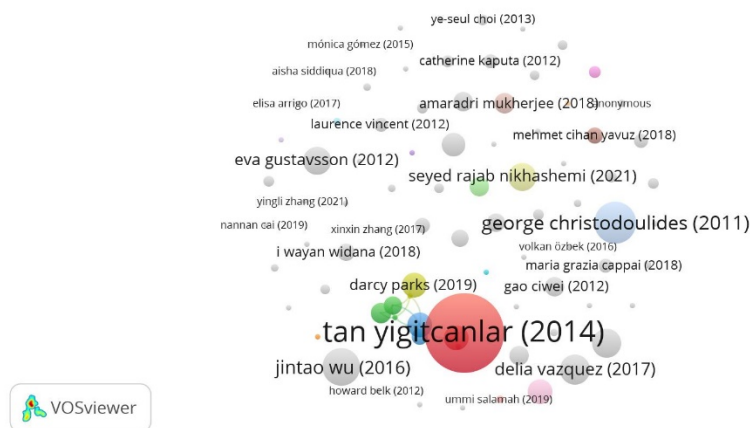

Source: own processing in VOSviewer
*Figure 3. **Smart objects article citation without outliers***

The third type of the conducted analysis was on keywords, from 1000 records only 134 keywords were found, from these 134 only 90 are connected. In figure 4, we may observe that there are several outliers like attachment, boundary object, communication, 3d bin packing problem, affordance, soft matter: self-organisation and the most important one, internet of things. The main cluster contains keywords like humans, algorithms, erp, deep learning. This is

happening because mainly smart objects refer to appliances which can be connected via phone, by using Bluetooth.

Source: own processing in VOSviewer
Figure 4. Smart objects article clusters for keywords

2. Smart brands. In order to identify the timeline of the neuromarketing articles, we wanted to see which years have the most published articles on this topic. However, VOSviewer does not provide such an analysis, so we computed the number of articles in Excel. The initial sample size was 274, but some of the articles did not have the year so the final sample size was 272 articles from years starting from 1986 to 2022.
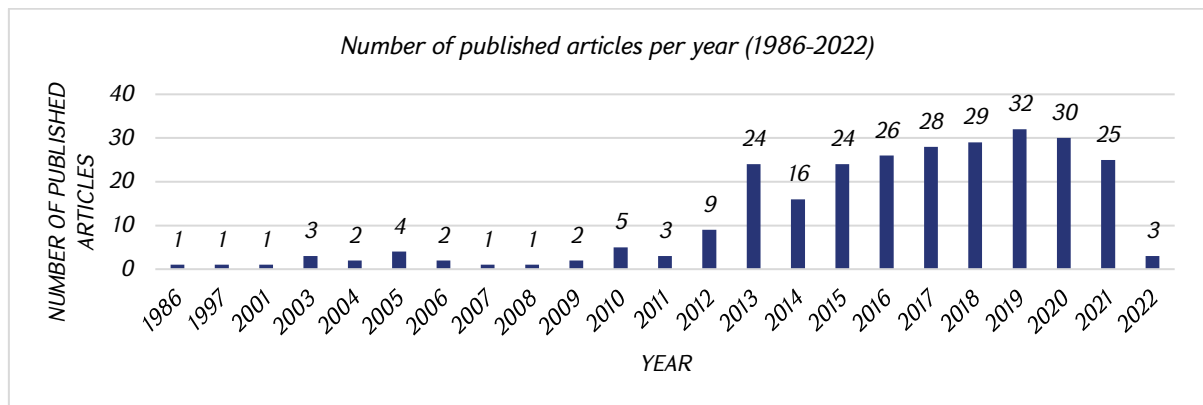
Source: own processing in Excel
Figure 5. Number of published articles over the years 1986 – 2022 for "smart brands"

As seen in the figure above, we have a rising trend from 2015 to 2019 and a descending trend from 2020 until 2022. In the early 2000s only a few articles were published, but from 2014 until 2020 the interest in this topic grew significantly.

Our next objective for smart brands was to identify which is the most cited document and the main keywords that showed up. For smart brands our database contained only 274 records.

When looking into citations, from 274 documents only 84 had at least one citation and from these 84 only 10 are connected. We may observe from figure 6, that Tan Yigitcanlar has the highest number of citations with 193 citations, in the second place there George Christodoulides with 54 citations followed by Jintao Wu in the third place with 45 citations.

Source: own processing in VOSviewer

Figure 6. ***Smart brands article citation with outliers***

The third type of analysis was keywords and when analysing them for smart brands articles, only 13 keywords were found, most of them in the medical field (figure 7). This may be a great opportunity to bring something new in a field that was not investigated before.

Source: own processing in VOSviewer

3. Smart consumers. In order to identify the timeline of the smart consumer articles, we wanted to see which years have the most published articles on this topic. However, VOSviewer does not provide such an analysis, so we computed the number of articles in Excel. The initial sample size was 1000, but some of the articles did not have the year so the final sample size was 986 articles from years starting from 1941 to 2022.


Number of published articler per year (1941-2022)
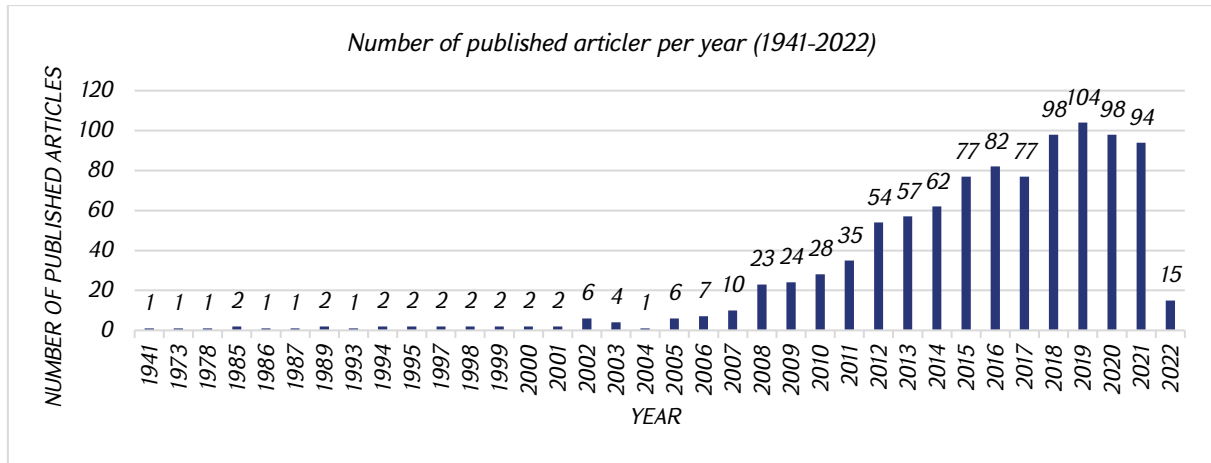
Source: own processing in Excel

*Figure 8. **Number of published articles over the years 1941 – 2022 for "smart consumer"***

As seen in figure 8, the number of articles published on the topic "smart consumer" have rose significantly starting with the year 2009. In the early 2000s only a few articles were published, but from 2009 until 2021 the interest in this topic grew significantly. In 2017 observe some decrease, but the trend is rising again starting with the next year.

Our next objective for smart consumers was to identify which is the most cited document and the main keywords that showed up. For smart consumers our database contained 1000 records.

When looking into citations, from 1000 documents only 528 had at least one citation and from these 528 only 66 are connected. We may observe from figure 9, that Eoghan McKenn has the highest number of citations with 267 citations, the second place is taken by Constantinos-Vasilios Priporas with 210 citations followed by Alexandra-Gwyn Paetz in the third place with 199 citations.
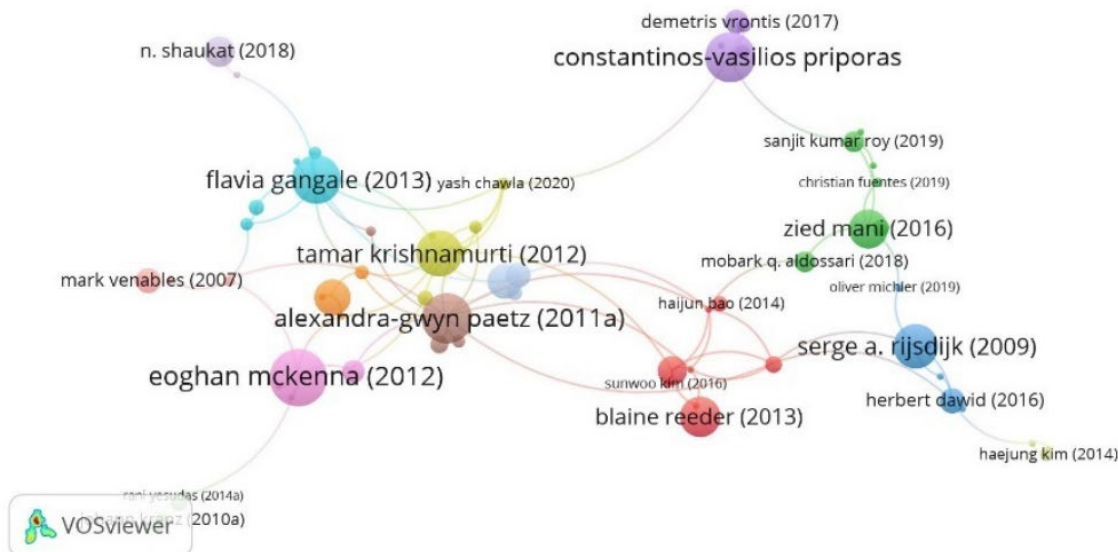
**Figure 9. *Smart consumer article citation without outliers***

The third type of analysis was on keywords, from 1000 records only 137 keywords were found, from these 137 only 122 are connected. In figure 10, we may observe that there are several outliers like consumer profiling, coordinated react and active packaging. The main cluster contains keywords like humans, consumer behaviour, internet, ecosystem, cost/control methods, computer stimulation, family/psychology, health services/standards.
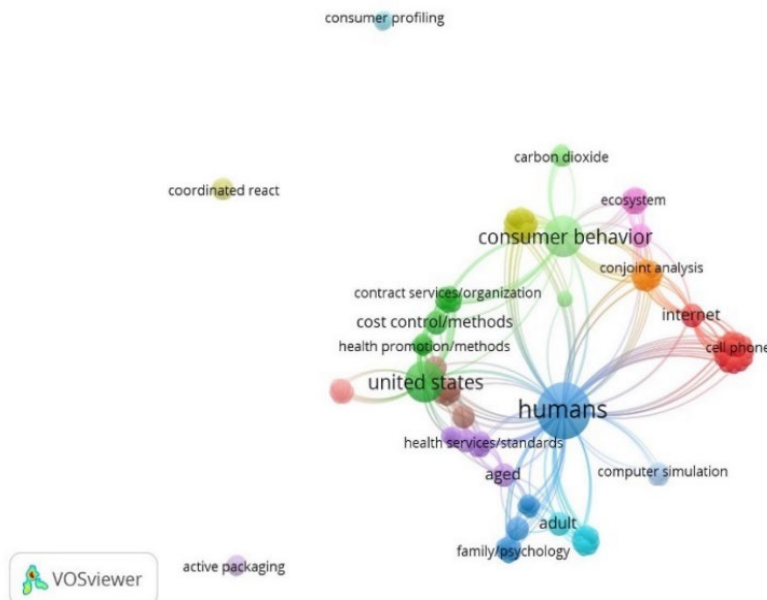
Figure 10. *Smart consumer article clusters for keywords*

257

4. Sustainable consumers. In order to identify the timeline of the sustainable consumers articles, we wanted to see which years have the most published articles on this topic. However, VOSviewer does not provide such an analysis, so we computed the number of articles in Excel. The initial sample size was 1000, but some of the articles did not have the year so the final sample size was 965 articles from years starting from 1992 to 2022.


No. of published articles per year (1992-2022)
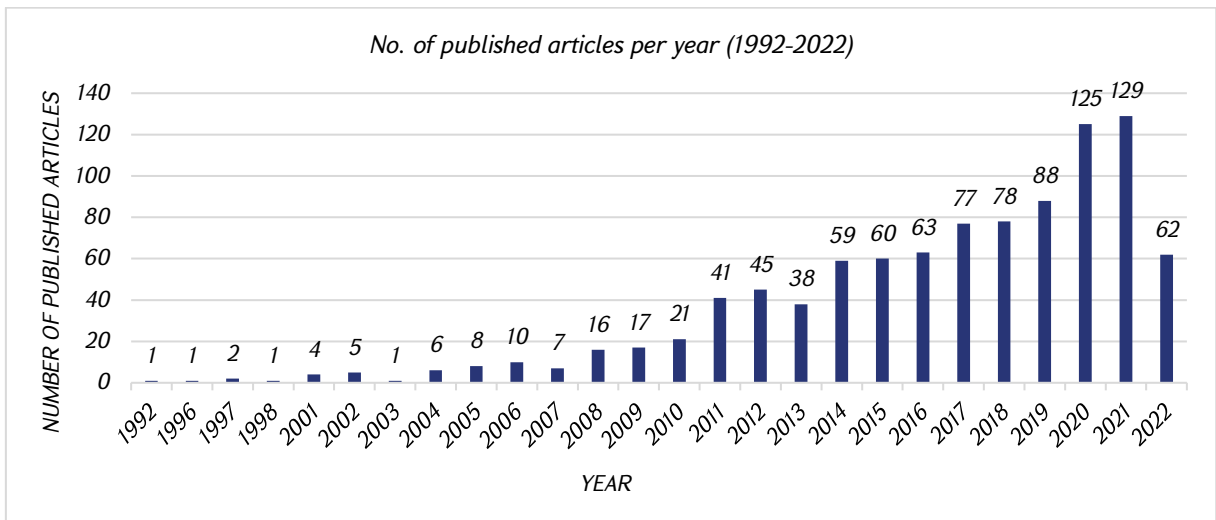
Source: own processing in Excel

Figure 11. *Number of published articles over the years 1992 – 2022 for "sustainable consumer"*

As seen in figure 10, the number of articles published on the topic "sustainable consumer" have rose significantly starting with the year 2012. In the early 2000s only a few articles were published, but from 2014 until 2021 the interest in this topic grew significantly. In 2013, we observe some decrease. In 2022, the data is not already complete, since this research is computed in mid-July. By the end of 2022, there will have been more articles published.

Our next objective for sustainable consumers was to identify which is the most cited document and the main keywords that showed up. For sustainable consumers our database contained 1000 records.

When looking into citations, from 1000 documents only 429 had at least one citation and from these 429 only 104 are connected. We may observe from figure 12, that Katherine White has the highest number of citations with 407 citations, M. Arantxa Colchero takes the second place with 396 citations followed by Filiep Vanhonacker in the third place with 259 citations.
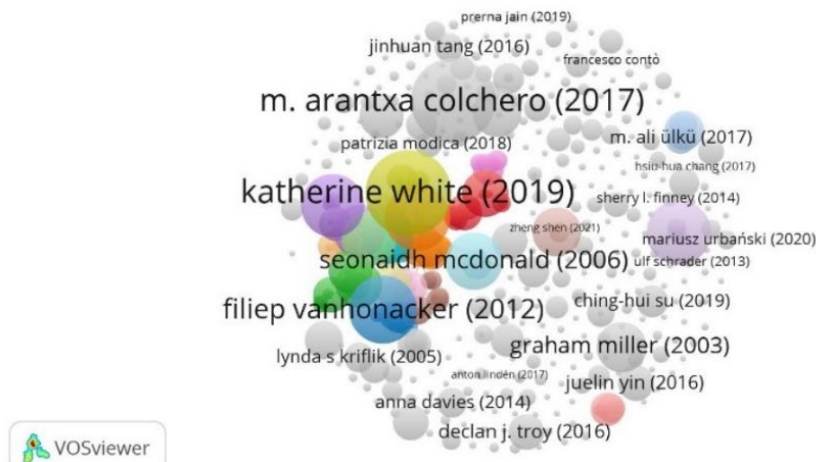
Source: own processing in VOSviewer

*Figure 12. **Sustainable consumer article citation with outliers***

The third type of analysis was on keywords, from 1000 records only 208 keywords were found, from these 208 only 188 are connected. There are several outliers like consumer's perception, family and friend support, consumer behaviour change and food waste. The main cluster contains keywords like humans, animals, sustainable consumption, books, animal welfare, food labelling, accidents, traffic/prevention etc. A clearer image for the cluster can be seen in figure 13. We may observe that sustainable consumer leads us more to the idea of food and how to be more sustainable regarding it.
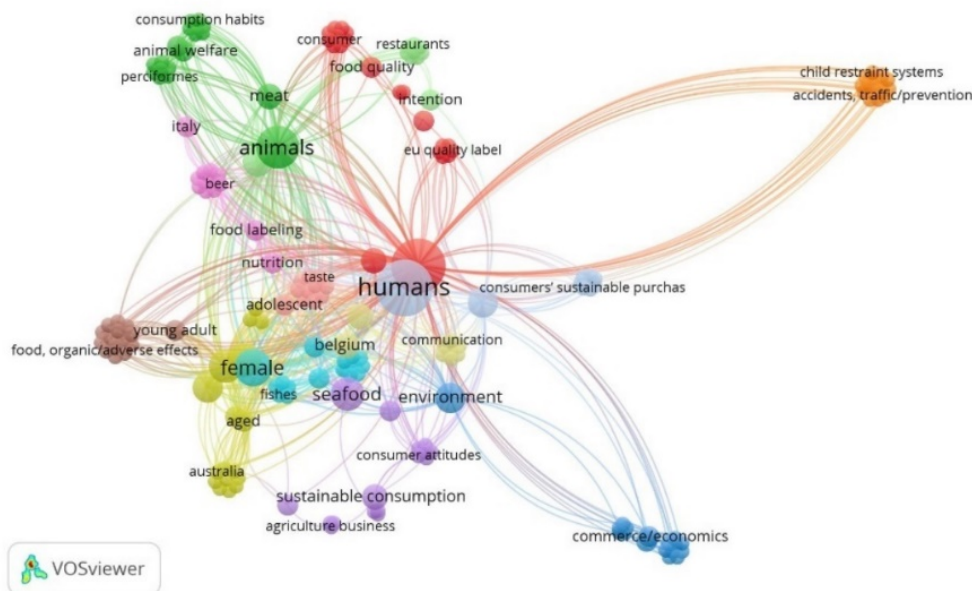
Source: own processing in VOSviewer

*Figure 13. **Sustainable consumer article clusters for keywords without outliers***

5. *Sustainable smart consumers.* As seen in Table 1, a chronological analysis of the findings in the time period from 2009 to the present is given. Among the 26 selected studies, there are more studies which have three or most authors (73,07%), the majority being journal articles (100%) and using mostly the quantitative method (54,54%). Also, through 26 studies we can see that mostly used as an analysis unit it's other (63,63%), the sample size being a thousand and below and not quantitative at the same percentage (45,45%). The main data collection method used was literature review and survey (36,36%) followed by mixed methods (18,18%), mostly using questionnaires.

