SAIDA KHALIL * –SHOVKAT HASANOVA **

The Blue Economy and the United Nation' Sustainable Development Goals: Challenges and Opportunities

Összefoglalás: Az egyre divatosabb Kék Gazdaság/koncepció a bolygó víztestei és óceánjai megőrzésének stratégiai megközelítéseivel foglalkozik. Felismeri a kényes egyensúlyt a fejlődés, a haladás és az óceáni erőforrások megőrzése között. Elsődleges célja az óceáni gazdaságokban rejlő lehetőségek kihasználása, miközben felelősen kezeli a potenciális kockázatokat. Ez a diskurzus hangsúlyozza a jelenkori igények kielégítésének fontosságát, anélkül azonban, hogy veszélyeztetné a jövő nemzedékek igényeit, amelyek a fenntartható fejlődés elveiben gyökereznek. Az ezen a területen végzett kutatási törekvések arra irányulnak, hogy megvilágítsák a Kék Gazdaság területén uralkodó kihívásokat, és az Egyesült Nemzetek Fenntartható Fejlődési Céljaival (SDG) összhangban álló módszereket dolgozzanak ki. Az olyan sürgető problémák azonosításával és kezelésével, mint a túlhalászás, a szennyezés és az élőhelyek pusztulása, az érdekelt felek célja a gazdasági növekedés és a környezetvédelem közötti harmonikus kapcsolat előmozdítása. Innovatív stratégiák és együttműködési erőfeszítések révén a cél egy fenntarthatóbb és rugalmasabb jövő megteremtése, ahol az óceánok az emberi jólét mellett virágozhatnak.
Kulcsszavak: Kék Gazdaság, fenntartható fejlődés, fenntartható fejlődési célok (SDG).

Abstract: The Blue Economy concept, increasingly in vogue, addresses strategic approaches to conserving the planet's water bodies and oceans. It recognizes the delicate balance between advancing development, progress, and preserving oceanic resources. Its primary goal is to capitalize on opportunities within oceanic economies while responsibly managing potential risks. This discourse underscores the imperative of meeting present-day demands without jeopardizing the requirements of future generations, rooted in the principles of sustainable development. Research endeavors in this realm seek to illuminate prevalent challenges within the Blue Economy domain and

□□✣✣□* *Azerbaijan State University of Economics, Economy and Business Department*
Email: saida_khalil@unec.edu.az

** *Azerbaijan State University okloppf Economics, Economy and Business Department*
Email: shovkat-hasanova@unec.edu.az

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devise remedies aligned with the United Nations' Sustainable Development Goals (SDGs). By identifying and addressing pressing issues, such as overfishing, pollution, and habitat destruction, stakeholders aim to foster a harmonious relationship between economic growth and environmental stewardship. Through innovative strategies and collaborative efforts, the aim is to pave the way for a more sustainable and resilient future, where the oceans can thrive alongside human prosperity.

Keywords: Blue Economy, Sustainable development, Sustainable Development Goals (SDGs).

Introduction

Covering more than 72 per cent of the Earth's surface and about 95 per cent of the biosphere, water bodies are essential for humans and almost all other living things. Water bodies thus continue to support all life by producing oxygen, absorbing carbon dioxide, and regulating global climate and temperature. They also provide food for a large proportion of the world's population and more than 80 per cent of global trade is carried out through water [1, 2].

The concept of "Blue Economy" introduced by Gunter Pauli in 1994 became globally recognised about twenty years later [3]. This concept was discussed at the Rio+20 Sustainable Development Conference of the United Nations in 2012. Initial goals such as "sustainable consumption and production patterns", food security, energy and disaster risk reduction and sustainability for all were proposed and adopted as priority areas [4].

Sustainable development is meeting the needs of the present without compromising the ability of future generations to meet their own needs. This trend is the approach adopted by the international community to solve the environmental, social and economic problems that the world has been facing for the last 20 years [5]. The concepts and goals of "Sustainable Development" and "Green Economy" only make sense when watersheds and oceans are fully integrated. In order to achieve a socio-economic, dynamic resource and environmental balance, the "Blue Economy" must be compatible with the Sustainable Development Goals [6].

The Blue Economy concept incorporates many concepts (e.g. geoeconomics, politics, economics, social and cultural studies) and aims to bring new perspectives by re-evaluating catchments. The Blue Economy foregrounds social justice concerns and identifies key points in their development (Griggs et al, 2013). (1) dispossession, displacement and ocean capture; (2) environmental justice concerns arising from pollution and waste; (3) environmental degradation and loss of ecosystem services; (4) impacts on the livelihoods of small-scale fishers; (5) loss of access to marine resources essential for food security and well-being; (6) unequal distribution of economic benefits; (7) social and cultural impacts; (8) marginalisation of women; (9) violation of human and indigenous rights; and (10) secession from governance [7].

Aquaculture, wind and wave energy, seabed drilling and tourism, known as blue growth sectors, are recognised by the European Union as future economic sectors and central areas of blue growth [8]. In addition, water resources provide numerous benefits to the world economy and offer important opportunities in terms of transport, food production and mineral resources. Mining, biotechnology and human settlement in coastal areas create important opportunities for tourism and recreation [4].

There are challenges in combining the Blue Economy concept with the UN Sustainable Development Goals. This creates potential struggles and conflicts regarding individual and industrial goals such as carbon emissions reduction and energy supply. This shows that it is difficult to find a way to fit the two concepts and achieve the goals of both [9].

