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NECESSARY CONDITIONS FOR CARRYING OUT BUSINESS ACTIVITIES IN THE FIELD OF DEEP TECHNOLOGIES IN THE CONTEXT OF THE BLUE ECONOMY OF BULGARIA

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This article introduces the “Necessary Condition Analysis” (NCA) as an innovative methodological tool for environmental and economic research. NCA is employed to identify the minimum conditions that must be in place for a desired outcome—such as sustainable growth, technological advancement, or effective innovation integration—to occur. The study focuses on applying this methodology in the context of two emerging and strategically significant domains: the Blue Economy and deep technologies. It presents a comprehensive review of theoretical frameworks and applied perspectives, incorporating insights from leading researchers, economists, and innovation theorists. The research explores the intersection of the Blue Economy and deep technologies within the Bulgarian economic context, highlighting strategic opportunities for sustainable development, digital transformation of traditional sectors, and the creation of competitive advantages. Specific sectors—such as maritime transport, fisheries, renewable marine resources, and associated technological innovations (e.g., artificial intelligence, blockchain, robotics) – are analyzed to determine the necessary conditions under which the convergence of these systems produces positive economic outcomes. The article proposes an analytical model applicable both nationally and internationally, demonstrating how stakeholders (institutions, investors, entrepreneurs, and researchers) can utilize NCA for proactive and evidence-based decision-making. The study includes comparative insights and best practices from other countries, offering a foundation for adaptation to local economic and institutional realities. The conclusions contribute to the broader discourse on the transformative role of deep technologies in the development of Blue Economy sectors, while also providing strategic recommendations for future policy design and innovation initiatives in Bulgaria and beyond.

Keywords: blue economy, deep tech entrepreneurship, necessary condition analysis, blue lobbyist, communication.

Nepieciešamie nosacījumi uzņēmējdarbības veikšanai dziļo tehnoloģiju jomā Bulgārijas zilās ekonomikas kontekstā

Raksts iepazīstina ar “Nepieciešamo nosacījumu analīzi” (Necessary Condition Analysis – NCA) kā inovatīvu pieeju, ko izmanto vides un ekonomikas izpētē, lai noteiktu minimālās prasības, kas jāizpilda, lai varētu notikt vēlamais vai labvēlīgais rezultāts. Pētījumā tiek apskatīti teorētiskie un praktiskie aspekti divās perspektīvās jomās – zilajā ekonomikā un dziļajās tehnoloģijās, uzsverot to savstarpējo mijiedarbību un nozīmi ilgtspējīgas ekonomiskās attīstības veicināšanā. Analīze balstās uz mūsdienu vadošo pētnieku un ekspertu pieejām, ietverot gan teorētisku ietvaru, gan reālus piemērus. Īpašs uzsvars likts uz šo koncepciju pielietojumu Bulgārijas ekonomikas kontekstā, identificējot iespējamus ieguvumus un izaicinājumus, kas saistīti ar dziļo tehnoloģiju izmantošanu tradicionālajās jūras nozarēs – piemēram, kuģniecībā, zivsaimniecībā, atjaunojamo jūras resursu pārvaldībā un digitālajās inovācijās, kā mākslīgais intelekts, blokķēdes un robotizācija. Tiek izstrādāts analītisks modelis, kas ļauj noteikt nepieciešamos nosacījumus veiksmīgai uzņēmējdarbības attīstībai šajā jomā. Pētījums sniedz ieskatu, kā ieinteresētās puses – uzņēmēji, investori, politikas veidotāji un pētnieki – var izmantot NCA metodoloģiju, lai proaktīvi analizētu un plānotu tehnoloģisko integrāciju zilās ekonomikas sektoros gan Bulgārijā, gan starptautiskā mērogā. Rakstā arī salīdzināti piemēri no citām valstīm, kas ļauj novērtēt labās prakses piemērus un to pielāgošanu vietējiem apstākļiem.

Atslēgvārdi: zilā ekonomika, dziļo tehnoloģiju uzņēmējdarbība, nepieciešamo nosacījumu analīze, tehnoloģiju integrācija, ilgtspējīga attīstība.