Table 1

Bibliometric analysis for sustainable sustainable smart consumer

Bibliographic of Selected Studies		Time Period									
		2009 - 2014		2015- 2018		2019 - 2022		2020 - Present		2009 - Present	
		N1 = 10		N2 = 5		N3 = 11		N5 = 8		N6 = 26	
		f	%	f	%	f	%	f	%	f	%
Number of authors	One author	1	10%	1	20%	1	10,10%	1	12,5%	3	11,53%
	Two authors			4	80%					4	15,38%
	Three or more authors	9	90%			10	90,90%	7	87,5%	19	73,07%
Study Attribute	Journal Article	4	100%	3	100%	4	100%	3	100%	11	100%
Study type	Quantitative	2	50%	1	33,33%	3	75%	2	66,66%	6	54,54%
	Qualitative	2	50%	2	66,66%	1	25%	1	33,33%	5	45,45%
Analysis unit	Student and other					1	25%			1	9,09%
	Other	3	75%	2	66,66%	2	50%	2	66,66%	7	63,63%
	Source	1	25%	1	33,33%	1	25%	1	33,33%	3	27,27%
Sample size	A thousand and below	1	25%	1	33,33%	3	75%	2	66,66%	5	45,45%
	Over a thousand	1	25%							1	9,09%
	Not quantitative	2	50%	2	66,66%	1	25%	1	33,33%	5	45,45%
Data collection method	Survey	1	25%			3	75%	2	66,66%	4	36,36%
	Focus group	1	25%							1	9,09%
	Literature review	1	25%	2	66,66%	1	25%	1	33,33%	4	36,36%
	Mixed (experiment, questionnaire)	1	25%	1	33,33%					2	18,18%

In order to identify the timeline of the sustainable smart consumer articles, we wanted to see which years have the most published articles on this topic. However, VOSviewer does not provide such an analysis, so we *computed* the number of articles in Excel. The initial sample size

was 20, and the years are from 2009 to 2022 with some gaps in 2013, 2014 and 2017 and having a peak in 2020.
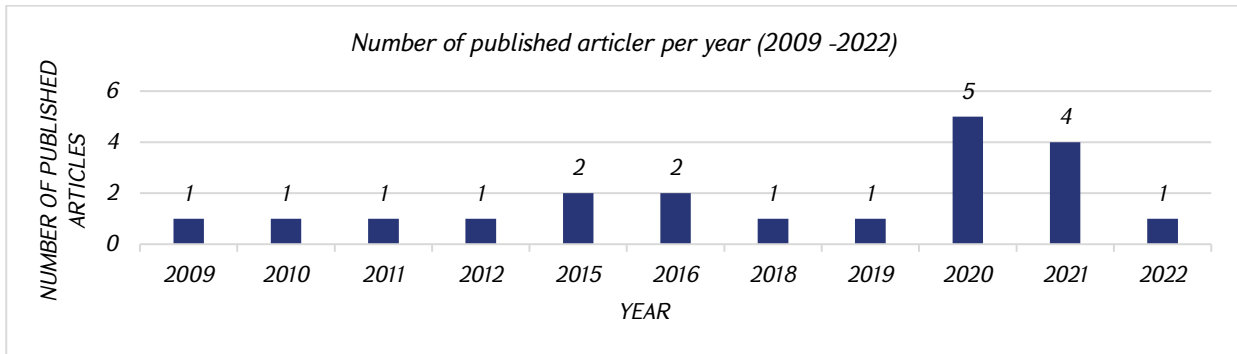
Figure 14. Number of published articles over the years 2009 – 2022 for "sustainable smart consumer"

Our next objective for sustainable smart consumers was to identify which is the most cited document and the main keywords that showed up. For sustainable smart consumers our database contained 20 records. As it seems, not many articles have been written on this topic.

When looking into citations, from 20 documents only 9 had at least one citation and none of them are interconnected. We may observe from figure 15, that Alexandra-Gwyn Paetz has the highest number of citations with 209 citations, Christos Vlachokostas takes the second place with 12 citations followed by Haiyun Chen in the third place with 10 citations.

Figure 15. Sustainable smart consumer article citation

The third type of analysis was on keywords, from 20 records only 14 keywords were found and from these none are connected. In figure 16, we may observe that the cluster contains keywords like technology, smart hotel, humans, technology readiness, attitude, perceived performance etc. So, the focus is on technology, how advanced it is and how ready are people to adapt to it.
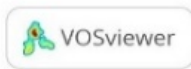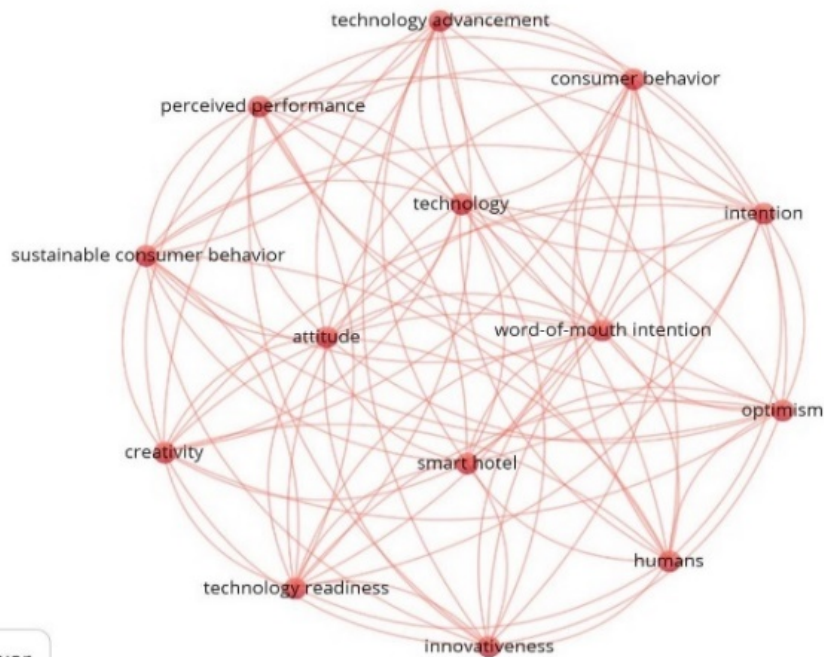
Source: own processing in VOSviewer
*Figure 16. **Sustainable smart consumer article clusters for keywords***

Conclusion. In conclusion, there have not been written many articles on smart sustainable consumer which gives an opportunity for research.

However, the most used keywords for the selected terms were humans, technology, consumer, environment, internet, algorithm.

The most cited authors were Alexandra-Gwyn Paetz, Katherine White, Eoghan McKenn, Tan Yigitcanlar and Gerd Kortuem.

The most published articles are on smart objects, smart consumers and sustainable consumer while a few were written on smart brands and sustainable smart consumers. For the last two, the trend of articles written on these topics emerged at the beginning of the 2000s.

preparation for insertion into the labor market). The funding source had no influence on contents or submission of the article.

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3. ÇELİK, Z., & Aypar, U. S. L. U. (2022). Bibliometric Analysis of Flow Theory from Past to Present with Visual Mapping Technique: A Marketing-Sided Approach. Öneri Dergisi, 17(57), 243-267.
4. Financial and Consumer Services Comissions: https://www.fcnb.ca/en/guides/being-a-smart-consumer

Appendix

Table 1

Chosen articles for the bibliometric analyses for sustainable smart consumers

Year	Selected studies	Study attribute	N (number of authors)
2009	Wilma Mert; Melanie Watts; Wibke Tritthart - Smart domestic appliances in sustainable energy systems - consumer acceptance and restrictions	journal article	3
2010	Jacquelyn Ottman - A Smart New Way to Segment Green Consumers	Sustainability Marketing, The New Rules of Green Marketing Book	J. Ottman Consulting	book	1
2011	Alexandra-Gwyn Paetz; Elisabeth Dütschke; Wolf Fichtner - Smart Homes as a Means to Sustainable Energy Consumption: A Study of Consumer Perceptions	journal article	3
2012	E.M.F. van den Broek; M.A. Dolman; C.P.A. van Wagenberg - Smart consumer awareness of sustainability of food products	journal article	3
2015	François Coallier - The role of the "interconnected" consumer in smart and sustainable cities: the interconnectedness between new and emerging technologies, the Internet of Things (IoT)	journal article	1
2016	Valerie Graf-Drasch; Henner Gimpel - The Impact of Sustainability on Consumers' Technology Approval : Taking Smart Energy-Saving Systems as an Example of Application	journal article	2
2018	Nieke Lemmen; Ayça Berfu Ünal - Symposium. Designing smart energy technology: How to engage and motivate consumers' sustainable energy use	journal article	2
2019	C. A. Malarvizhi; Sreenivasan Jayashree; Shamima Raihan Manzoor - Examining a Model to Measure Green Packaging Practices Among Consumers in Malaysia: A Sustainable Contributor to Achieving Smart Environmental Goals	journal article	3
2020	Haiyun Chen; Ting Zhu; Jiazhen Huo; Habisch Andre - Sustainable co-governance of smart bike-sharing schemes based on consumers' perspective	journal article	4
2021	Saraju P. Mohanty - Low-Cost Consumer Technology Can Help to Build Sustainable Smart Villages	journal article	1
2022	M.M. Fouad; Stratis Kanarachos; Mahmoud Allam - Perceptions of consumers towards smart and sustainable energy market services: The role of early adopters	journal article	3

ARMINE SCHANYAN

PhD in Economics, Associate Professor, ASUE

WELFARE GUARANTEES FOR SOCIALLY VULNERABLE LAYERS OF SOCIETY

Keywords: *human capital, completeness, opportunities, well-being, lifestyle*

The state constructs judgments about man and life in a rational field, for example, considering a beneficiary as a carrier of human capital. The best practice of state care has been formed in developed countries, but in the context of total regulations it is necessary to take into account, for example, the distortion of health, physical and spiritual unity. It is obvious that it is very one-sided in terms of the content from the viewpoint of completeness, even if the state support mechanisms are fully functional. It means that by placing a person in a sensory and logical framework, we emphasize the latter's important role in the fullness of the vocation assigned to him. In this case the agenda of the state is the creation, operation and maintenance of environmental structures, and the constant task of a person is to find himself in a newly created motivational environment.

Introduction. A person's lifestyle is conditioned by the environmental influence, but since a person at an energetic age has an ability to influence the environment around him, it becomes very necessary that the prevalence of this influence in a positive sense includes integration processes not only in the human-environment system, but also in public relations in the direction of the restoration and development of various vitally necessary aspects. If we conventionally divide the life cycle of a person into four parts, the active participation of the state is not strictly necessary in the second and third periods, because the opportunities for individual development, in general, allow to relieve the burden of the state in the context of the solution of various problems of the society. There is always an opportunity to discover new groups of people joining the rows of the active society, but in the issue of being initiative it is preferable to determine the path of integration on the principle of volunteering.

Literature review. In 1973, when Freedom House published its first comprehensive assessment, only 44 of 148 countries were classified as Free. Today, 84 of 195 countries are Free. The share of countries rated Free has generally increased over the past 50 years, but progress faltered beginning in the early 2000s[1]. Economic growth is considered an important factor in human life, but it will not automatically affect the improvement of human dignity and dignity. In this connection, there are three components that are considered most decisive in

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[1] https://freedomhouse.org/sites/default/files/2023-03/FIW_2023_50Years_DigitalPDF.pdf

development, long and healthy life, the acquisition and development of knowledge, and the improvement of access to a better life. Human Development Index is created by combining three components: average life expectancy at birth, average educational attainment at the elementary, junior high and high school levels, per capita income calculated based on Purchasing Power Parity[1].

One of the basic principles of social policy is the principle of social responsibility, which requires investment maximum efforts from an individual, family, and group in self-sufficiency and self-defense. At the same time, the society or the state provides them with only those forms or volumes of support or assistance that they cannot provide independently[2]. In the context of human-community-state-region-world, all the components are important in the vision of the RA development, but the basis is human-community interconnectedness. In 2015-2019, the RA average (regional average) of the Human Development Index has mainly increased[3]. Political systems, as well as the economic systems, expect the support of the cultural system, otherwise open coercion will have to be applied, which cannot be considered as effective. Apart from the positive trends of the modern civilization process, the assessments of modern socio-cultural situation in the world are heterogeneous and these socio-cultural processes do not fit within the strict framework of existing schemes, because culture is not only technologically reasoned, but also has ethnic, religious and other characteristics.[4] One of the most important resources of interstate relations is the mutual perceptions of their societies, which, under the conditions of a considerable cultural distance, can hinder the adoption of cooperative decisions directed at each other at the state level, and in the case of close ties between societies, effective mutual understanding, use of a commonly understood language, constant communication at the daily level and value openness to each other, the official relations of states get a resource to become easy and comprehensive. [5] «Educated and Capable, citizen, people» Megapurpose 01 states that the realization of the rights of a citizen is as important as the fulfillment of duties and obligations, who considers himself primarily as responsible for his own well-being and health.[6] Through deeper structural changes in the object of social (sociotechnical) management, cardinal reorientations of direct and reverse links and actions in the management system (its subject and object of management), a fundamentally new quality of development is achieved, which allows

[1] World Development Indicators, WB; https://manajemen.uma.ac.id/2021/02/indicators-of-stages-of-success-in-economic-development/

[2] Gyozalyan V. G. Social Policy// Educational manual Yerevan. "Tir" pub., 2017.-p.20

[3] The vision of complex development of the Syunik and Vayots Dzor regions of the RA// S. Khachikyan and others: -Yerevan, Economist, 2022, "Amberd" series 58, p. 46

[4] G. Grigoryants, H. Grigoryan Culture and Knowledge in Information Society// Yerevan. Interlingua, 2016 pp. 18

[5] A. Atanesyan, A. Mkrtichyan Armenian Society at Crossroads: Foreign Policy Orientations, Priorities and Perceptions// Sociological research (collective monograph) Yerevan, Konrad Adenauer Foundation Armenian branch, 2021, "TUMO DESIGN" LTD pub., p. 18

[6] Armenia's Transformation Strategy, 2050, p 55

the system to rise to a new level of life existence and become more sustainable, acquire positive qualitatively new properties and ensure quantitative growth.[1]

Research methodology. The range of methods included in the research was formed by applying widely known methodology, principles and concepts, in particular, the tools of abstraction, induction and deduction, comparison of numerical series of indicators and juxtaposition. Compared to separate approaches of economic-mathematical and statistical methods, in the research the main emphasis and preference were given to the methodological approaches used in the context of the goal-result connection, because the variety of public programs at the level of metrics allows us to consider the results of the analysis not only at the perspective, but also at the strategic level.

In particular, the possibilities of quantitative and qualitative evaluation, systematic analysis and synthesis are expanded when the peculiarities of Performance Budget, Planning Programming Budgeting System and Management by Objectives methods are manifested at a given level of program budgeting staged development. In the first case, the main content of the method is related to social and economic efficiency. In the following two cases, on the basis of the first budgeting method, the main components of methodological improvement are highlighted, which outline the way to achieve the state policy goals at the optimal decision-responsibility level[2].

In the book "Culture and knowledge in the information society", the authors, referring to the classics, note that despite the difference in approaches, terms, and methodology, they are all united by common prerequisites and principles, in particular, in the new socio-political terms and disciplines, the importance of understanding the civilizational advances and the need to reflect, because none of the old theories can adequately express the created realities[3].

However, the formulas that are applicable for the purpose of evaluating the level of development of human capital (for example, including the number of years spent on education in the Cobb-Douglas production function formula, the results of the study showed that the biggest losses in the economy over a quarter-century period in transitional Armenia were precisely in the field of human capital[4]), are the basis for expanding the limits of comprehensiveness of assessment by determining the influence of similar components (for example, unlimited or continuous education component) that have become imperative today.

Analysis. The existence of an economic foundation is mandatory from the point of view of creating and maintaining structures in the social sphere. As compared with 2021, in 2022,

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[1] Strategic Management: Textbook for masters // Under ed. of doctor of. Economic sciences, PhD I. K. Larionov.-3rd ed.-M.: Publishing and Trade Corporation "Dashkov and K", 2019.-p.108

[2] Finances, Money Circulation and Credit, Textbook// L. Badanyan, K. Abgaryan, A. Salnazaryan and others, Yerevan, Zangak-97, 2007, pp. 203-204; https://library.anau.am/images/stories/grqer/tnt/Finances%202007.pdf,

[3] G. Grigoryants, H. Grigoryan Culture and Knowledge in Information Society// Yerevan. Interlingua, 2016.-p. 4.

[4] Barkhudaryan G. Interactions between education, human capital and economic growth, Problems of economic development and management. 2016, Armenia Book 9, 40-58 pages

12.6 percent growth of the approved GDP by quarters is represented by the following indicators: 1 428.3, 1 899.1, 2 379.1 and 2 733.7 billion drams (totally 8 496.8 billion AMD). The GDP indicator per capita was 2 861 735 AMD or 6569 USD. Despite the decrease in the rate of growth in the 4th quarter from 14.83 percentage points to 12.81%[1] in comparison with the 3rd quarter of 2023, according to the preliminary data of the first quarter, the growth trends of more than 10 percent are maintained. The expansion of the current attractive investment environment in the RA, the additional support mechanisms of the state in terms of demonstrating the required flexibility in time are necessary to the extent that the initiative of the private or public sector is delayed.

No matter how much the state considers the resulting distribution of resources in separate groups of beneficiaries or their unity, the perception of a beneficiary in this issue is less beneficial, and then in some cases it can be more beneficial. In the issue of the solution to numerous problems, the lack of intersections within the framework of the above is value system, so in the current reality, the key to the solution may be different in each country. According to international experience, changes in the list of happy countries are always published, but regardless of these changes, the happiness of the society is measured by the level of well-being, meanwhile, as we have already mentioned, the complete picture may be only described when taking into account such components proceeding from the nature of the internal lifestyle rather than from the external one.

The prevalence of poverty in the world is increasing in its dimensions, overcoming which, being a priority among the 17 goals of the United Nations Organization, mutually conditions the possibilities of mitigation of income polarization, becoming a dominant factor in the matter of the solution of the eternal problems of ensuring well-being and living standards. In the long-term programs of the Republic of Armenia (Strategic Program for Poverty Alleviation, Sustainable Development Program, Perspective Development Program - 2015, 2021 and 2025 horizon, respectively) in the safe, stable and developing environment, the issues of poverty reduction (73.5 percent is not poor in 2021), employment provision (the level of labor force participation in 2021, including agriculture: 1 287.3 thousand people[2]) were raised in line with the state of the existing society.

In 2021, the amount of maximum average monthly nominal consumer expenses of 6 vulnerable groups in the RA is twice as much as the extreme poverty line, but does not cross the general poverty line, making 54023 AMD. According to the republican distribution, the same indicator (per capita nominal consumer expenditures of the household) exceeds the general poverty line only in Yerevan, increasing by 54720-67059 AMD in 2018-2021[3].

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[1] RA Socio-Economic Situation in January 2023, RA SC, pp.10,18;
https://www.armstat.am/file/article/sv_01_23a_112.pdf

[2] Food Security and Poverty, January-December 2022, pp. 14, 97; https://www.armstat.am/en/?nid=82&id=2549

[3] Food Security and Poverty, January-December 2022, p.93; https://www.armstat.am/en/?nid=82&id=2549

Currently, many initiatives are aimed at ensuring the inclusiveness of the mentioned groups in the socio-economic active life with the combination of separate programs.

Until the restoration of the minimum necessary level of welfare-oriented public consciousness, the state has a lot to do here, and by distinguishing health being the most important component in the sensory and logical worldview, we can state that it is true that the determination of the superiority of the mental and physical world towards each other is highly individual, but the justification that the health system is a priority in issues elaborated at the state level is conditioned by the circumstance that from the point of view of expression, the human health is a phenomenon placed in the metrics framework. Visitor-oriented centralized policies in the health system are not so new as children, learner-centered and other centralized policies. In this case, an important question is how the person, being in the center, acts as a beneficial participant.

The composition of budget programs (Program of the Government of the RA (2021-2026), Section 4[1]) related to human capital development issues is presented below.

Table 1

The classification of state budget programs by sectors[2] (mln AMD)

Sector	Programs by codes	2022
Public administration	1050, 1215	1 186 489,0
Environmental protection	1016, 1071, 1133, 1155, 1173, 1186	6 771 742,0
Social protection	1011, 1032, 1068, 1102, 1141, 1153,1205, 1206	526 757 884,0
Health	1003, 1053, 1099, 1142, 1188, 1191, 1200, 1201, 1202, 1207, 1208	118 704 592,0
Education	1045, 1111, 1146, 1183, 1192, 1193, 1227	170 449 547,0
Science	1162	25 150 175,0
Culture	1056, 1075, 1124, 1148, 1168, 1196, 1198	20 305 879,0
Sport	1041, 1163	5 644 398,0
Youth	1115	1 906 154,0
Migration	1070	1 606 868,0
Judiciary	1123	635 596,0
Total		879 119 324,0

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[1] Annex to Decision of the Government of the Republic of Armenia 1363-N of 18 August;
https://www.gov.am/files/docs/4586.pdf 30/03/2023

[2] A Study of Relations between Development Policies and Budget Programs;
https://minfin.am/hy/page/petakan_byuj/

268

It is clear that all the programs directly or indirectly provide or contribute to the preservation of human resources. In terms of the solution of social problems (housing, health insurance, etc.), even in the nearest future, the increase of funding from the consolidated budget exceeding 3 trillion in various directions (General public services, Defense, Economic affairs, Social sphere, etc.) may cause serious difficulties in terms of ensuring adequate coverage. The improvement of the financial efficiency and usefulness assessment mechanism continue being the main emphasis here. By and large, we cannot expect significant changes in the structure of the RA budget expenses in the current period. The volume of education and healthcare expenses of the consolidated budget in relation to GDP in 2018-2021 was in the range of 2.5-2.7 and 1.3-2.3 percent[1], respectively, and the share of state expenses in the field of culture among the directions receiving the smallest financial allocation still exceeds 1.5 percent. In other countries, not by share in the budget expenses, but by share in GDP in 2021 it (by classification COFOG 1999 Recreation, culture and religion) made maximum 3 or more percent in Hungary and Iceland, the share of allocations in GDP minimum 0.5 percent in Ireland, and the average indicator of the EU countries has fluctuated between 1.1-1.2 percent during the recent years[2]. For example, in 2019, as compared with 2011, the UK had one of the lowest rates of government expenditure on cultural services across OECD countries. However, this shortfall appears to be addressed by large amounts of investment from the private sector[3].
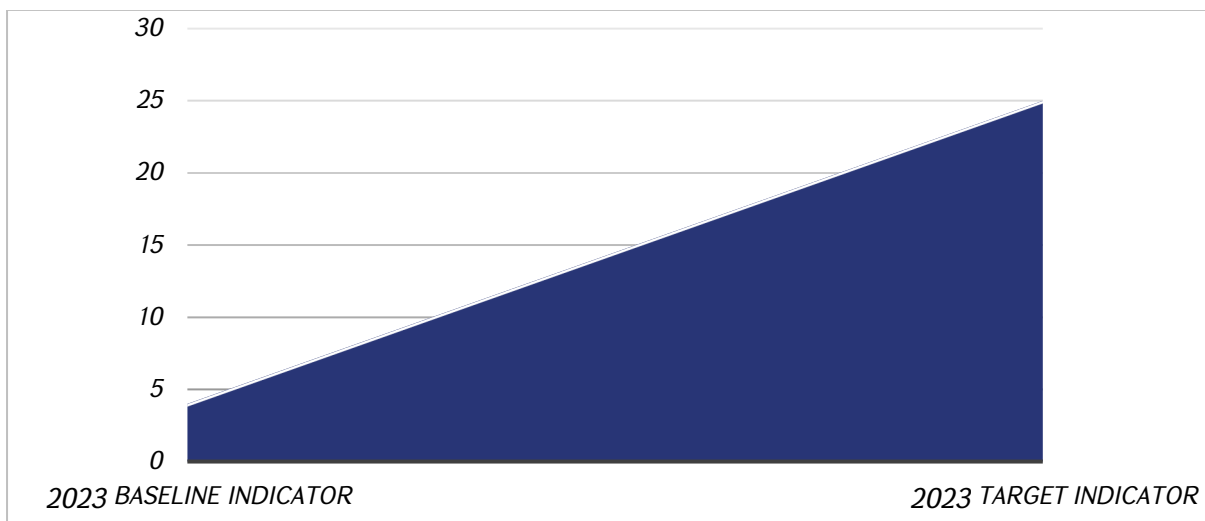

Figure 1. *Share of communities included in cultural events, percentage[4]*

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[1] Food Security and Poverty, January-December 2022, pp 8.9; https://www.armstat.am/en/?nid=82&id=2549

[2] https://ec.europa.eu/eurostat/databrowser/view/gov_10a_exp/default/table?lang=en

[3] https://www.oecd-ilibrary.org/sites/29f05369-en/index.html?itemId=/content/component/29f05369-en#section-d1e25734

[4] https://minfin.am/hy/page/petakan_mijnazhamket_tsakhseri_tsragre/

In the medium-term sector, the financing of the mentioned sector in the structure of the RA state budget expenses will make 1.07 percent in 2025 with a tendency of decrease. Let us present the change of the main indicator of the final result of the 1196 program, as an important part of the general state policy of the RA government, a standard contributing to the policy of balanced and sustainable development in all the residential areas.

Totally, in the conditions of a long-term education-labor market gap, the negative side of the employment-poverty interaction still persists, which can also have a lasting influence on the remaining lifespan of the groups representing that sector. Completing the social sphere, let us mention that at the beginning of 2023, 63-70 age group of 468750 pensioners in the RA exceeds more than 2 times the 71-75 age group, making up 43.3 percent (202912 pensioners), and vice versa, 81 and older age group exceeds it by 1.7 times the previous age group, making 16.5 percent. It is true that in the case of 90263 beneficiaries, the rest age groups are formed by the predominance of old-age pension recipients after the 63-age group, and at the same time a sharp decrease is noticeable in the next 71-75 age group from 13809 to 2303 people, and before that age groups sharply decrease in the 51-55 age group was registered with the predominance of disability benefit recipients, decreasing from 40954 to 6112 people[1]. The separation of age subgroups is also important for determining the role of the beneficiary (for example, the degree of satisfaction of the main part of the subgroup aged 81 and over on the same issue, due to various reasons and factors, can be very different from the position of the same people forming the previous age subgroup), for the assessment of the result of the implementation of the state initiative and, at the same time, for the purpose of combining both of them.

Over the years, the budget Programs/Events of the same sectoral directions have been aggregated, and more than 170 programs are being implemented currently. It can be said that the issue is not so much at the program level (for example, the Ministry of Labor and Social Affairs has anchored the measures on all the existing problems) as in such stratification of a strategic approach that will allow adopting the universal mechanism of requirements for the formation of a healthy person arising from the definition of human capital. The universal one-time assessment of budget programs in our country will strive for completeness in the strategic domain, because there will be a high probability that the development of the information base can result from a complete picture. Paying attention to the fundamental change of the formulations is also important, because in fact the correct practice, along with the documentary compliance, will ensure the expected results in the field of veracity and provability.

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[1] RA Socio-Economic Situation in January 2023, RA SC, pp.156,160;
https://www.armstat.am/file/article/sv_01_23a_112.pdf,

Table 2

PROBLEM-RESULT

The problem level	The proposed possible result
1. The maximum threshold of the sufficient range- physical and mental daily activity	Desirable level - preferred employment
2. Minimum threshold of sufficient range- economically justified or effective work	Necessary level - greater involvement in individual branches of the economy (for example, the agricultural sector)
3. Necessary level - minimum standard of living	*

When ranking the developed countries among the ranks of happy countries, it can be considered as sufficient, for example, in comparison with the elderly population of the RA, the existence of an incomparably higher level of income of the same group in terms of positive impact on life expectancy, or in case of urban concentration, the independent organization of the household and other conditions. In case of impossibility of the aforementioned solutions to the 1st and 2nd problems in the RA*, based on the features characteristic of the Armenian people, until 2050 the Megapurpose of increasing the population in the development vision of the RA will allow to restore, maintain and develop the combination of several generations.

Summarizing, it should be noted that the advancement of the issues of continuous development of the same subject-object processes build up the goals at the tactical-strategic level, at the intermediate strategic level (strategies, programs, concepts) and at the strategic high level with the following logics:

- Programs/Events - society is at the center,
- Strategic level - human-centered strategy,
- The level of the mission -the individual is bearer.

Conclusion. The circulation of budget resources in any form is aimed at achieving and maintaining a common mission. In this case, it is very important to give a new breath to the pro-beneficiary policy that has already become traditional in many countries. In the human capital development policy, the most effective form of state-beneficiary cooperation is manifested by maintaining the direct link between employment and well-being within the possible limits of human life, contributing from both sides to the formation of normal living conditions for the part that expects one-sided support in the social sphere. First of all, it is necessary to establish the interdependence of life stages taking turns in the field of individual development opportunities, and then to improve the systemic approaches of the impact mechanisms implemented in different stages. An improved macro-environment is a necessary, but not sufficient condition for ensuring the well-being of the public and restoring the quality of life, and only with simultaneous balancing of the quantitative and qualitative components of the measurability in the multi-factor system will ultimately contribute to the most positive developments and ensure the regulations of the influence and replenishment of market mechanisms.

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TAMARA TEPLOVA
Doctor of Economic Sciences, Professor, Director of CFR&DA, HSE University
TATIANA SOKOLOVA
Candidate of Sciences, CFR&DA, HSE University
IRINA PANTELEEVA
Post-Graduate Student,Research Intern of CFR&DA, HSE University

ESG AND RUSSIAN COMPANY-SPECIFIC RISK: EVIDENCE FROM EXPLAINABLE AI MODELS

Earlier papers did not thoroughly highlight the importance of ESG constituents as determining factors for company-specific risk. Our main contribution to academic literature is that we discover key determining factors for company-specific risk emphasizing the importance of the determinants within the scope of environmental responsibility (Russian case, 36 Russian non-financial public companies). We present the first attempt to apply Explainable AI to reveal the relationship of different ESG metrics on company-specific risk. We use a novel methodology based on the two-stage approach: neural networks with dense layers to account for nonlinear effects and the Shapley values from the game theory to interpret empirical results. We employ Nesterov-accelerated Adaptive Moment Estimation (NADAM) for optimization of the neural networks. Additionally, we provide a ranking of a diverse set of factors (categorized as macroeconomic variables, financial performance of companies, trading data on stocks, and ESG-related indicators) by their influence on company-specific risk.

Companies that adhere to a sustainable energy policy and with a better capacity to reduce the use of resources tend to have smaller company-specific risks. The company's commitment to reduce emissions in its production and operational processes and a sustainable emissions policy contribute positively to the reduction of company-specific risk.

Introduction. In our paper, we consider the peculiarities of investing in emerging capital markets, the inability to fully diversify risks (preservation of unique risks for companies), and the impact on the remaining risks of factors that determine sustainable development.

ESG-friendly investment products have been the fastest-growing sector in the asset management industry with the volume of these products totaling $2.7 trillion in 2021. Our motivation is to discover determining factors for company-specific risk for emerging capital

cases following papers by Farah et al., 2021[1]; Farooq, 2018[2]; Wong et al., 2021[3]. Throughout our paper, the terms 'company-specific risk', 'unsystematic risk', and 'idiosyncratic risk' are used interchangeably.