Introduction

The blue economy is in the sights of the United Nations (UN), in connection with the initiative “UN 2030: Agenda for Sustainable Development” (UN 2015), which aims to create sustainable economic solutions for the planet and for humanity, through its 17 goals, 169 targets and 300 indicators. Goal 14 of this initiative, called “Life Below Water”, is particularly important in the context of the issues

discussed in this article. This is because, through this goal, the United Nations (UN) is committed to building sustainable solutions in the field of the so-called “blue economy”. Moreover, the organization declares the years from 2021 to 2030 as years of research on the “blue economy”, under the title “Decade of Ocean Science for Sustainable Development”. In this sense, this article is relevant because it contributes to the great efforts to find sustainable economic solutions for the blue economy.

The subject of the article is the conditions of the blue economy in Bulgaria, examining the suitability of these conditions for carrying out entrepreneurial activity in the field of deep technologies. The main goal of the article is to examine in one scientific paper various current studies concerning the blue economy, the field of deep technologies and entrepreneurial models suitable for work in both sectors. The specific objective is to study the effect of the interaction of these three topics in the real economic reality of Bulgaria.

The research tasks that the article sets are:

- (1) systematizing the views of leading world researchers in the field of blue economy and deep technologies;
- (2) providing recommendations for improving the conditions for the development of an entrepreneurial process in the field of deep technologies in the conditions of the blue economy of Bulgaria;
- (3) indicating models for communication between stakeholders to achieve sustainable solutions in the field of deep technologies in the field of the blue economy.

What exactly is the blue economy?

If something is big and blue, there is a huge possibility that the same thing is also deep. This assumption is probably not always true in the real world, but when it comes to seas and oceans, the colour blue and great depths often have a connection. Large bodies of water, with their depths, sizes and colours, have been occupying the human imagination for millennia and have led researchers to discover more and more new spaces and objects in Plato's magical “World of Ideas”. This article uses Plato's approach in reverse and forward directions. First, we will take out known, researched and established ideas and invisible objects from there, compare and examine them, and later we will return proposals to the shelf of the world of ideas, proposing new such ideas and objects based on the research conducted.

Although we can very easily assume that if something is blue, big and wet, it means that the same thing is deep, this logical connection often does not correspond to the truth, because in the real economic environment of Bulgaria, the issues we will consider are not quite well combined, if at all. This article will occupy the reader not with depths of a geographical nature, but with the depths of technologies in the conditions of the Blue Economy, which a number of researchers convince us that they will be of key importance in the future. These depths are somewhat Platonic, because very often they are found in the world of imaginary objects or are waiting to be added there by researchers, talents, entrepreneurs and others. Often, we do not even suspect that they are there. In order to obtain them, we must create the necessary conditions for creativity and invest mental efforts of a high order. How? We will try to understand in the study below, considering a world example.

Let's start with the conceptual apparatus with which various researchers work in the field of the Blue Economy. According to the study by Lee et al. “The Blue Economy and the UN Sustainable Development Goals: Challenges and Opportunities”, the concept of the Blue Economy originated from the UN Conference on Sustainable Development held in Rio de Janeiro in 2012 (UNCTAD 2014). It was at this conference that the concept of the Blue Economy was adopted by the world community. The idea of development and observations of the world ocean and the marine economy can be traced throughout human history, with the first serious scientific reports on the topic being written throughout

the 20th century, as we see from the article by Eikeset and her colleagues “What is Blue Growth? The Semantics of “Sustainable Development” of the Marine Environment” (2018). However, the UN conference in Rio de Janeiro is particularly important for understanding the current issues in the development of the global economy, because it raises the question of the sustainability of the economy in the long term. The sustainability of the Blue Economy is essential because the challenges it faces are enormous. In the study “Ocean Research and the Blue Economy” we read the following:

In its report on the ocean economy, the Organisation for Economic Co-operation and Development (OECD 2016) estimates that ocean-related economic activities amounted to around US\$1.5 trillion in 2010. The Organisation for Economic Co-operation and Development (OECD) predicts rapid growth in ocean-related economic activity, with ocean industries having the potential to outpace the growth of the global economy, both in terms of value added and employment. Their projections show that between 2010 and 2030, the ocean economy could double its contribution to global value added, reaching over US\$3 trillion per year.