Earlier works in the areas predominantly utilized research techniques such as FERC regression models (Moumen et al., 2016[4]), multifactor linear regression models (Vozlyublennaia, 2013[5]), and panel regressions (Kumari et al., 2014[6]). We present the first attempt to apply Explainable AI to reveal the relationship of different ESG metrics on company-specific risk. With the use of neural networks, we will capture non-linearity in the influence and interaction of the factors without explicit specification of non-linear functions as required in econometric modeling.

Literature review. Roll (1988)[7] reports that systematic factors explain less than 40% of stock returns while the rest can be explained by company-specific factors. Later works confirm these findings and argue that further information about a company reduces the synchrony of stock price movements which is viewed as a proxy for information about a company accommodated in stock prices (Ferreira et al., 2007[8]; Crawford et al., 2012[9]; Dong et al., 2013[10]).

Earlier works did not thoroughly highlight the importance of ESG constituents as determining factors for company-specific risk in emerging markets (Farah et al., 2021[11]; Farooq,

[1] **Farah, T., Li, J., Li, Z., Shamsuddin, A. The non-linear effect of CSR on firms'** systematic risk: International evidence. *Journal of International Financial Markets, Institutions and Money*, 71, 2021, 101288.

[2] Farooq, O., Ahmed, N.. Does inflation affect the sensitivity of investment to stock prices? Evidence from emerging markets. *Finance Research Letters*, 25, 2018, 160-164.

[3] Wong, W.C., Batten, J.A., Ahmad, A.H., Mohamed-Arshad, S.B., Nordin, S., Adzis, A.A., Does ESG certification add firm value? *Finance Research Letters*, 39, 2021, 101593.

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2018[1]; Wong et al., 2021[2]). Muhammad et al. (2015)[3] argue that the improved environmental performance of a company means a decrease in its volatility and downside risk, but the authors leave out the consideration of company-specific risk. Many researchers are convinced that the relationship between idiosyncratic risk and ESG is questioned, based on such arguments as the "illusion of transparency", "impression management theory" and others. Deand Clayman, 2015[4], and Wamba et al., 2020[5] are convinced that positive environmental performance can serve as a company insurance for investors. According to investors, suck kind of insurance is a sign of the low likelihood of negative effects. It means the lower company-specific risks.

Reber et al., 2022[6] attempted to analyze the relationship between ESG factors and a company's unique risk in the case of IPO because this company stage is characterized by strong information asymmetries between company insiders and the market. ESG disclosure reduces idiosyncratic volatility and risk of loss, and higher ESG ratings have lower firm-specific volatility and downside risk during the first year of trading in the secondary market. Companies that increase the ESG rating and openly publish information about their ESG policy create some signal: for investors it means that the company is following the sustainability rules. Thus, ESG metrics and disclosure of a company's ESG policy help companies build their reputational capital with investors after going public.

In our research, we fill the gap and study the whole Russian market, not only IPO companies. Additionally, we provide a ranking of environment-related ESG scores by their impact on the explained variable.

We choose the Russian stock market as one of the emerging markets. We have not found research papers that deal with determining factors for company-specific risks in Russia. In general, emerging markets are poorly studied in terms of the impact of ESG factors on the

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capital market (Deng et al., 2019[1]; Feng et al., 2022[2]; Singhania and Saini, 2021[3]). Russia is facing a few urgent environmental issues (depletion of natural resources, air and water pollution, a large amount of household waste) and is still on the way to transition to a postindustrial economy (according to Trading Economics, the services sector accounted for 58% in GDP in 2021). For example, in 2019, Russia was placed 174 out of 193 by CO_2 emissions per capita (according to the World Bank).

Section 2 provides a literature review. Section 3 outlines hypotheses and describes variables that are used in this research. Section 4 describes the methodology. Section 5 presents description statistics. Section 6 includes empirical results and discussion.

Research hypotheses and specification of variables

Hypothesis 1. An increase in ESG scores is associated with a decrease in company-specific risk.

Sassen et al. (2016)[4] show that a company with high corporate social responsibility in the European market has low idiosyncratic risk. Companies that have been ESG-scored disclose more information on assumed risks that results in a decrease in company-specific risk (Wong et al., 2021[5]).

So, we assume that if financial indicators and a firm's value are influenced by ESG, then company-specific risk is also influenced by ESG.

Hypothesis 2. Indicators of environmental responsibility possess a weaker explanatory power than macroeconomic variables and the size of the company.

We hypothesize that in the Russian emerging market, which features overall slow GDP growth since 2012 and large downswings in GDP rates during the crises of 2008-2009 and 2014-2015, as well as the dominance of the public sector in the economy and low liquidity of the stock market, macroeconomic variables and the size of the company will make the greatest contribution to shaping company-specific risk.

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[1] Deng, X., Cheng, X. Can ESG indices improve the enterprises' stock market performance?—An empirical study from China. *Sustainability*, 11(17), 2019, 4765.

[2] Feng, J., Goodell, J.W., Shen, D. ESG rating and stock price crash risk: evidence from China. *Finance Research Letters*, 46, 2022, 102476.

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Specification of variables. In our paper, following Morck et al. (2000)[1], Piotroskietal. (2004)[2], and Xingetal (2011)[3] we define stock price informativeness (SPI) as:

$$SPI_i = \ln\left(\frac{R_i^2}{1-R_i^2}\right), \tag{1}$$

where R_i^2 denotes the determination coefficient of the following two-factor market model with a daily stock return over the financial year as an explained variable:

$$r_{i_t} = a_i + \beta_i r_{m_t} + \varepsilon_{i_t}, \tag{2}$$

where r_{i_t} denotes daily stock return and r_{m_t} denotes daily market return.

Higher values of SPI point to smaller volatility of stock returns compared to that of market returns which implies that the price is highly informative and the company-specific risk is low. As SPI decreases company-specific risk increases.

We will use the following variables to control for the profile of a company:

Company size is approximated by the log of market capitalization and the log of revenue.

Enterprise value is measured with Tobin's Q and revenue growth.

The liquidity of stocks is assessed with the free-float coefficient and with the average daily turnover of stocks.

Financial ratios such as leverage, return on assets, return on investment, and profit margin.

Social score. Farah et al. (2021)[4], based on the analysis of a wide cross-country sample, discover a non-linear (U-shaped) influence of the corporate social responsibility factor on the level of a company's systematic risk. Gillan et al. (2021)[5] reveal that company-specific risk is affected by both the aggregate ESG score and the corporate social responsibility (CSR) score.

Governance score. Moumenetal (2016)[6] report that a larger membership of the Board of Directors is associated with improved completeness and reliability of the disclosed information on the company's risks thereby reducing its company-specific risk.

Return volatility. We conjecture that company-specific risk increases with an increase in return volatility of the company stock.

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Research methodology and descriptive statistics. We use a neural network with dense layers to accomplish the research objective. The first layer performs batch normalization of the input data. Data normalization will serve to adequately process possible outliers, boost efficiency, stabilize the performance of the neural network, and increase its overall quality (i.e., to reduce the RMSE value).

The input layer is followed by three hidden dense layers within a funnel-shaped structure containing 100, 60, and 30 neurons, respectively. To resolve the problem of overfitting, each hidden layer is complemented with a dropout layer with a dropout probability of 10%. We employ Nesterov-accelerated Adaptive Moment Estimation (NADAM) for optimization. The neural network is trained on 215 epochs. The training involves time-based cross-validation, i.e., a gradual expansion of the training set over time and a corresponding movement of the test set.

We use 5 models, each for one partition, that ensures an exhaustive search of the input data to be added to the test set. With this approach, there is no data loss which is important given a comparatively small number of observations (370 observations).

In the interpretation of the results, we use the Shapley value to assess the marginal contribution of each factor to the definitive result (Lundberg et al., 2018[1]).

Our sample consists of 36 Russian non-financial public companies from 2007 to 2020. Rough data have been retrieved from the Eikon Refinitiv database. The dataset containing 370 observations is unbalanced because, for some companies, ESG data are occasionally missing from the database (Tab. 1). The sample is heterogenous in terms of liquidity and includes high-liquidity stocks (average daily trading volume exceeds $1,33 mln, i.e. RUB 100 mln), medium-liquidity stocks (average daily trading volume ranges from $0,13 to $1,33 mln), and low-liquidity stocks (average daily trading volume does not exceed $0,13 mln, i.e. RUB 10 mln).

Descriptive statistics on the sample

	Mean	Median	Std. dev.	Min
SPI	-0.987	-0.870	1.345	-4.500
ESG_Score	41.275	40.269	17.609	4.686
Social_Score	37.092	35.096	21.061	0.368
Governance_Score	50.271	50.857	22.797	5.046
Environmental_ Score	37.828	38.839	21.977	0.000
Resource_Use_Score	45.352	46.177	28.047	0.000
Emissions_Score	45.083	50.378	26.329	0.000
Ln_Env_Innovation_Score	0.925	0.000	1.622	0.000
Ln_Policy_Water_Score	3.071	4.272	1.950	0.000

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	Mean	Median	Std. dev.	Min
Ln_Policy_Energy_Score	3.163	4.222	1.876	0.000
Policy_Emissions_Score	48.460	62.407	30.228	0.000
Env_Management_Team_Score	35.669	0.000	37.442	0.000
Env_Supply_Chain_Management	21.551	0.000	35.125	0.000
GDP_growth	1.180	1.826	3.408	-7.800
Inflation	7.100	6.754	3.775	2.878
NetDebt_EBITDA	1.400	1.010	1.528	0.000
ROE	0.175	0.144	0.290	-1.500
ICR	13.797	8.717	13.314	-3.000
ROA	7.797	6.926	8.328	-15.000
Operating_Margin	18.432	15.942	15.072	-15.000
Ln_Average_daily_turnover	19.508	19.669	1.633	15.000
Q-Tobin	1.934	1.147	1.932	0.241
Liquidity	0.758	0.303	5.615	0.000
Ln_MC	26.674	26.645	1.219	23.370
Ln_Revenue	26.726	26.625	1.244	23.481
Revenue_growth	9.788	6.436	21.381	-45.000
Volatility	0.361	0.39	0.169	0.080

Empirical results. We have built 5 neural network models. The RMSE measure of the quality of model prediction ranges from 0.54 to 2.26 and assumes the value of 1.19 when averaged over all 5 models. This quality is appropriate to make conclusions. Figure 1 displays the modeling results for the last (fifth) model encompassing the largest number of observations in which the test set contains the latest-in-time observations.

Among the considered environment-related factors, the measure of sustainability in a company's emissions policy (*Policy_Emissions_Score*) exhibits the strongest impact on company-specific risk (judged by the median value across the 5 models). The second strongest impact is found for the measure of the effectiveness of a company's environmental management (*Env_Management_Team_Score*) and the aggregate measure of environmental responsibility (*Environmental_Score*). The third strongest impact is shared by the measure of water withdrawal (*Policy_Water_Score*) and the measure of a company's commitment to reduce emissions in its production and operational processes (*Emissions_Score*).
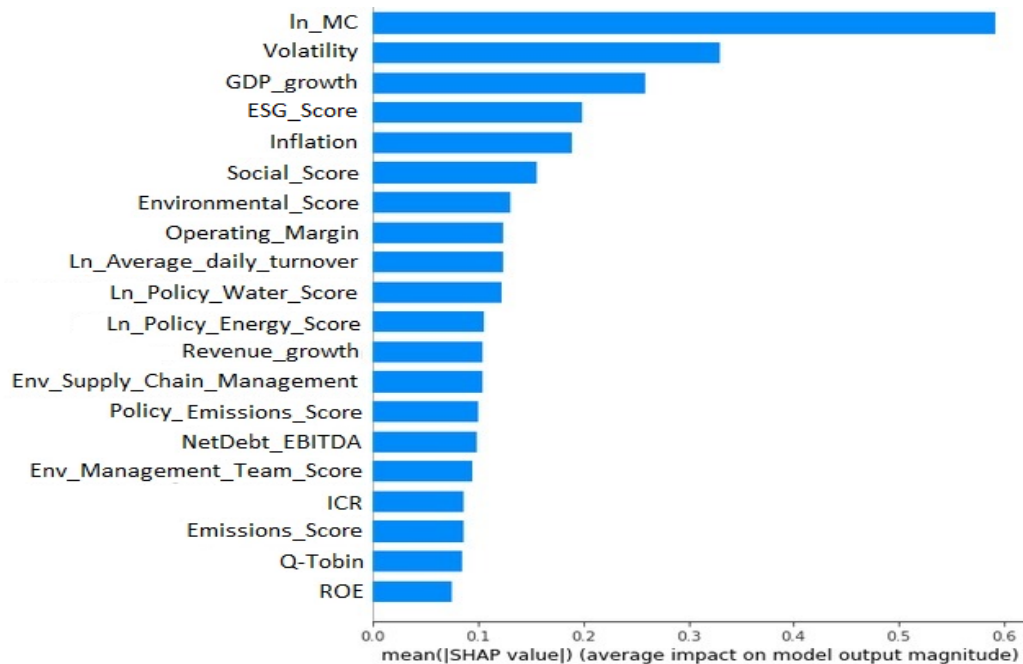
Figure 1. *The average contribution (strength of influence) of each factor in the formation of a company-specific risk according to the model (5)*

These results are overall consistent with those obtained in earlier works that highlight the importance of environmental considerations for a company's value (Abdi et al., 2020[1]), cost of capital (Baldi and Pandimiglio, 2022[2]; Zhang et al., 2021[3]), and financial ratios (Xie et al., 2019[4]; Lin et al., 2019[5]; Aastvedt et al., 2021[6]; Xie et al., 2022[7]), which, in turn, affects company-

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[2] Baldi, F., Pandimiglio, A. The role of ESG scoring and greenwashing risk in explaining the yields of green bonds: A conceptual framework and an econometric analysis. *Global Finance Journal*, 52 (126), 2022, 100711.

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specific risk (Vozlyublennaia, 2013[1]; Kumari et al., 2014[2]; Moumen et al., 2016[3]). In our research, for the first time, environmental factors are ranked by the strength of their influence.

The designed approach allows us to have inferences both on the strength and the direction of the impact of environmental factors. Hypothesis 1 which proposes that an increase in ESG scores is associated with a decrease in company-specific risk is partially supported. For companies that adhere to sustainable energy policy (which corresponds to the *Ln_Policy_Energy_Efficiency* metric), company-specific risk decreases as was hypothesized. This is in line with the findings of Aastvedt et al. (2021)[4] who state that US and European oil and gas companies are positively affected by green innovations in terms of ROA. Note that our sample contains a large share of oil and gas companies. Similarly, Fan et al. (2017)[5] find that Chinese companies with a more sustainable energy policy have larger values for ROE, ROA, ROIC, and profit margin.

A company with a better capacity to reduce the use of resources (*Resource_Use_Score*) also possesses lower company-specific risk. This can be explained by the fact that companies capable of reducing the use of resources simultaneously manage to reduce operating costs which leads to a more stable financial position and a lower level of company-specific risk. This conclusion is consistent with that of Martin et al. (2012)[6] on a positive influence of the use of energy for a company's productivity in the UK. This can be explained by the observation that higher productivity contributes to a sustained company's growth and reduction of company-specific risk.

We have obtained a novel result concerning the importance of sustainability in a company's supply chain management which is not considered in earlier works. Companies that adhere to (abandon) sustainability in a company's supply chain management (the *Env_Supply_Chain_ Management* metric) have a lower (higher) level of company-specific risk.

If a company declares its commitment to reduce emissions in its production and operational processes and implements sustainability in a company's emissions policy (*Policy_Emissions_Score, Emissions_Score*), then company-specific risk decreases. On the opposite, company-specific risk increases for companies featured with a high level of emissions.

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[1] Vozlyublennaia, N. Do firm characteristics matter for the dynamics of idiosyncratic risk. *Journal of International Financial Markets, Institutions and Money*, 27, 2013, 35-46.

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This is in line with observations by Fujii et al. (2013)[1] on a positive influence of CO2 reduction on ROA and ROS for Japanese companies. Also, Klemetsen et al. (2020)[2] find that Norwegian manufacturing companies that observe the EU Emissions Trading System directives demonstrate an increase in value-added and labor productivity. Companies with a larger value of the aggregate measure of environmental responsibility have larger company-specific risks. It is worth noting that the same is true for the aggregate ESG score (larger ESG scores are associated with larger company-specific risk) while higher levels of social responsibility (*Social_Score*) and corporate governance (*Governance_Score*) tend to decrease company-specific risk. This is partially consistent with the findings of Aslan et al. (2021)[3] for the US market: some sectors reveal a positive influence of environmental performance on the default probability. The authors explain it by the fact that for these sectors, measures undertaken within the environmental responsibility policy are too costly and this leads to an increase in credit risk. The sample in our research consists of 36 non-financial companies, out of which there are 7 oil and gas companies, 7 iron and steel companies, 7 utility companies, and 3 chemical companies. For these sectors, environmental innovations and the modernization of technology to reduce negative effects on the environment are particularly costly.