Before the proposed passage, the authors clarify that a healthy and functioning ocean ecosystem provides human society with resources that are vital for its existence. Starting with the fact that the ocean is the largest carbon dioxide filter, we move on to the forecast made again in the same study, namely that in 2030 they (the sectors of the Blue Economy) are expected to employ approximately 40 million full-time equivalent jobs in a business-as-usual scenario. From the study, we understand that it is important to collect adequate, verified and verifiable data on the sea and the maritime economy, so that the different end users of this data can handle data that is equally accurate and meaningful. Subsequently, in the study we also read who the end users of this data are:

End-users of ocean data and information fall into four main types:

- (1) scientific end-users, who conduct research activities that are wholly or partly dependent on continuous ocean measurement and observation;
- (2) operational end-users, who use ocean data and information to support operational needs related to safety, economic efficiency and environmental protection;
- (3) policy end-users, who require sustainable ocean data and information to support policy formulation, monitoring and evaluation of policy effectiveness;
- (4) public end-users, who have a general interest in the ocean or use ocean data and information to support their recreational activities or pursuits.

The question arises, what will we measure in terms of economic activity? According to information entitled “What are the sectors of the blue economy?” on the website of the Caribbean Maritime University, citing the “European Union Annual Report on the State of the Blue Economy 2018”, in the maritime economy we have established and emerging sectors. The information makes it clear that according to the institute, established sectors are: Fishing; Maritime transport and ports; Shipbuilding; Marine construction; Maritime and coastal tourism; Maritime passenger transport; Maritime transport services; Marine research and development; Activities to expand, clean and increase the depth of sea routes, channels and water areas of ports and roadsteads.

From the same information, we understand that the Caribbean Institute considers the following sectors as emerging: Marine aquaculture and biotechnology; Offshore and wind energy; Ocean renewable energy; High-tech marine services; Seabed mining; Safety and surveillance; The Caribbean Maritime University also indicates in the information on its website that the general idea of the Blue Economy includes the sectors: Fisheries and aquaculture; Maritime transport, shipping/ports; Coastal tourism and cruise ship industry; Marine biotechnology; Seawater desalination; Deepwater mining, offshore oil/gas; Renewable energy; Shipbuilding and small vessel construction; Marine construction; Defense and security; Research and education.

Approximately the same sectors are shown in the already cited study by Rayner et al. (2019) “Ocean Observing and the Blue Economy” in its table predicting the growth of the sector in the period up to

2030. The jump in added value to the planet's gross domestic product promised by the article is extremely high for the period from 2010 to 2030. In the field of offshore wind farms, this growth is expected to reach 1257%. But the question remains what is the Blue Economy and is what has been cited so far enough to explain the Blue Economy?

The answer is provided by various reports prepared by various institutions around the world such as the United Nations, the European Union, the World Bank, but also by the work of various researchers such as Ki-Hoon Lee et al. (2020), Anne Maria Eikeset et al. (2018), Rosa María Martínez-Vázquez et al. (2021). Many other noteworthy works, such as Gunter Pauli's book "The Blue Economy - 10 Years, 100 Innovations, 100 Million Jobs" (2010) and Jivanta Schoettli's "The Blue Economy 3.0: The Marriage of Science, Innovation and Entrepreneurship Creates a New Business Model That Transforms Society", also help in understanding the topic. Below we will summarize the ideas that the aforementioned authors and institutions offer to describe the sector and the issues of the blue economy.

In short, according to the UN, the blue economy is an economy that:

- comprises a set of economic sectors and related policies that together determine whether the use of ocean resources is sustainable;
- the challenge for the Blue Economy is to better understand and manage the many aspects of ocean sustainability, ranging from sustainable fishing to ecosystem health to pollution prevention;
- the Blue Economy challenges us to realize that sustainable management of ocean resources will require cooperation across borders and sectors through diverse partnerships, which has not been achieved on such a scale before. This is a difficult task, especially for Small Island Developing States (SIDS) and Least Developed Countries (LDCs), which face significant constraints;
- the UN notes that the Blue Economy will help achieve sustainable development, including the UN Development Goals, such as Goal 14 – "Life Below Water".

According to the World Bank, the Blue Economy is the sustainable use of ocean resources for economic growth, improved livelihoods and jobs, while preserving the health of the ocean ecosystem.

According to the European Commission, the Blue Economy encompasses all economic activities related to the oceans, seas and coasts, encompassing a wide range of interconnected established and emerging sectors.