Companies that overlook (adhere to) the water withdrawal policy (*Ln_Policy_Water_Score*) have smaller (larger) company-specific risks. We explain this result by the fact that the reduction in the use of water requires technological innovations which are costly for companies and lead to an increased company-specific risk in the short-run.

Shapley value allows us to investigate the binary influence of factors: for high values of a factor and low ones. We obtain a counterintuitive result regarding the measure of the effectiveness of a company's environmental management: if the company's management team responsible for the promotion of environmental measures is assigned a higher KPI (the *Env_Management_Team_Score* metric), the company's company-specific risk increases. We explain this by the cost of environmental measures. In Russia, the labor market is not very developed, and the salaries of managers in the field of ecology are quite high. The creativity of the management team concerning environmental KPIs also increases costs for companies.

Macroeconomic variables such as GDP growth and inflation are in the top 5 factors for models (1) and (5). Lower rates of GDP growth are associated with higher levels of company-specific risk which is in agreement with the findings of Caglayan et al. (2020)[4]. A novel result is

[1] Fujii, H., Iwata, K., Kaneko, S. Corporate environmental and economic performance of Japanese manufacturing firms: Empirical study for sustainable development. *Business Strategy and the Environment*, 22 (3), 2013, 187-201.

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[3] Aslan, A., Poppe, L., Posch, P. Are sustainable companies more likely to default? Evidence from the dynamics between credit and ESG ratings. *Sustainability*, 13, 2021, 8568.

[4] Caglayan, M.O., Xue, W., Zhang, L.Global investigation on the country-level idiosyncratic volatility and its determinants. *Journal of Empirical Finance*, 55, 2020, 143-160.

that lower annual inflation rates are associated with larger company-specific risks. This contradicts earlier findings in Farooq (2018)[1] and can be explained by the observation that over periods with lower inflation rates, companies actively invest and innovate in the environmental area and cheap money promotes the ESG agenda.

Among the environmental factors considered in this research, the top 5 determining factors include only the measure of sustainability in a company's emissions policy (*Policy_Emissions_Score*) in models (1), (2), and (3) and the measure of a company's commitment to reduce emissions in its production and operational processes (*Emissions_Score*) in the model (4). It is worth noting that according to model (5) which encompasses the largest number of observations environmental considerations are not within the top 5 determining factors for company-specific risk.

Conclusion. Within our research that adopts Explainable AI in its empirical design, we rank key determining factors for company-specific risk for a sample of Russian companies over the period from 2007 to 2020. We developed a novel two-stage approach: the first stage suggests neural network modeling with dense layers to identify determining factors for company-specific risk and the second stage suggests the use of Explainable AI (based on the Shapley values) for interpreting empirical results.

For some environmental factors, we confirm the hypothesis of a positive impact on company-specific risk. Companies that adhere to a sustainable energy policy and companies with a better capacity to reduce the use of resources have smaller company-specific risks. Companies that adhere to sustainability in a company's supply chain management have a lower level of company-specific risk. If a company declares its commitment to reduce emissions in its production and operational processes and implements sustainability in a company's emissions policy, company-specific risk decreases.

We have obtained novel results for some environmental factors: companies with higher aggregate ESG scores have larger company-specific risk, and companies that economize on the use of (waste) water have larger company-specific risk is larger (smaller). In most models, we find support for the hypothesis that company size, macroeconomic variables, and market properties of stocks are leaders among the determining factors for company-specific risk.

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ANUSH TUMANYAN
PhD in Economics, ASUE
LILIT GALSTYAN
PhD in Economics, ASUE

BREAKING THE GLASS CEILING: WOMEN'S ROLE AND CHALLENGES IN IT COMPANIES

Keywords: *IT companies, women's role, female role models, gender discrimination, discriminatory behavior, leadership positions*

The paper deals with the significance of women's contributions to IT businesses and the difficulties they encounter. It draws attention to the underrepresentation of women in IT, which is a concern for the sector as a whole, which is missing out on talent and diversity. The essay also examines the factors that contribute to this gender gap, such as the lack of female role models in the field of information technology and the persistent prejudices and preconceptions in the sector. By making the case that encouraging and helping women in IT is not just morally right, but also advantageous for businesses, as it may help them become more creative and successful.

Introduction. The paper discusses the important role that women play in IT companies and the challenges they face in the industry.

The paper explores the lack of female role models in IT and the gender pay gap, as well as the stereotypes and biases that still exist in the industry. The difference between the average gross earnings of female and male employees is known as the 'gender pay gap'[1]. By arguing that promoting and supporting women in IT is not only the right thing to do but also makes good business sense, as it can help companies to become more innovative and successful.

The gender discrimination in the IT companies is reflected in various ways. For instance, women in the tech industry are often paid less than their male counterparts, even when they have similar skills and experience. Another example is that women and other underrepresented groups in tech may be overlooked for promotions and other career advancement opportunities due to implicit bias and other forms of discrimination. Women in tech may face harassment, bullying, and other forms of discriminatory behavior that make it difficult for them to feel safe and supported at work. Lastly, women are underrepresented in many tech roles, including

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[1] E. Gould, J. Schieder, K. Geier (2016, Oct. 20), *What is the gender pay gap and is it real? EPI,* https://www.epi.org/publication/what-is-the-gender-pay-gap-and-is-it-real/

leadership positions, which can make it difficult for them to find mentors and role models who can help them advance in their careers.

Literature review. *'Girls are capable of doing everything men are capable of doing. Sometimes they have more imagination than men'- Katherine Johnson, NASA Mathematician.*[1]

Women's role in IT is very important. Women are demanding more from work, and they're leaving their companies in unprecedented numbers to get it. Women leaders are switching jobs at the highest rate we've ever seen and at a higher rate than men in leadership[2]. This could have serious implications for companies. That is why women are already significantly underrepresented in leadership and this is a problem for companies because they lose the talent and interesting mind and experience of women. They can do interesting and non-standard jobs, they think differently and sometimes extraordinarily, which may be very amazing and innovative in technology and IT.

There are many interesting biases about women in tech and many reasons, which are coming from school to university. 83% of males are studying STEM (science, technology, engineering, and math) subjects at school, compared to 64% of females. This breaks down to 17% of the male's studying physics, compared to 7% of females. The corresponding breakdown for math is 28% male and 20% female[3].

So what factors are putting girls off STEM subjects? The main explanation is that women and girls are mainly good at other subjects and do not plan their future with STEM, but not always our envisaging may come true. There is a list of female role models who changed the tech world, for example, Ada Lovelace, the first computer programmer of the world, Radia Perlman's mother of the Internet, and others. By all means, this list is not extensive, countless women have made outstanding contributions to the field of STEM. In addition, many reasons prevent women from realizing their potential, such as mindset, mentality, motherhood, striving to achieve everything and many more.

The lack of role models is one of the main challenges women in tech confront. In tech firms, women are frequently underrepresented in executive roles. According to Finances Online, women hold less than 20% of all leadership positions in technology. For women, this might make it challenging to develop in their jobs and accomplish their objectives[4].

Gender prejudice and sexual harassment are other challenges that women in tech must overcome.

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[1] **The Editors of Encyclopaedia of Britannica, (2023, Dec 5), Katherine Johnson, American mathematician, BRITANNICA, https://www.britannica.com/biography/Katherine-Johnson-mathematician**

[2] LeanIn.Org and McKinsey & Company, Women in the Workplace 2022 (October 2022)

[3] A PwC UK research report, Women in Tech Time to close the gender gap, p.5

[4] **Laura Clay (2023, May 2), The Biggest *Challenges for Women in Tech: Explained, ADVANTISGLOBAL,*** https://www.advantisglobal.com/blog/biggest-challenges-for-women-in-tech

Women in tech frequently experience harsher evaluations than their male counterparts, hindering their career growth and development[1]. According to a 2017 survey by the Pew Research Center, 50% of women and only 19% of males reported experiencing gender discrimination at work[2].

Adding to these challenges, the COVID-19 pandemic has its advantages and disadvantages for women worker's well-being and prospects. The study, which polled 500 women in the global technology, media, and telecommunications (TMT) workforce across 10 countries from November 2020 to March 2021, found that, compared with how they felt before the crisis, TMT women have experienced dramatic drops in motivation and productivity at work, job satisfaction, work/life balance, and feelings of loyalty to their employers (Figure 1)[3].
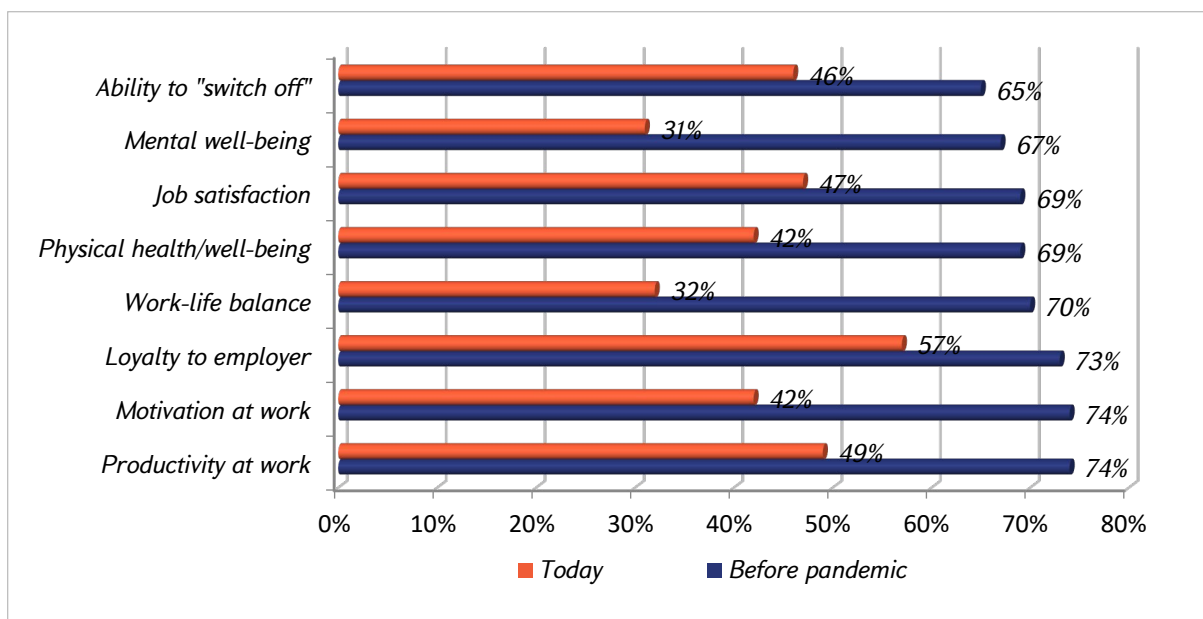

Figure 1. Analysis of TMT sector respondent data from Deloitte's Women and Work global study, 2021

Eighty-three percent of TMT women surveyed said their workload had increased, and most said they were also spending more time on housework and caring for dependents. The boundaries between life and work have collapsed: satisfaction with the balance between work

[1] Laura Clay (2023, May 2), The Biggest *Challenges for Women in Tech: Explained, ADVANTISGLOBAL,* https://www.advantisglobal.com/blog/biggest-challenges-for-women-in-tech

[2] A.W. GEIGER, (2017, Dec 26), *17 striking findings from 2017*, PEW RESEARCH, https://www.pewresearch.org/short-reads/2017/12/26/17-striking-findings-from-2017/

[3] S. Hupfer, S. Mazumder, A. Bucaille, G. Crossan (2021, Dec 01), *Women in the tech industry: Gaining ground, but facing new headwind*, DELOITTE, https://www2.deloitte.com/us/en/insights/industry/technology/technology-media-and-telecom-predictions/2022/statistics-show-women-in-technology-are-facing-new-headwinds.html

and life has fallen by 38 points and the ability to 'switch off' from work has fallen by 19 points. Perhaps more worryingly, only 38% of women in the TMT industry feel that their company's commitment to supporting them is sufficient. Only 30% say their employer has improved their access to flexible working (e.g. the freedom to work around caring or other responsibilities), and only 22 % say their employer has made it clear that they are not expected to be '24/7'.

Some of them could work effectively and find remote jobs, become flexible, think multitasking and work and always be on, but many tech companies could retain their workers giving them some privileges in motherhood, and child care. It helped them to keep the gender gap and made it easier to maintain progress in gender equity and women's representation in the tech sector.

Methodology. The analysis conducted based on academic works by various authors on the role and difficulties faced by women in IT firms served as the methodological foundation for the scientific paper and allowed us to research and analyze the issues in this field. A large portion of the data on women's engagement in IT and STEM sectors, as well as in leadership roles, was presented using the statistical technique. The share of female employees in the workforce of major tech companies, the percentage of women in the TMT sector, and the financial gender pay gap were discussed. The most significant characteristics that are typical to female role models in IT organizations have been presented using a mapping and graphical technique. There were contrasts created. All of this has brought attention to the issues facing women in IT, which will help to find the solutions for those problems and make effective proposals.

Analysis. Women are demanding more from work, and they are leaving their companies at unprecedented rates to get it. Women leaders are changing jobs at the highest rate we have ever seen and at a higher rate than men in leadership. This can have serious implications for companies. Women are already significantly underrepresented in leadership. For years, fewer women have been promoted to first-level managers because of the "broken rung"[1]. Companies are now struggling to retain the relatively few female leaders they have. And all of these dynamics are even more pronounced for women of color.

The tech sector still has an issue with gender diversity. It sadly lags behind the rest of the job market when it comes to hiring women. The share of female employees in the workforce of the five largest tech companies on the planet (Amazon, Apple, Facebook, Google, and Microsoft) only have a workforce of about 34.4% women[2].

As our chart shows, based on self-reported company numbers, female employees make up between 29 percent (Microsoft) and 45 percent (Amazon) of the workforce at America's largest tech companies.

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[1] The "broken rung" describes the phenomenon where women in entry-level positions are promoted to managerial positions at much lower rates than men.

[2] **Beagle Talent (2022, Oct. 22),** ***Top priorities for hiring & retaining women in tech, LINKEDIN,***
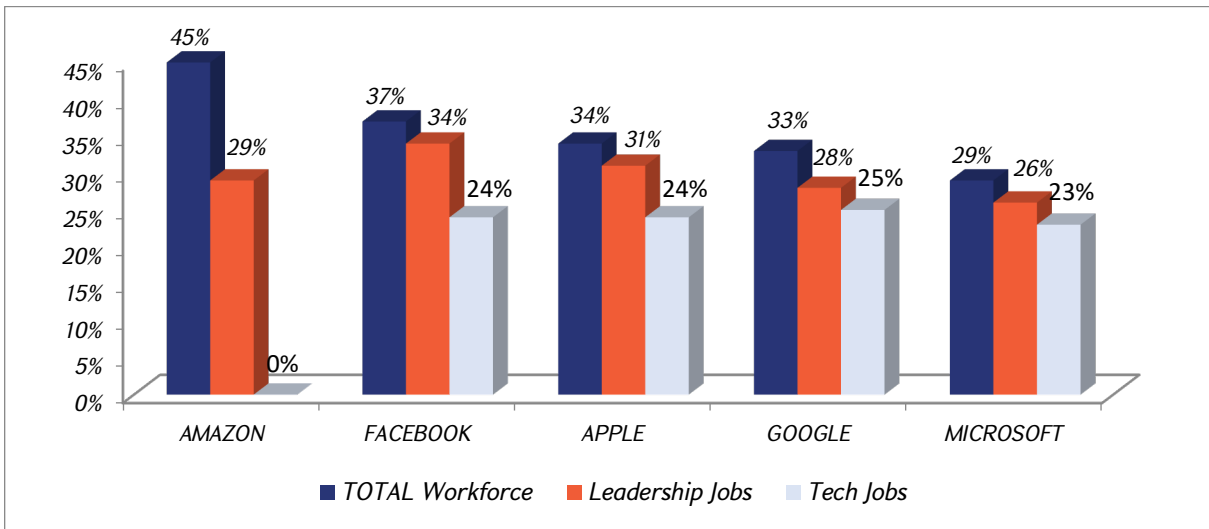https://www.linkedin.com/pulse/top-priorities-hiring-retaining-women-tech-beagletalent

Figure 2. **The share of female employees in the workforce of major tech companies (%) in 2021[1]**

Currently, women make up about 28% of the tech workforce. This is a significant improvement from the early 2000s when women only made up 9%.

In the US in 2023, about 3.7 million women worked in tech positions (which represents only **23%** of the labor force). In Europe, approximately 1.7 million women held tech positions (representing about 19.1% of the ICT labor force) [2].