In his book "The Blue Economy - 10 Years, 100 Innovations, 100 Million Jobs", author Gunter Pauli develops the concept that the potential of the Blue Economy is 100 million jobs, provided that the emphasis is on technological innovations that change the environment for doing business and living habits.

Ki-Hoon Lee et al find that the Blue Economy is situated in two competing realms – opportunities for growth and development, and threatened and vulnerable spaces in need of protection. The inherent conflicts between these two debates require solutions to embrace the opportunities associated with the ocean economy while recognizing and addressing its threats. In the context of the Blue Economy, the United Nations Sustainable Development Goals (SDGs) suggest that economic development should be both inclusive and environmentally sound, and emphasize the need to balance the economic, social and environmental dimensions of sustainable development with respect to the oceans.

Anne Maria Eikeset et al, in their article "What is Blue Growth? The Semantics of "Sustainable Development" of the Marine Environment", believe that the Blue Economy is linked to the concept of "blue growth" and recommend seeking solutions to the problem caused by the misunderstanding between interested groups. They propose to move to a concept of "speaking the same language", emphasizing the need for a separate mechanism that is unilaterally understandable to all interested parties. In general, it is proposed, through the concept of "blue growth", to measure the sustainability and contribution of the Blue Economy to the global gross domestic product.

Rosa María Martínez-Vázquez et al. examine the concept of the Blue Economy through the prism of the concepts of “Blue Economy”, “Blue Growth”, “Marine Economy”, “Ocean Economy”, clearly showing in a table the following conclusion: The central point (regarding the understanding of the Blue Economy) is the promotion of the development of the ocean as a sign of progress and economic, political, social and cultural growth, without losing focus on sustainability.

We will conclude our review of scientific studies on the topic of the Blue Economy with the report of the Organization for Economic Cooperation and Development, entitled “The Blue Economy 2030”. This study advocates the thesis that in the period up to 2030, the main factor for sustainable economic development will be innovations based on science and technology. To some extent, the study looks at the so-called deep technologies, which we will use to make a smooth transition to our next sub-topic, namely these same technologies and what is needed to get to them.

The term “deep technology” was coined by Swati Chaturvedi, CEO of Propel(x) in 2014. In her post “So, what exactly is “deep technology”, Chaturvedi defines it as companies based on scientific discovery or significant engineering innovation. She distinguishes between conventional technology companies, such as Uber, for example, and those based on deep tech, which she points out are more based on “tangible scientific research or engineering innovation.” The term has undergone a transformation, and according to Siegel and Krishnan in 2020, it provides an opportunity for interpretation, as future technologies may not be understandable or described with today's thinking and language.

In the same publication, they add that the term “deep technology” is increasingly understood as a means to justify significant time, economic, and intellectual capital expenditures to cultivate new business lines. According to the World Bank, deep technology includes technologies based on scientific or engineering breakthroughs with the potential for commercialization. They encompass areas such as artificial intelligence and machine learning, materials, advanced manufacturing, biotechnology, nanotechnology, drones and robotics, photonics and electronics, clean technology, space technology, and life sciences. Deep technology companies are research and development (R&D) intensive and multidisciplinary.

Others, such as Nicolas Harlé et al. (2017), argue that deep technologies are different in several ways: they involve a strong research base, a challenging business model, and require large investments. Because of their ambition and often their complexity, disruptive deep technologies can require significant development time before they are brought to market.

Deep technologies, according to Günter Schuh et al. (2022), are capable of significant technological advances compared to established technologies and have the potential to radically change existing markets or create entirely new ones.

The latter definition will be the one that this study will adhere to in formulating its conclusions.

In their publication, titled “From Tech to Deep Tech”, Arnaud de la Tour et al. argue that a particularly important factor in the success of deep technologies is the ecosystem that supports them.

A series of questions arise here, such as: What are the necessary and sufficient conditions for entrepreneurial activity in the field of deep technologies? How can we determine these necessary and sufficient conditions with the greatest precision? What should be the behaviour of entrepreneurs working in the field of deep technologies? The following authors attempt to answer these questions in their publications:

Eduardo Avancini Dionisio and his co-authors in the publication “Identifying Necessary Conditions to Deep-Tech Entrepreneurship” state that: “The necessary conditions are related to the political and business environment; education, research and development; general infrastructure; credit; trade; diversification and market size; and capacity to absorb knowledge.” Thus, they answer the question “What are the necessary conditions for carrying out entrepreneurial activity in the field of deep technology?”.