The number of women working in the IT sector in the world is very limited, around 13%. Meanwhile, in Armenia, women make up about 44% of the tech workforce[3]. This is a great result for our small country.

Many factors, including long-standing structural barriers, socio-economic and technological change, and economic shocks, drive and influence ***gender gaps*** in the labor force. More women have entered the paid workforce and are increasingly taking on managerial roles, but globally, societal expectations, employer policies, the legal environment, and the availability of care continue to play an important role in determining educational and career choices. The decade of austerity in the aftermath of the 2008 global financial crisis has constrained sectors that form the core of social infrastructure, with consequences for families and primary caregivers – often women – during the pandemic. Women are disproportionately affected by both geopolitical conflict and climate change. In addition, the projected worsening of the current

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[1] Felix Richter (2021, July 21), *Women's Representation in Big Tech, STATISTA,*
https://www.statista.com/chart/4467/female-employees-at-tech-companies/
[2] Women in Tech Statistics, Uncovering Trends and Unseen Data by WomenTech Network (2023), WOMENTECH,
https://www.womentech.net/en-us/women-technology-statistics
[3] Statistical Handbook (2021), *Women and Men in Armenia*, ARMSTAT,
https://armstat.am/file/article/gender_2021.pdf

crisis in the cost of living is also likely to have a greater impact on women than on men, as women continue to earn and accumulate wealth at lower levels.

North America has closed most of its gender gap, 76.9%. The countries of North America are closely followed by Europe, which has closed 76.6 percent of its gap, and then by Latin America and the Caribbean, which has closed 72.6 percent. The gender gap in Central Asia is 69%. Sub-Saharan Africa ranks fifth, having closed 67.8%. The Middle East is more than 4 percentage points behind Sub-Saharan Africa. It has closed 63.4% of its gender gap, the lowest performance of all regions[1]. (Figure 3)

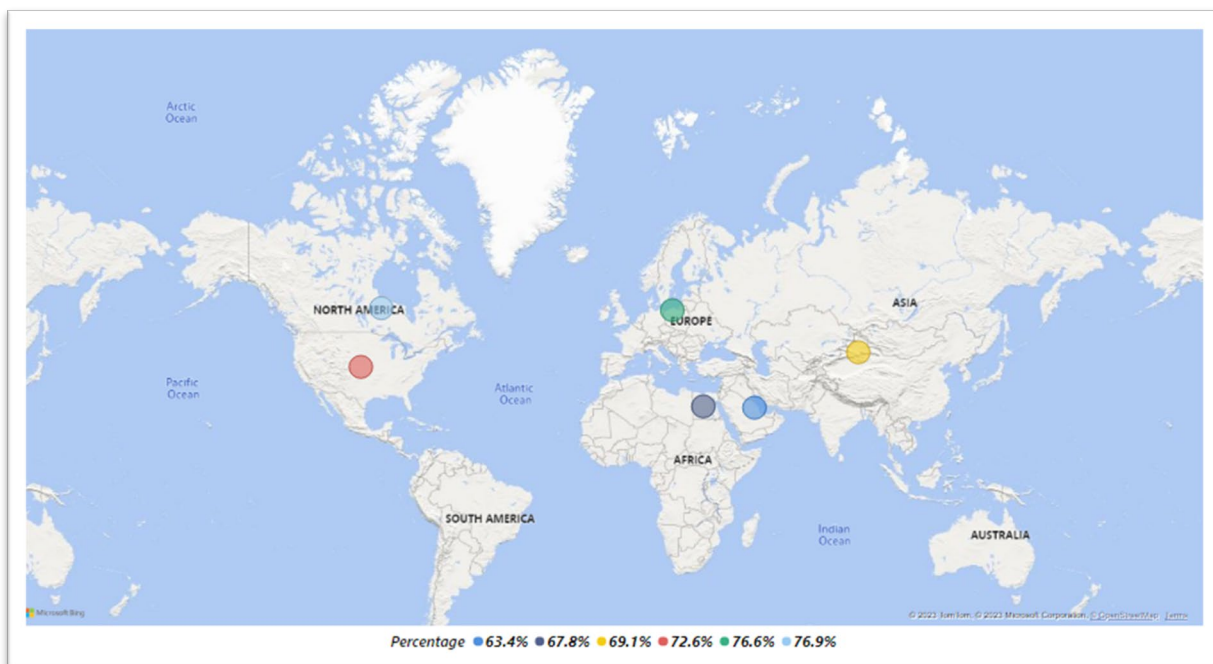Percentage ● 63.4% ● 67.8% ● 69.1% ● 72.6% ● 76.6% ● 76.9%

Figure 3. *Gender gap indexes in 2022*

Men in STEM professions experience higher annual salaries than women - a difference of nearly $15,000 per year ($85,000 for males versus just $60,828 for females). This disparity is even more acute among Latina and Black women who are typically earning only around $52,000 per annum. A study in the US showed that there was a gender wage gap of 1.6%. It also demonstrated that while women were paid less than men when working remotely, they seemed pleased to settle for $0.95 for every dollar their male colleagues requested as wages. It also found that racial prejudice is a significant factor in the wage gap between female workers of color and white men, with Hispanic women and African Americans expecting to make only $0.91

[1] **WORD ECONOMIC FORUM (2022,13 July)**, *Global Gender Gap Report*, **WEFORUM**,
https://www.weforum.org/reports/global-gender-gap-report-2022/in-full/1-benchmarking-gender-gaps-2022

for every dollar their counterparts receive. Although the Constitution of the Republic of Armenia, the Labour Code, and the Act on the Labour Inspectorate provide for the principle of equal wages for equal work and prohibit gender segregation in the labor market and in the field of employment, the reality shows that women are discriminated in the following ways. As a result, at the level of the Republic, the average monthly net income of women is 59% of that of men, and the average monthly salary is 64.4% of that of men[1].

As the Table1 shows, all occupations have gaps. It is higher than the average for occupations such as technicians, service and sales workers, and craft workers, while it is lower for skilled agricultural workers. For the remaining occupations, it is around the average and no pattern between skill level and gender pay gap can be derived.

<div align="right">Table 1</div>

Raw gender pay gap (hourly), by occupation, 2020[2]

	Males	Females	Gender pay gap
	Log wage per hour		%
ALL	6.359	6.128	-23.1
Managers	6.723	6.482	-24.1
Professionals	6.705	6.420	-28
Technicians and associate professionals	6.433	6.086	-34.7
Clerical support workers	6.328	6.045	-28.3
Services and sales workers	6.267	5.898	-36.9
Skilled agricultural, forestry and fishery workers	6.155	6.043	-11.2
Craft and related trades workers	6.280	5.959	-32.1
Plant and machine operators and assemblers	6.271	5.996	-27.5
Elementary occupations	6.075	5.846	-22.9

The gap is a simple difference between the logged mean wages per hour for each gender.
Where negative, males are exhibiting higher wages than females, at the mean, and vice versa.

As in other countries around the world, women are less likely to be found in managerial positions in Armenia, which may be an early sign of the glass ceiling effect, although women dominate the next three skill levels (i.e. professionals, technicians and associate professionals, and clerical workers). Then, as the skill level approaches the lower end (towards elementary

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[1] Women in Tech Statistics, Uncovering Trends and Unseen Data by WomenTech Network (2023), WOMENTECH, https://www.womentech.net/en-us/women-technology-statistics

[2] UN Women, Tbilisi, Georgia, 2020, *ANALYSIS OF THE GENDER PAY GAP AND GENDER INEQUALITY IN THE LABOUR MARKET IN ARMENIA*, ARMSTAT, https://armstat.am/file/article/analysis_of_the_gender_pay_gap_armenia_en.pdf

occupations), men start to dominate. Overall, women are more likely than men to be found in high-skilled occupations.
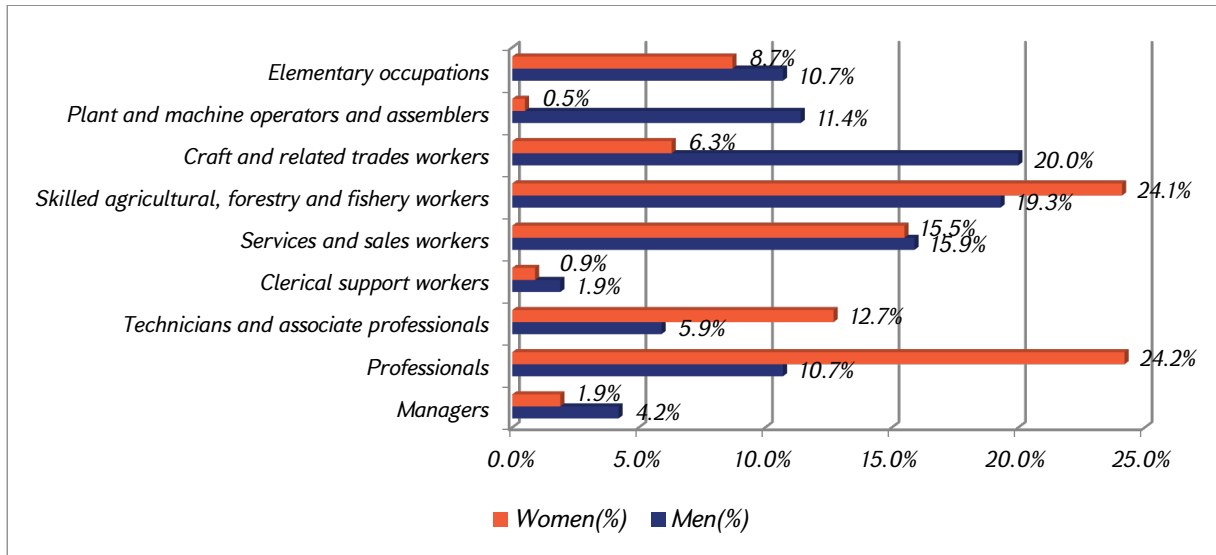

Figure 4. Occupational structure of employment, by gender, 2020[1]

A study from 2021 foresees that it will take an astonishing 268 years to eradicate the **financial gender gap**, as reported by the World Economic Forum.[2]

Conclusions. In conclusion, women play crucial roles in IT companies as technologists, leaders, mentors, and role models. However, they also face various challenges, including gender bias, unequal opportunities, work-life balance issues, lack of representation, discrimination, and stereotypes. There are several strategies and instructions for empowering women to face and overcome these obstacles:

1. encourage more women to pursue and complete degrees for computer science,
2. encourage women-owned tech companies, find mentors for women, allow them to speak and to be heard, develop new skills.

Addressing these challenges requires concerted efforts from IT companies, including promoting equal opportunities, addressing unconscious bias, fostering a supportive work culture, encouraging leadership diversity, providing work-life balance support, offering training and development programs, and raising awareness to challenge stereotypes. IT companies can create a more inclusive, flexible and equitable environment where women can thrive, contribute

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[1] UN Women, Tbilisi, Georgia, 2020, *ANALYSIS OF THE GENDER PAY GAP AND GENDER INEQUALITY IN THE LABOUR MARKET IN ARMENIA*, ARMSTAT,
https://armstat.am/file/article/analysis_of_the_gender_pay_gap_armenia_en.pdf

[2] Women in Tech Statistics, Uncovering Trends and Unseen Data by WomenTech Network (2023), WOMENTECH,
https://www.womentech.net/en-us/women-technology-statistics

their unique perspectives and talents, be flexible in terms of working hours and location, which helps women balance family and professional life duties and advance in IT industry.

It is imperative to recognize and value the role of women in IT and not only, to take proactive steps to overcome the challenges they face, ensuring a more inclusive and diverse IT workforce for the future.

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MINXING WANG
Shanghai Lixin University of Accounting and Finance,
School of Financial Technology, Shanghai, China
LIQING HUANG
Shanghai Lixin University of Accounting and Finance,
School of Financial Technology, Shanghai, China
JIALU LI
Shanghai Lixin University of Accounting and Finance,
School of Financial Technology, Shanghai, China

STUDY ON THE CONSTRUCTION OF ESG SYSTEM IN DEVELOPING COUNTRIES: EVIDENCE FROM CHINA

The ESG (Environment, Social and Governance) investment evaluation system is an appraisal system methodology based on the concept of sustainable development and built on a disclosure system to measure the sustainability and financial capability of companies in the green economy. With the rise of the concept of sustainable investment and the implementation of the dual carbon policy, ESG investment in China has embarked on a fast track of development, but as it is in its infancy, there are still many issues to be improved in the operation process. This paper will first enumerate the problems encountered in the operation process through three dimensions: information disclosure, evaluation system and market investment, and then explore the main problems through case studies to seek possible directions for solutions. And then based on the above research to comb the connotation of ESG systems from the definition, methodology and advantages. Finally, on the basis of exploring the corresponding solutions to the existing problems, it provides an empirical reference for the construction of ESG-related systems in developing countries in the world market. It also explores possible solutions for the sustainable development of developing countries and the global economy against the backdrop of a macroeconomic downturn in which the global economy has been hit by the corona-virus, international political turmoil and the recurrence of mini-financial crises.

1. Background. In recent years, with the concept of corporate social responsibility becoming a global consensus and the rise of the concept of sustainable development, non-financial indicators such as environmental impact, social contribution and governance capability of listed companies have increasingly become a key concern for governments and investors.

ESG combines the three dimensions of environment, society and governance, providing an integrated framework for sustainable development and helping investors to judge whether a company's business approach is in line with the concept of sustainable investment, so that investors no longer limit their investment to the financial performance of the company, but make a more comprehensive consideration on the basis of the company's environmental, social and governance performance. This is not only in the investor's own interest, but also an important means of changing corporates' behavior in a socially beneficial way, and thereby can be counted as a form of responsible investment.

The United Nations Principles for Responsible Investment (UNPRI) has also found that environmental, social and governance factors have an impact on portfolio performance, thus encouraging all parties to adopt and collaborate on the six principles, which include incorporating ESG issues into the investment analysis and decision-making process, promoting acceptance and implementation of the principles within the investment industry, and seeking appropriate disclosure on ESG issues by entities invested.

Among all the factors, the environmental ones are particularly important. With the deepening of the global greenhouse effect, climate change and carbon neutrality have become global hot issues. From the 1990s to the present, the international community has adopted three important international legal documents to address climate change, namely the *United Nations Framework Convention on Climate Change* (1992), *the Kyoto Protocol* (1997) and the *Paris Agreement* (2015), which have laid the foundation for the release of ESG and sustainable development-related policies. On 15 April 2020, the Council of the European Union adopted a Framework to Facilitate Sustainable Investment, by written procedure, to provide a uniform classification system for enterprises and investors across the EU on the identification of environmentally sustainable economic activities. On September 22 of the same year, at the 75th session of the United Nations General Assembly, the Chinese government proposed that "China will increase its independent national contribution, adopt more vigorous policies and measures, strive to peak CO_2 emissions by 2030, and strive to achieve carbon neutrality by 2060." China's carbon reduction targets not only demonstrate the responsibility of a great power, but also meet the international consensus on green development with the goals of 'carbon neutrality' and 'emission peak'. The implementation of these strategies will have a profound impact on many industries around the world. Whether it is structural changes in the energy industry or further breakthroughs in green technology, carbon neutrality is expected to play an important role in guiding industry trends in the coming decades; both investors and companies, each individual has the obligation to follow the guidance and contribute to the early achievement of this goal, so the trend of energy saving and emission reduction for each company has become inevitable.

Furthermore, a review of relevant domestic and international studies reveals there is a certain correlation between ESG and corporate performance.

Gray, Shadbegian[1] (1995) and Filbeck, Gorman et al.[2] (2004) argue that increasing environmental input increases the cost of the firm and brings economic loss to the firm, therefore the two factors are negatively related. The results of Hang Song et al.[3] (2017) show that there is no significant relationship between environmental performance and corporate performance. However, some scholars such as Vachon, Thoumy[4] (2012) argue that the efficient use of natural resources can bring more economic benefits to firms. Chinese scholars such as Jun, Lu and Shuyan, Jiao[5] (2011), on the other hand, argue that environmental disclosure and corporate performance are negatively related, but environmental inputs can lead to increased economic benefits.

However, some studies have shown that the relationship between ESG and corporate performance depends on different industries and companies: Andreas[6] (2007) argues that environmental performance in a particular industry is not correlated with corporate financial performance. Xuan, Chen and Weide, Chun[7] (2010) also concluded that, in overall, environmental performance is positively correlated with financial performance; however, the correlation between environmental performance and financial performance is not significant in different industries. Walley, Whitehead[8] (1994) argued that environmental improvement activities can improve the economic performance of a firm; when environmental improvements are made passively, environmental performance has a negative or no correlation with financial performance.

In addition, other scholars' studies have shown that how ESG affects corporate performance is not always constant, for example, Jing, Chen[9] (2019) found that for the long term, ESG has a significant positive correlation with financial performance; for the medium

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term, ESG has a positive correlation with financial performance; and for the short term, the correlation between ESG and financial performance is not significant.