To the question “How to determine with the greatest accuracy the necessary conditions for the occurrence of a given event and by what tool?”, the publications of Jan Dul (2016a, 2016b) and the tool “Necessary Conditions Analysis” provide an answer, where a bottleneck graph is used. This graph shows the necessary level of conditions for a given level of outcome. Bottleneck graphs are particularly useful for interpreting multivariate necessary conditions and identifying necessary configurations.

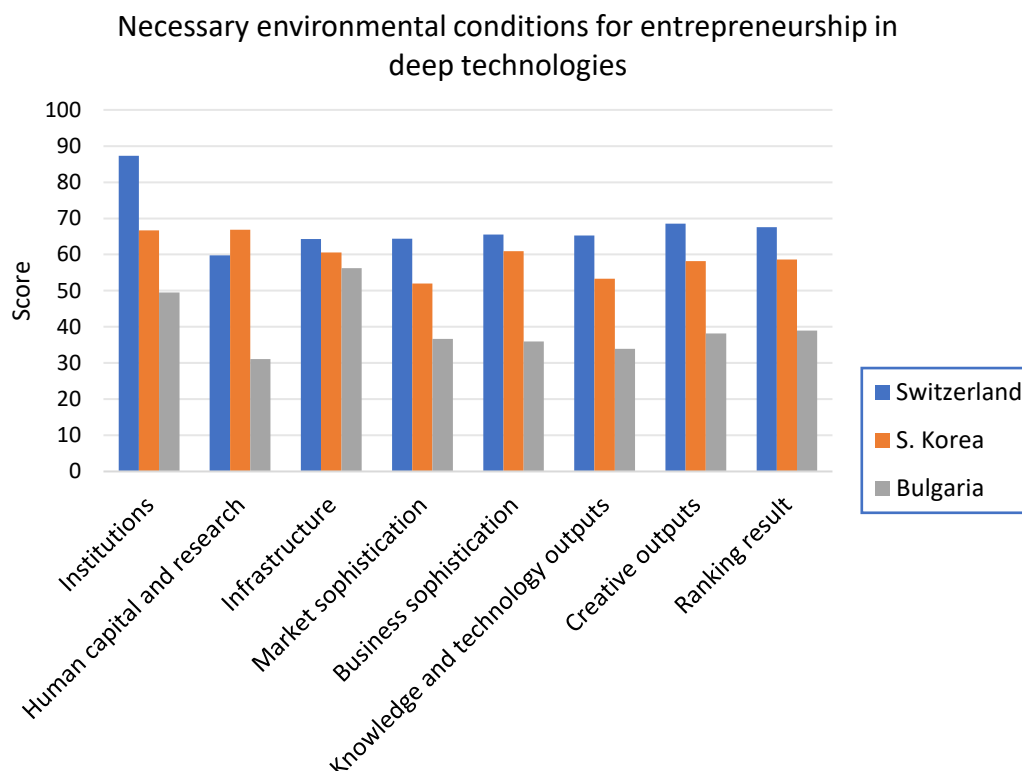
For the purposes of our research, we will work with the indicators provided in the World Intellectual Property Organization's annual report on global innovation, showing the Global Innovation Index for 2023 (Dutta et al. 2023).

It is important to note that this study is based on the financial principle that no individual sector of an economy can have a higher credit rating than the overall country. By transferring this principle to sectors in economic reality, we can argue that each sector automatically receives the values of the national economy. In terms of research and international comparisons, the country's results are transferred to each individual sector, with clarifications made about the sector's capabilities when the country's rating changes.

Below we will describe the opportunities of Bulgaria's Blue Economy, using the country's national result from the GII 2023 study. We will also make clarifications about the sector to determine the level of development potential in the field of entrepreneurship in the field of deep technologies.

Figure 1

GII 2023 indicators for Switzerland, South Korea and Bulgaria



Source: the author's own elaboration based on Dutta et al 2023.

The graph presents the results of three countries – Bulgaria, Korea and Switzerland, in the GII ranking for 2023 in various areas: Knowledge and technology; Creativity; Business environment; Market environment; Human capital; Infrastructure; Institutions; Ranking result.

The selected countries – Switzerland and Korea, occupy first and tenth place respectively in the ranking of the study. It is assumed that the indicators between them are a “necessary and sufficient condition” for the presence of innovations in the national economy, according to the same study. These indicators can be considered as “bottlenecks” according to the methodology of Dul.

The graph visually shows what the Bulgarian economy should do to improve the likelihood of creating innovations and deep technologies on its territory, or at least how to extract optimal economic effect from them. The goal set to improve the indicators of the index is a good guideline for action, but this fact alone is not enough. Bulgaria should direct its efforts towards entering the top ten places in the ranking, which, given the current 38th place, seems like a task of medium difficulty – difficult, but not impossible.

Bulgaria's blue economy and entrepreneurship in deep technologies

According to a World Bank report entitled “Bulgaria: Towards the Development of a Blue Economy” from December 2020, the blue sector in Bulgaria is represented by the following sectors: coastal tourism, maritime transport, shipbuilding and ship repair, port activities, marine non-living resources, marine living resources. The largest share is coastal tourism (with a 70% contribution to GVA), followed far behind in percentage terms by shipbuilding and ship repair (9% contribution to GVA), marine non-living resources (with a 9% contribution to GVA) and port transport (8% contribution to GVA). The data are for 2018. It is worth adding to the above the conclusions made by Anastasia Nedayvoda and colleagues on deep technologies in a study entitled “Financing Deep Technologies”. This study draws attention to the fact that most companies based on deep technologies arise in developed countries, but their solutions are applicable worldwide. According to the study:

Many of these solutions are particularly important for emerging markets, as the intractable challenges of climate, health and connectivity, among other issues, disproportionately affect these nations.

Bulgaria's blue economy, according to the World Bank, is in the process of being created and strengthened. The framework within which this group of economic sectors is being pursued by the European Commission is as follows:

- integrated spatial and participatory approach to territorial development;
- defining priorities with stakeholders;
- negotiating trade-offs;
- developing a future “Vision” for the ocean space.

The framework includes several other very important prerequisites: (a) knowledge management; (b) governance, fiscal reforms and public investments that help create a favourable environment for sustainable private sector growth (risk-free growth); and (c) the promotion of private investment. All these aspects should be supported by a number of key considerations based on a cross-sectoral analysis.

The framework for the development of the blue sector in Bulgaria also takes into account the protection of the ecosystem of the region, relying mainly on a multi-faceted approach, where different activities are carried out simultaneously to achieve multi-directional results.

On the other hand, deep technologies require specific conditions to arise in a certain place, and these conditions can be seen as a kind of economic barrier to entry into the business with them.

For deep technology entrepreneurship to be possible in the context of the blue economy, there must first be a sustainable blue economy. A blue economy must be either an economy whose state changes insignificantly under the influence of external factors, or an economy that does not have negative environmental impacts. At the present time, as the World Bank report states, Bulgaria's blue economy is in the process of being created and strengthened, i.e., it is not sustainable, but rather unstable and developing. In this context, we can conclude that deep technologies in the blue economy cannot yet be

expected to emerge easily. Based on the nature of these technologies, we should not exclude the possibility of a new sector that we cannot yet imagine, and we must open our minds to its possible emergence. At the very least, we should accept that such a possibility exists, and not deny it completely.

Despite the rather negative findings that we have indicated so far, we can point to the logical connection of the favourable conditions upon the occurrence of which the Blue Economy of Bulgaria can reach a state in which free entrepreneurship with the tools of deep technologies is possible.

First, we must be sure that the Blue Economy of Bulgaria is well developed and realistically positioned. An economy is well developed when a large part of its sectors are growing and are well positioned throughout the various economic cycles – 5-year, 10-year, 30-year and more.

The second thing that we must have as a necessary condition is a favorable national environment for innovation, which, as we show in Figure 1, is a distant, but not impossible prospect for Bulgaria.

To specify what Bulgaria needs to achieve in order to increase its position in the Global Innovation Index ranking, we must consider the pillars that the index examines to determine the general state of a given economy. For this purpose, we need to return to Figure 1. From which it is clearly seen that the Bulgarian economy has the biggest problems in the field of human resources and talents, and in the field of infrastructure it is rather approaching the benchmark countries.