In summary, with the new economic development model of high-quality economic development and carbon neutrality as the core driver and the rise of the sustainable investment concept as the premise, the practice of ESG has been a major trend, which is of great significance to both enterprises and investors. However, the international academic research mostly lies in the study of correlation between ESG and corporate performance. The experience in the study of problems in its operation process is still insufficient. Therefore, this paper aims to sort out the implementation and problems of ESG in the operation process, and try to propose solutions, which can help improve the relevant defects in the ESG field and have practical significance for the development of the global ESG system.

2. Data and Methods. The fundamental problem that currently limits the development of the global ESG system is the inadequacy and lack of objectivity of the information data used to make the assessment. Information disclosure is the first step as well as the foundation of the following steps. The power of ESG to change a company depends on how much information investors and rating agencies can obtain to determine whether a company meets ESG requirements, i.e., the extent and reliability of information disclosure. Therefore, incomplete information, missing data and falsification are the root of a series of problems that arise subsequently. However, since the current global economy is in an overall downward trend due to a series of problems such as the impact of the coronavirus, many enterprises are not operating well, thus leading to a generally low quality of information disclosure. Given that ESG is a system based on the information disclosure system to select indicators and methodology to build an evaluation system to provide investors with measurement criteria for investment, this paper will illustrate the existing problems in the ESG system from three aspects: information disclosure, evaluation system, and market investment issues.

2.1 Information disclosure issues

2.1.1 Disclosure framework to be regulated. One of the difficulties in ESG information disclosure is the lack of data and the inconsistent disclosure caliber, which is a problem that exists all over the world. In China, for example, according to the statistical data of *ESG Questionnaire Report of A-share listed companies in 2021*, 1147 A-share listed companies disclosed ESG-related reports by the end of 2021, which is more than three times of the 371 ESG reports disclosed in 2009, showing that the awareness of ESG disclosure is gradually increasing. Although the quantity has improved, the quality of disclosure still needs to be improved, especially the high rate of missing data and poor uniformity of environmental information of some enterprises. The lack of standardized ESG information disclosure guidelines and standardized ESG information disclosure rules makes enterprises in various industries have no concept of the information that needs to be disclosed so that they cannot reasonably select the content of disclosure, resulting in low relevance of disclosure. Moreover, some companies may tend to deliberately avoid information that may have a negative impact when disclosing, and

selectively disclose a large amount of information that is beneficial to their own performance promotion at the same time. Such selective disclosure can lead to uneven quality of disclosure, incomplete information, different caliber of disclosure, information asymmetry of quantity over quality, and the problem of "reporting good news but not bad", which is difficult to evaluate as a key factor for investment decision.

2.1.2 Corresponding laws and regulations are not yet perfect. Whether the information disclosure is comprehensive and truthful is related to the accuracy of ESG assessment results. Many countries or regions with an early start in ESG have detailed laws or standards to safeguard the sources of disclosure information required for ESG assessment. Countries and regions with typical international ESG information disclosure systems, such as the United States, the European Union and Hong Kong, China, have made provisions for disclosing corporate ESG information: the United States emphasizes that all listed companies must disclose the impact of environmental issues on company operations; the European Union only makes mandatory information disclosure for heavily polluting companies and adopts the principle of voluntary information disclosure for other companies; Hong Kong, China, requires listed companies to disclose ESG information in accordance with the *Environmental, Social and Regulatory Reporting Guidelines* and require some indicators to be explained without disclosure. Although the above three have different focuses on information disclosure, their regulations contain the requirement of mandatory disclosure of enterprise ESG-related information. In addition, there are different principles for ESG information disclosure internationally, typically GRI, ISO26000 and SASB.

However, in many developing countries and some developed countries, due to the late start of ESG, the construction of information disclosure system is relatively backward, and this has revealed a series of problems such as corporate fraud and ESG greenwashing. For enterprises, they can hide their negative impact on the environment and society through false information, which is a common motivation for "greenwashing".

For investors, investment decisions based on misinformation can undoubtedly increase investment risk significantly. In countries where ESG-related systems are well established, "greenwashing" and falsification of information are the key issues to be monitored. In June 2022, the U.S. Securities and Exchange Commission (SEC) launched an investigation on Goldman Sachs Group Capital Management's ESG mutual funds, with the aim of examining whether there are information disclosure and "greenwashing" issues in ESG assessments across industries. Back in May, the SEC had fined BNY Mellon's investment advisory division $1.5 million for misrepresentations and omissions in ESG fields while managing its mutual funds, which resulted in some investments not being ESG reviewed. The SEC's attention demonstrates the significance of disclosure and corporate "greenwashing" in ESG investments.

At present, some of the problems exposed in ESG information disclosure in China, such as corporate falsification and low access to data, are mainly caused by the current phenomenon that ESG information disclosure in China is mainly voluntary for enterprises. Compared with

voluntary disclosure, the corporate information obtained mandatorily is not only more comprehensive and real, but also makes ESG assessment results more authoritative. In 2018, the Ministry of Ecology and Environment informed Jiangsu Huifeng Bio Agricultural CO., LTD. of a series of problems such as illegal disposal of hazardous material waste, illegal disposal and transfer of hazardous waste, and secret discharge of highly concentrated toxic wastewater, and then ordered the local authorities to rectify them. However, the corporate had previously vigorously publicized its corporate greenness, which was undoubtedly a cover-up of its illegal behavior and a "greenwashing" of the company with serious consequences. This further confirms that mandatory disclosure is now the focus of ESG disclosure construction in China.

Table 1

ESG Related Policies from China

Year	Policies or Events	Description
2015	Environmental Protection Law of the People's Republic of China	Special requirements for corporate environmental information disclosure and monitoring
2016	Guidelines for Establishing the Green Financial System	A relatively complete green financial policy system has been established
2018	Code of Corporate Governance for Listed Companies	Establishes the basic framework for ESG information disclosure
2020	China proposes "double carbon" target	Make requirements for China's green financial services in various industries
2020	Measures for the Administration of Trading of Carbon Emissions Rights (Trial Implementation)	Further requirements for carbon emissions information monitoring in relevant industries
2020	Plan for the Reform of the Legal Disclosure System of Environmental Information	Make provisions and requirements for mandatory corporate disclosure
2021	Guidelines on Investor Relations Management for Listed Companies (Draft for Comments)	Include ESG content to encourage disclosure of carbon reduction measures and effectiveness
2021	Guidance on Environmental Information Disclosure for Financial Institutions	Encourage environmental information disclosure to the financial industry

2.1.3 Lack of a credible ESG database. Although there are abundant sources of information and data required for ESG ratings, usually including corporate annual reports and social responsibility reports (CSR) released by enterprises, as well as passive media reports and data released by government departments, the scope of ESG itself is too broad and scattered, and its connotation is difficult to define so far, and there is a large amount of textual descriptive information that is difficult to verify, which makes it difficult to establish a credible database and thus makes it more difficult for investors to screen and integrate ESG-related information.

2.2 Assessment system problems

2.2.1 Rating system standards are not yet unified. At present, there are many ESG rating systems but no unified standard, and most of the international mainstream rating agencies such as MSCI ESG, Thomson Reuters ESG, Goldman Sachs ESG, etc. have the problem of strong subjective factors, which also have certain influence on the results of ESG rating. China's ESG

system is still in its infancy, mainly based on the rating system of SynTao Green Finance. But there are also huge differences with foreign rating mechanisms, for example, the weight of 37 key indicators of the MSCI will be determined based on the industry in which the company is located, and usually the weight of each indicator is between 5% and 30%, while the rating method of SynTao Green Finance uses vote-count to divide in into 10 grades from A+ to D. In addition to the three primary indicators E, S and G, there are 1 secondary indicator, 52 tertiary indicators and 75 industry indicators. Since there are many differences between the two in terms of methodology, strengths and weaknesses, and client groups, even if the same company uses different methods and models, different ESG scores may be obtained.

In addition, most ESG agencies at home and abroad disclose limited details of their ratings in order to protect their commercial secrets, which lead to its lack of transparency and independence, thus making it difficult for investors to accurately evaluate and judge their ratings.

2.3 Market Investment Issues

2.3.1 The "greenwash" issue brings more ESG risks to investors. Greenwashing, that is, the pursuit of profit in the name of environmental protection but not related to environmental protection, thus misleading to the public because of the label of environmental protection. At present, many listed companies, driven by interests, will promote their products as green, low-carbon and environmentally friendly, and regard ESG as a tool to enhance corporate image or a move to passively meet regulatory requirements, instead of truly integrating the concept of sustainable development and ESG into corporate development strategies and management.

At the same time, with the rise of ESG and sustainability topics, the number of investors upholding ESG concepts is increasing. The global ESG investment is on the fast track of rapid development. According to Bloomberg's estimation, global ESG assets are expected to exceed $53 trillion in 2025, accounting for more than one-third of total assets under management, and many fund products are also attracting capital sources under the banner of ESG and sustainable investment.

However, a large portion of these fund products are not worthy of the name. Some fund managers take advantage of the defect where ESG data disclosure norms are not uniform and rating standards are temporarily ambiguous to label pseudo-ESG investment products, which only bear the name of green finance but do not meet ESG investment standards, as environment-friendly products. Since the market's enthusiasm for ESG investment continues to rise, by exaggerating the environmental benefits, sustainability and risk resistance of the products to attract investors who are hard to distinguish the real from the fake, which will undoubtedly mislead investors, thus leading to the chaos of "greenwashing products" everywhere.

In 2020, Deutsche Asset Management (DWS) was accused by former Chief Sustainability Officer Desiree Fixler of making misleading statements that more than half of its $900 billion in assets were invested in accordance with ESG standards in its annual report. On May 31, 2022, about 50 German police officers raided the offices of Deutsche Bank and its subsidiary Deutsche

Wirtschaftsprüfer (DWS) to search DWS for alleged "greenwashing" of ESG funds, and obtained some key evidence. Asoka Wöhrmann, CEO of DWS, announced her resignation after the search and the company's stock fell by more than 5% on the same day.

The ESG system is built to avoid and prevent ESG-related risks to a certain extent, but the widespread use of "greenwash" products makes it contrary to the purpose, which brings more ESG risks to investors' investment.

2.3.2 Lack of attention to controversial ESG data by investors in developing countries. Although ESG is a system built on a disclosure system, relying on disclosure data, it should also be judged with an emphasis on controversial data. Controversy data is a useful supplement to negative ESG information because it covers a wide range of issues and involves issues that companies try to avoid. In addition, controversial events can also reflect a company's ESG risk management capability. The occurrence of controversial events can affect investors' recognition of a company's environmental, social and governance aspects, which in turn affects the performance of a company's stock price and trading volume.

The current domestic and international rating systems incorporate controversial data in different ways, with foreign countries giving higher weight to ESG controversial events, while domestic rating agencies, although they have started to realize its importance, still do not pay enough attention to it, resulting in investors' lack of attention to it as well.

In China, for example, according to the statistics of Securities Times·China Capital Market Research Institute, since 2006, a total of over 3,800 negative environmental events have occurred in A-share manufacturing listed companies and their important subsidiaries. And on the first trading day after the release of negative environmental events, compared to the CSI 300 index, the stock price of listed companies fell by about 0.14% on average.

In contrast, international secondary markets react more significantly to negative environmental events. A scholarly study indicated that listed companies in the U.S., U.K., Germany, and Finland experienced a cumulative average decline in share prices relative to the market benchmark index of about 3.6% in the 20 trading days before and after the announcement of negative environmental events (2003-2006). Listed companies in Korea experienced a cumulative average share price decline of about 9.7% relative to the market benchmark index in the 3 trading days before and after the release of negative environmental news (1993-2000). According to a study by Bank of America-Merrill Lynch, major ESG-related controversies have shrunk the market value of U.S. companies in the Standard & Poor's 500 Index (S&P 500) by nearly $534 billion between 2014 and 2019. As can be seen, a greater weight is given to ESG controversies abroad than at home.

3. Case Study and Key Issues to Explore

3.1 Case Analysis. In the context of the basic strategy of sustainable development and the rise of new concepts such as "carbon neutrality", "emission peaking" and green economy, ESG-related research in China has started to develop in a spurt. Since 2018, a number of start-ups or leading enterprises have carried out pilot work in the field of ESG and achieved certain

results. However, ESG in less developed countries is still in its infancy and there are many problems as mentioned above, so this paper takes the leading enterprises in the new energy vehicle industry at home and abroad as an example for horizontal comparison, explores and studies their practice in ESG system respectively, and summarizes some potential risks and problems as well as the corresponding solution directions.

3.1.1 Global Tesla. Tesla, as the initiator and leader of new energy vehicles, has a role to play in promoting the development of new energy vehicles that cannot be ignored. While it should have positive environmental benefits from a product perspective, thus contributing to sustainable development. However, even with its macro-level push for environmental protection, Tesla itself is not a company that values ESG. On the environmental front, the biggest problem is that its production process is not environmentally friendly. But Tesla has not committed to a carbon emissions and carbon neutrality program to date, which inevitably affects its score on the environmental front.

On the other hand, in its 2022 first quarter report, Tesla said it was under investigation by a California government agency for waste disposal issues. In late 2020, the company was also fined 12 million euros by the German government for not recycling batteries in an environmentally friendly way. Taken together, these events show that even though Tesla has pushed the auto industry to be more environmentally friendly and green, it does not pay enough attention to environmental protection itself, which will inevitably lead to Tesla scoring lower than its peers in environmental aspects. At the same time, the negative environmental impact will also reduce Tesla's image in the public mind, which will indirectly lead to debate on social issues.

In contrast to the environment, Tesla has a lot of shortcomings and controversies in social issues. For example, it has been facing product safety and quality controversies, including delivery delays, battery design flaws, Model S crash and fire accidents, solar panel fire accidents, and safety concerns about the automatic assisted driving system. Within the Chinese market alone, there have been numerous hardware problems for Tesla in recent years, including brake failure, autopilot malfunction, battery problems, etc., which have largely reduced Tesla's reputation in the public mind. Not only that, Tesla's self-driving vehicles have been involved in a number of casualty accidents. The National Transportation Safety Administration (NHTSA) has repeatedly asked Tesla to strengthen the supervision of self-driving vehicles, and also suggested that they use the self-driving protection measures used by Ford and General Motors, but Tesla did not respond and did not make significant improvements.

In addition, Tesla's performance on worker management, health and safety issues has been unsatisfactory, with allegations of denial of health insurance for injured employees, disregard for employee privacy, and obstruction of employee unionization. In this regard, the number of violations at Tesla's California plant from 2014 to 2018 is three times the total number of violations by the top 10 U.S. car companies, according to standards set by the U.S. Department of Labor's Occupational Safety and Health Administration.

In the above series of events, both home and abroad, although Tesla is ahead of its peers in terms of technology, its performance in terms of society, employees and environmental protection does not reach the middle level of the industry. Such frequent and extensive negative news will obviously bring down Tesla's reputation and lead to a further decline in its ESG score.

In terms of corporate governance, Tesla's board independence, CEO duality and insider directors are the most significant problems, even causing shareholder proposals and legal complaints. In the case of SolarCity merger, for example, Musk, as a director of Tesla and SolarCity, eventually completed the acquisition for a high price of $260 million. Tesla shareholders filed seven lawsuits immediately after the merger was completed, suing the company and Musk for concealing the fact that SolarCity was facing bankruptcy, overbidding for the merger, ignoring conflicts of interest, breaching fiduciary duties, and failing to adequately disclose facts related to the merger.

A sound senior management system and decision-making structure within a company is the foundation of a company's long-term, stable growth, and is also a key to the "governance" score in the ESG index. Apparently, Tesla does not meet that requirement. As a pioneer in new energy vehicles, Tesla has been kicked out of the S&P 500 ESG Index and its stock price has been low for a long time, reflecting the impact of the company's poor ESG performance on its business soundness.

3.1.2 BYD. As a leading company in the new energy vehicle industry, BYD has published social responsibility reports for many years since 2010 and has achieved good results in many rating systems. In March 2022, BYD became the first car company in both China and the world to declare that it would stop producing fuel vehicles. But in May of the same year, it was embroiled in controversy over the Changsha pollution incident. It is suspected that the improper treatment of exhaust gas emissions at BYD's Changsha plant caused hundreds of children in the surrounding area to suffer from unexplained nosebleeds, even adults who also suffered from vomiting and dizziness. However, the factory refuses to admit it, insisting that its exhaust emissions meet government environmental standards. Regardless of whether the truth is caused by negative externalities resulting from the Changsha factory's improper handling of pollutant emissions, this negative incident has to some extent cast a shadow over BYD's image and also exposed a large number of ESG risks. Therefore, based on the ESG evaluation system, this paper uses the ESG evaluation methodology to analyze where the long-term sound operation and sustainable development risks of BYD enterprises lie as follows:

(1) Negligence for related topics

Since its inclusion in the MSCI rating system, BYD's performance has been relatively good compared to its industry, with the grade it has received has always been A. However, from the Changsha pollution incident, it can be found the two issues of "labor management" are at a backward level. According to the tests and inspections BYD has received, the main health hazard on its production line is volatile organic compounds (VOCs), which are generated from the painting process in the vehicle painting workshop. However, this is not the first time BYD

exposed shortcomings in exhaust emissions, there are records showing that BYD had a similar incident as early as 2016 and was punished.But after that it still repeatedly exploded as many as 13 environmental incidents, which shows that its companies do not pay attention to the problem of factory pollution.