It can be seen that the indicators “Business Environment”, “Market”, “Ability to Accumulate and Absorb Knowledge” and “Creativity” have almost the same values. In order to have balance and sustainable growth, however, a multifaceted approach is needed and all these indicators must be increased smoothly and simultaneously. Here, communication between stakeholders in the process plays a major role. In the conditions of the Blue Economy, according to Lee, this comes down to strengthening communication through various channels between the following several participants:

- state institutions;
- NGO sector;
- business (entrepreneurs);
- local communities;
- science.

In the conditions of Bulgaria, where we do not have a well-established Blue Economy, we do not have fruitful communication between these groups of stakeholders, any economic growth is greatly hampered. Communication here should be understood as processes of civil dialogue, in which each group, relying on information that is verified – that is, recognized by all others as reliable, demands and seeks support for its interests in a pluralistic public conversation.

It is a matter of leadership that extensive and full communication between stakeholders begins to take place. This task can be handled by a new type of professionals, whom we will call: blue lobbyists. They are a type of lobbyists who are more like consulting lobbyists according to the methodology of Ivka Tsakova (2010). People who know in detail not only the deep technology market, but also the Blue Economy and are authorities in the eyes of all stakeholders. They are able to provide information that all parties can trust, as recommended by a study by Friederike Welter, Nadezhda Veleva, Susanne Kolb entitled “Trust and Learning in Cross-Border Partnerships in an Enlarged Europe” (2008).

The results of this study show that the following conditions are necessary for entrepreneurial activity based on deep technologies in the field of the blue economy in Bulgaria:

- (1) the presence of an established blue economy;
- (2) the presence of a dialogue in the sector to create an ecosystem aimed at bringing the sector and the country to the market of new technologies and innovations, that is, to create a market environment;
- (3) a good start would be for Bulgaria to start issuing a report on the state of the Blue Economy, following the example of countries such as Ireland;

- (4) the country should increase opportunities for talent mobility and improve communication between the various participants in the process of creating a sustainable blue economy;
- (5) entrepreneurs in the country should be aware of the nature of deep technologies, which can transform entire market niches and provide new market opportunities unsuspected in the current economic context;
- (6) market openness and business freedom should also be improved;
- (7) communication both within the sectors of the country and beyond must be ensured with access for Bulgarian entrepreneurs and scientists to the global processes of creating deep technologies, but also to the opportunities for entrepreneurship based on these technologies.

As with all possible improvements, it is best to make them simultaneously.

A little more about the context of Bulgaria and the international controversy related to the topic

In order to develop entrepreneurial activity with the tools of deep technologies in the conditions of the Blue Economy of Bulgaria, the following important environmental prerequisites are necessary:

- strengthening the Blue Economy sector;
- improving the business environment;
- improving market opportunities;
- investments in human resources;
- institutions adequate to the global environment for doing business;
- promoting creativity in society;
- investments in human capital: attracting, creating and increasing capabilities.

The Bulgarian Blue Economy is developing, this process requires time, resources and understanding. Deep technologies, in turn, require developed markets, business dynamics, human capital, institutions to happen somewhere. All this makes it quite difficult to implement an entrepreneurial process and entrepreneurship in these areas.

Despite the difficulties, Bulgaria cannot afford to remain outside the best global processes and must pursue a strong policy of inclusion, talent transfer and creation on its territory, providing them with binding mobility, work in global networks, funding and assistance tied to results.

A good start is the conference held in the city of Burgas under the title “Blue Economy and Blue Development”, on June 1-2, 2018, concerning the Blue Economy sector. The conference in question is a good example in the direction of filling the white spots in the field of knowledge about the Blue Economy. The ideas presented in the conference reports do not differ significantly from the global trends in the sector. A clear approach to regionalization of the issue is noticeable, emphasizing the specifics of the different water basins.

Thematic areas of the conference were:

- innovation and investment in the blue economy;
- challenges for infrastructure and regional development with blue growth;
- development of tourism in maritime and river areas;
- the sea and aspects of blue development in public communications and philology;
- solutions in psychology, social work and pedagogy, stimulated by water, water spaces and environmentally friendly life models;
- legal and administrative aspects of maritime areas and regulations;
- engineering and transport solutions related to water spaces and routes;
- information technologies and use of alternative sources in blue growth.

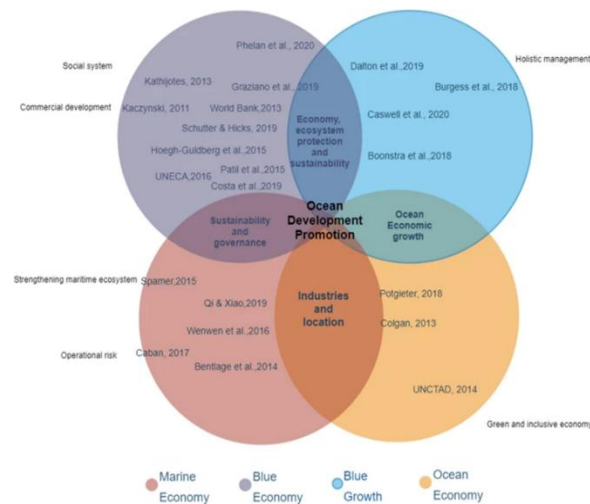
It is noticeable that the texts and topics do not cover the issues of entrepreneurship in the blue economy. Recommendations are provided on “what to do”, but the question of “who should do” these actions is not addressed. The latter can be considered a knowledge gap and should be studied as a topic.

Discussions in the field of deep technologies are diverse and divided into four main directions, as Martínez-Vázquez and her colleagues argue (Martínez-Vázquez et al. 2021):

- (1) economics, conservation and sustainability of natural ecosystems;
- (2) ocean growth;
- (3) industries and locations;
- (4) sustainability and governance.

Figure 2

Comparative analysis between authors' definitions



Source: Martínez-Vázquez et al. 2021.

Discussions in the field of deep technologies are diverse. The main question that concerns researchers is what are the necessary circumstances for the emergence of deep technologies in a particular place and in a particular sector. Frank attempts at prediction are being made by various researchers. An example of such a search is the report of the Office of the Deputy Assistant Secretary of the US Army (Research and Technology), published in 201 and entitled: “Emerging Science and Technology Trends: 2017-2047 Synthesis of Leading Forecasts”. Where the following trends for the development of the world and deep technologies are clearly outlined:

- robotics, autonomous systems and automation;
- advanced materials and manufacturing;
- energy generation, collection, storage and distribution;
- biomedical science and human augmentation;
- quantum computing;
- mixed reality and digital mimicry (e.g., AR, VR, voice synthesis);
- food and water security technologies (e.g., water harvesting, lab-grown meat);
- synthetic biology;
- space technologies (e.g., asteroid mining, commercial space travel, anti-satellite weapons);
- climate change adaptation technologies (e.g., geoengineering, super carbon-absorbing plants).

Again, the question “who will do them” is not considered, which we can consider as a white spot in knowledge. The entrepreneur and his characteristics are not visible and no prediction is made about them. The answer to the question “Who are the entrepreneurs using deep technologies in the Blue Economy of Bulgaria?” is part of the larger question “Who are the entrepreneurs of the future in the world and what do they need to do to be successful in the new economic and deeply unknown, still, future reality?”.

Bulgaria can help promote the debate on the above issues by ensuring and encouraging global communication on the above issues. Moreover, in order to have sustainable success, Bulgaria must become a place for communication between the bearers of different ideas, as the country must provide better living and working conditions for talented people and be very well connected politically, culturally and economically with potential places around the world where new, yet unknown, technologies of the future are supposed to and are most likely to arise. Bulgaria's blue economy is no exception. Entrepreneurs in Bulgaria, including in the field of the Blue Economy, should strive for this goal.

Conclusion

Deep technologies could emerge in different places around the world and in different economic sectors, but it is more likely to happen where there are more prerequisites for this. Prerequisites are something that societies around the world, through their leaders, institutions, talent and a favorable environment, can control and create. By constantly monitoring the necessary and sufficient conditions for the emergence of deep technologies, hypotheses could be made about where and in which sector such an emergence is more likely. On the other hand, the study of the prerequisites for the emergence of deep technologies allows less developed countries, regions and sectors of the world economy to join this process through talent transfer, equity investment in new developments and other similar initiatives with the potential for development on a significant scale.

Let's jump into the deep end. It's very interesting, exciting, but also a little dangerous. If we are well prepared and realize what we are doing, we will cope.

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