(2) The problem of "reporting good news but not bad news" exists in CSR reports

A good CSR report should be able to provide rating agencies and investors with an objective and effective basis for judging and investing, but according to BYD's 2021 CSR Report, the company has the problem of "empty slogans without initiatives". For example, the report states that the group's overall vision is to "meet people's aspirations for a better life with technological innovation", but there are no broken down, specific and achievable goals; besides, BYD hopes to "strictly control emissions" and "effectively reduce pollution ", but there are also no relevant initiatives or data to illustrate how to achieve these intentions. In addition to the pollution incident and the negative environmental events over the years, BYD did not achieve those two goals above.

(3) Lack of ESG risk awareness by corporate management.

Corporate executives do not systematically have data on relevant ESG governance initiatives, thus having no means or energy to manage and control them and assess performance. It shows that the corporate management has weak control over corporate ESG risks, which is not conducive to effective risk control.

In summary, the negative externalities caused by BYD's emissions have not only affected the health of the surrounding residents, but also laid a hidden danger for the safety and health of its workers. It is true that BYD's expanding production capacity has brought huge profits and made it a new energy star company, but after a detailed analysis it can be found that there are a lot of ESG risks. What's more, the handling of controversial incidents is not very appropriate, which is not conducive to the sustainable development of the company in the long run. If they continue to choose to ignore the laissez-faire approach and have an empty vision without clearly establishing environmental and social sustainability goals, their future ESG ratings will also be discredited, ultimately affecting investors' choices.

3.2 Major issues to explore. Controversial events can not only reflect a company's ESG risk management capabilities, but also affect investors' recognition of a company's environmental, social and governance aspects, which in turn affects the performance of a company's stock price and volume.

However, unlike Tesla, BYD's negative events did not cause much volatility in the capital markets. From the performance of the capital market, BYD fell 3.86% in A-shares and fell 5.95% in H-shares on the first trading day after the suspected pollution incident was exposed by the media. But on the next day it stabilized and rose slightly in A-shares, and rose 8.47% in H-shares at the same time. The company's share price was not affected by these negative environmental events. As mentioned earlier, not only BYD, but also the market "punitive response" to negative environmental controversies of listed companies in developing country is often not obvious. ESG

failure has become the norm for A-shares.

The reason for this can be that the handling of controversial events is relatively simple, and the penalties are too low to cause significant direct economic losses or long-term deterrence to listed companies, which indirectly make secondary market investors believe that ESG controversial events usually have little impact on company development and performance.

In addition, ESG system is applicable to measure the long-term investment development of a listed company. However, at present, most Chinese secondary market investors pursue short-term profit-seeking investment with immediate effect. So, they still pay more attention to financial indicators and are not sensitive to issues related to ESG controversies, which shows that ESG concept has not been fully integrated into the Chinese market that the culture of ESG investment has not been fully formed.

Therefore, this paper draws on international experience to briefly review the handling of controversies in the international rating system, thus proposing some directions for improving the contradictions in the ESG investment market in developing countries.

For example, MSCI ESG considers that the generation of a controversial event indicates that a company may have structural problems in risk management. Its approach to controversial events is to grade the severity of the event based on its impact on two dimensions, namely environmental or social, and then to deduct the critical matter score by continuously monitoring the controversial events.

Thomson Reuters ESG evaluates controversial data separately from disclosure data, i.e., ESG controversial events are scored separately to obtain the ESG controversy score, and the ESG composite score is recorded as ESGC by combining it with the separate ESG score in the absence of controversial events. This scoring method increases the weight of controversial events in the overall ESG score, while reducing the impact of corporate disclosure bias.

The S&P Dow Jones & SAM ESG Rating System indicates that if a company has a controversial event, it first measures the extent of its negative impact and then adjusts its score downward for the corresponding indicator through the MSA multiplier. MSA (Media & Stakeholder Analysis) measures how companies respond to environmental, economic and social events that have a significant impact on their financial position and core business. An MSA multiplier is obtained from a professional assessment and used to adjust the initial calculated metric scores. The greater the impact of a negative event, the greater the percentage reduction in the score.

According to the above, optimizing the ESG scoring system, increasing the weight of controversial events on ESG scoring, and adjusting the scoring according to the way companies handle controversial events is an effective way to further influence investors and companies and thus optimize the ESG investment market. In other words, ESG investment can only become a kind of value investment when the practice of ESG concept can simultaneously enable enterprises to avoid business risks, investors to make profits and regulators to implement policies smoothly, i.e., when the three form a closed loop of benefits.

ESG investment can only become a kind of value investment when the practice of ESG concept can simultaneously enable enterprises to avoid business risks, investors to make profits and regulators to implement policies smoothly, i.e., when the three form a closed loop of benefits.

At present, there is still space for progress in ESG investment in developing countries. Enterprises and investors still need to improve their understanding of the connotation of ESG investment assessment system, which will help enterprises and investors to better form ESG consensus, thus improving ESG adoption rate and optimizing ESG investment market. Although the international definition of the connotation of ESG has not yet been unified, many organizations and institutions have put forward definitions under their own views. Through the above case exploration, this paper also composes the connotation of the system from definition, methodology and comparative advantage, providing empirically meaningful reference for the unification of ESG connotation.

4. Internal combing

4.1 Definition. ESG investment evaluation system mainly consists of three evaluation directions: environmental, social and governance, which is a new and important evaluation system methodology for China's sustainable development strategy and global sustainable development concept in practice. Compared with the traditional evaluation system that focuses only on the financial status and profitability of enterprises, ESG focuses more on evaluating the sustainable development and green economy financial capability of enterprises. It aims to provide review and guidance for enterprises, investors and social macro-regulation departments to practice sustainable development and reproduction. Since the connotation and definition of ESG is too broad, this paper will define the ESG investment assessment system from different perspectives based on the above content as follows:

4.1.1 ESG is a risk evaluation tool

From the perspective of investors and stakeholders, ESG is a systematic methodology of corporate value and risk that focuses on non-financial performance such as environmental, social and governance, and can be used as a tool to assess risk. Compared with the existing traditional investment evaluation system, ESG focuses more on the risks and opportunities faced by enterprises in the future long-term development. Therefore, investors can understand whether an enterprise has the ability to develop sustainably and make a preliminary judgment of investment risks through ESG evaluation, so as to avoid investment risks caused by non-financial issues and maximize the benefits for investors and stakeholders.

4.1.2 ESG is a risk management tool

From a corporate perspective, ESG integrates three dimensions: environmental, social, and governance, and provides an integrated framework for companies to monitor and manage the non-financial risks they face that are different from traditional risks. By integrating ESG into an enterprise risk management framework, identifying and fully understanding various ESG-related risks, using ratings and indices to assess the financial impact of ESG risks and

performance, and then managing key risks with the help of the framework, companies can align their risk management and sustainability management, with a comprehensive understanding of current and future ESG risks and their financial impact, thus gaining competitive advantage through effective risk management by managing risk effectively.

4.1.3 ESG investing is a responsible investment

From the perspective of sustainable social and economic development, ESG investment is measured by environmental, social and governance factors, and its intention is to control and guide the investment orientation by promoting the concept of green, society feedback and efficient governance, so that people's investment will be attracted to the enterprises with better performance in the above criteria and distant from the enterprises with pollution and undesirable factors. In this way, high-quality enterprises will receive more resources and attention, thus achieving the promotion of environmentally and socially friendly concepts. Such an investment evaluation system with the concept of sustainable development as the core idea is a concept of responsible investment.

4.1.4 ESG investment evaluation system is empirical in nature

As an instrumental methodology in the reality of sustainable development strategies, the ESG investment evaluation methodology, like most corporate strategy and investment evaluation models, has a distinctly direct empirical character, i.e. an investment evaluation system that is developed through observational analysis of research data, mathematical and empirical case studies, in order to formulate or test theoretical hypotheses, with the expectation that the results will have direct practical reference.

4.2 Methodology of ESG evaluation system. The ESG evaluation system is a graded and tiered systematic evaluation based on three major aspects: E (Environmental Protection), S (Social Responsibility), and G (Governance), and is supported by theories of Sustainable Development, Economic Externalities, and Corporate Social Responsibility. Based on reasonable information disclosure, the ESG performance of the company is measured and scored in three areas: environmental protection, social responsibility, and corporate governance, and their respective subdivisions.

4.3 Comparative advantages of ESG assessment systems. Through the control of the development rules of the financial investment field and the concept of sustainable development strategy, the ESG investment evaluation system, which was born under the guidance of the new concept of "green finance", can exercise the traditional corporate financial investment evaluation system to provide reference indicators for the capital reproduction process and capital accumulation, while paying more attention to the long-term development of the company and the combination of economic efficiency and social responsibility. Faced with the reform and development of socialist market economy into deep water, mechanisms such as market development needs to be further improved. There is still potential to regulate the financial structure of socialist market economy that the increasingly serious demographic problems under the aging trend need to be solved at the level of pension, education and housing. But the

traditional performance analysis focusing only on the financial situation of enterprises is gradually difficult to cope with, especially in the context of the coronavirus, which gives rise to economic development slowdown and many other problems. Meanwhile, the evaluation system of performance analysis that focuses too much on the current financial statements of the company is macro-limited, which makes it difficult to reflect the market and society's predicted revision of the company's overall future operating earnings and non-economic earnings.

5. Insights and Suggestions

ESG investment in China is currently on the fast track of development, but as mentioned above, there are still many issues to be resolved, mainly exists in six main areas:

(1) The disclosure framework needs to be standardized

(2) Corresponding laws and regulations are not yet perfected

(3) Lack of a credible ESG database

(4) The standard of rating system is not yet unified

(5) The "greenwashing" issue brings more ESG risks to investors

(6) Lack of attention to ESG controversy data by investors

These are also major issues that many developing countries' ESG systems are facing so that are also useful as a reference. In addition, the significance of ESG system construction is to help companies to achieve sustainable development of the global economy by effectively managing environmental, social, and governance-related risks, thus calmly responding to the severe challenges they are facing globally. Especially in the current context of macroeconomic downturn with the impact of the coronavirus, international political turmoil, and frequent mini-financial crises, it is more relevant to develop and improve the ESG system.

To further promote the improvement of ESG investment assessment system in developing countries so as to achieve the ultimate goal of sustainable economic development, combining the above issues, case studies and international experiences, this paper proposes the following six recommendations:

(1) It is recommended to improve the information background disclosure framework.

At present, most international ESG in developing countries is still in its initial stage, but the international ESG market has developed rapidly in recent years, which provides opportunities for developing countries to explore the ESG market. However, compared with the current ESG evaluation system in some developed countries or regions, the ESG evaluation system in developing countries has many shortcomings, which requires learning from international advanced ESG evaluation experience. After a long period of development, the international ESG rating market has been standardized. And although the ESG evaluation contents of different institutions have different focuses, they all have a clear framework for corporate information disclosure. Collecting and disclosing corporate information under the framework required for ESG evaluation is an important condition to ensure accurate ESG evaluation results.

(2) It is recommended to improve the relevant disclosure policy and transition from voluntary disclosure to mandatory disclosure.

At present, some developing countries are still in the stage of transition from voluntary disclosure to mandatory disclosure, but some enterprises may conceal or falsify information that is unfavorable to them when disclosing their own information, which requires policy protection of information disclosure. In countries or regions where the ESG evaluation system is well established, there are regulations on corporate information disclosure, and they have been improved over time. Developing countries where ESG evaluation has just started should also continue to improve their policies on mandatory corporate information disclosure to provide safeguards for ESG evaluation.

(3) It is recommended to further improve ESG basic data services and cooperate to build a diversified ESG database.

The main source of ESG data is self-disclosure by enterprises. A sufficient amount of data can constitute a complete and comprehensive ESG database, which can better serve the ESG evaluation. Therefore, the quantity and authenticity of basic data become the key to ESG evaluation system, which developing countries still need to strengthen. On this basis, countries can work together to build a diversified ESG database, break the restrictions between countries, so that the ESG database can be enriched and improved, and the most critical data can be extracted quickly and easily during the evaluation process, which not only improves the efficiency of the evaluation, but also increases the diversity and reliability of the self-generated ESG evaluation system.

(4) It is recommended to design assessment indicators and weights in accordance with different national situations and policy directions.

As a common green valuation index in the international arena, when selecting the ESG indexes and setting weights, it should take into account not only the important indicators of international investors' concern, but also with typical localized features, so as to make the valuation system more comprehensive and practical. According to the different national conditions and economic development of each country, some evaluation indicators with local characteristics should be added or subtracted appropriately or the weights should be adjusted within a reasonable range. For example, since China is now at the stage of overall well-off, whether enterprises are involved in poverty alleviation and other projects can be used as an indicator. Not only China, but also each country has different development characteristics. Differentiated indicators and weights can make ESG evaluation more realistic and make up for the shortcomings of the current international ESG evaluation system which is not fully adapted to the different market needs of each country.

(5) It is recommended to establish a common classification catalog to improve the capacity of multiple constraints.

A commonly accepted green financial classification catalog can be established to improve the comparability, compatibility and consistency of international green financial classification

standards, as well as to prevent the proliferation of "greenwash" projects to a certain extent.

In addition, regulation and market should be mobilized together to curb "greenwashing". First of all, on the regulatory side, the threshold of ESG investment products should be raised by issuing relevant laws and regulations to set strict minimum disclosure standards for ESG-labeled investment products; at the same time, the assurance efforts of the independent third-party should also be strengthened by introducing a special ESG investment product green assurance agency to monitor the data disclosed by ESG investment products, thus improving its validity and objectivity to avoid misleading investors. misleading investors. Secondly, on the market side, financial institutions should make complete and truthful disclosure of ESG investment products' prospectus and other materials. For instance, funds should make clear explanation on how to choose appropriate strategies to achieve their goals and what different stock selection methods and criteria are involved.

(6) It is recommended that greater weight should be given to topics related to controversial events.

The ESG scoring system can be optimized by taking reference from international experience, dividing ESG controversial events into four levels: minor, moderate, serious and very serious. And the controversial event score should be separated from the disclosure score. By calculating the controversial event score independently and then including it in the ESG composite score together with the disclosure score, the weight of controversial events can be increased. Besides, additional points should be added and subtracted for the company's ability to deal with controversial events, and the latest ESG score should be adjusted in a timely manner to maintain the timeliness and authenticity of the ESG score.

ESG investment originated in Western, while developing countries, with emerging market economies as the mainstay, have developed more rapidly than developed markets in Western. However, since they continue to face multiple pressures such as environmental development, population density, and economic development, in addition to its later pursuit of sustainable development goals than in developed markets, there are still many areas that need improvement in the ESG field.

Especially in the current context of the epidemic, it is a severe test for the resilience, risk resistance and sustainable development strategy of enterprises. Therefore, It is even more essential for enterprises to keep pace with the times by paying attention to the merits of corporate performance, strengthening corporate information disclosure, paying attention to ESG-related risks, and strictly requiring the performance of enterprises in environmental protection, social impact, and corporate governance. At the same time, in the general environment of emerging market economies, promoting the development of ESG system to improve the sustainable operation capability of enterprises is not only conducive to effective management of ESG risks and sustainable economic development, but also responds to the global trend of sustainable investment to reduce the financing cost of projects in line with sustainable investment principles. In addition, in order to further form ESG consensus,

developing countries can, under the coordination of all parties, hold seminars to promote exchanges and consensus among countries in the field of ESG, reach consensus on ESG-related topics to carry out economic, policy and academic exchanges and cooperation, thus improving economic sustainability through green finance, sustainable investment, ESG risk management, etc., which jointly enhance international competitiveness and influence.

Economic development requires enterprises to be good front-runners, and enterprises are important roles in economic development. Companies with good performance drive the development of individual industries and promote the progress of the new economy, while companies with flaws are not only riskier but also cause harm to economic development. Therefore, the adoption of ESG evaluation system and related regulatory policies can enable companies to have better performance and create a better economic engine. The development of green finance is moving in a new direction with the adoption and popularization of the ESG concept as well as the construction and application of an ESG investment assessment system model.

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313

PRIORITIES AND CHALLENGES OF ECONOMIC DEVELOPMENT

INTERNATIONAL CONFERENCE MATERIALS

MAY 11–12, YEREVAN, 2023