Ocean Challenges

A number of problems create serious problems for the development of the blue economy and limit its development potential. Throughout history, people have seen many ecosystems as an infinite resource and, in addition, as free repositories of industrial waste. However, resources are far from being truly infinite. Coastal areas are always at the centre of many sectors. Increasing demand, ineffective governance, inadequate economic incentives, technological advances and poor implementation of UNCLOS and other legal and governance instruments often lead to poorly regulated activities.

[4] Martínez-Vázquez, R. M.–Milán-García, J.– De Pablo Valenciano, J. (2021): Challenges of the Blue Economy: evidence and research trends. *Environmental Sciences Europe,* 33., (1.).

[7] Bennett, N. J.–Blythe, J.–White, C. S.–Campero, C. (2021): *Blue growth and blue justice: Ten risks and solutions for the ocean economy. Marine Policy,* 125.

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[9] Khim, J. S. (2020): The Blue Economy and the United Nations' sustainable development goals: Challenges and opportunities. *Environment International,* 137.

With increasing competition, the interests of vulnerable people (such as small-scale artisanal fishers) are often displaced in favour of other, more visible sectors (such as coastal tourism) [10].

Major human effects include, but are not limited to, the following:

Unsustainable exploitation of marine resources, unsustainable fisheries: The fishing industry plays an important role in the world economy and has had a significant impact on food, traditions and people's livelihoods for millennia. The loss of biodiversity in the world's oceans will have negative consequences as 10% of the world's population is engaged in fishing. In addition, according to the calculation of fish stocks, it was determined that 33.1 per cent of fish stocks were overfished and 7 per cent of fish stocks remained as a result of this overfishing [11].

Physical change and destruction of marine and coastal settlements and landscapes: Coastal landscapes are changing as demand for urban infrastructure to support commercial, residential and tourism activities increase [12]. Most of the major cities with world-renowned harbours are located in coastal areas. This leads to overcrowding in coastal areas and puts great pressure on coastal areas. Coastal development projects cause various threats such as coastal retreat, seawater erosion, coral bleaching, and even changes in coastal landforms [13].

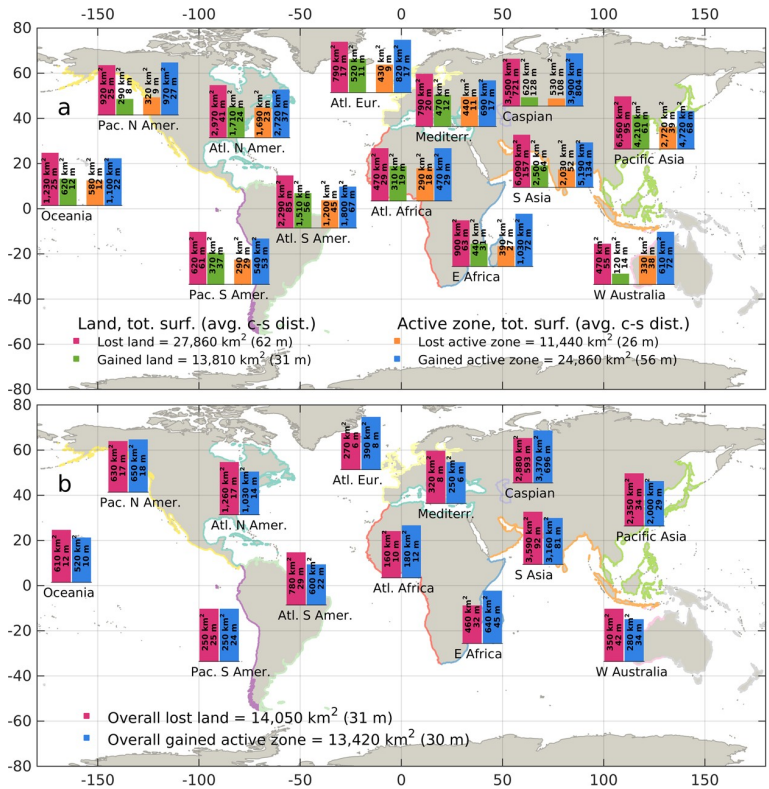
[10] World Bank and United Nations Department of Economic and Social Affairs (2017): *The Potential of the Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries.* World Bank, Washington DC.

[11] Ørbæk, H.–Klubb, F.–Korsnes, S.–Win, Z. M. (2019): *How to Overfish-A guide to unsustainable management of marine resources.*

[12] Bulleri, F.–Chapman, M. G. (2010): The introduction of coastal infrastructure as a driver of change in marine environments. *Journal of Applied Ecology,* 47., (1.), pp. 26–35.

[13] Senevirathna, E. M. T. K.–Edirisooriya, K. V. D.–Uluwaduge, S. P.–Wijerathna, K. B. C. A. (2018): Analysis of causes and effects of coastal erosion and environmental degradation in southern coastal belt of Sri Lanka special reference to Unawatuna coastal area. *Procedia Engineering,* 212., pp. 1010–1017.

Figure 1. Overall gained and lost (a) and gained-lost neat balance (b) of land and active zone, aggregated by continent/ocean and expressed in km² and in cross-shore distance. The global aggregated quantities are also shown in both panels. Coastline colours identify the considered areas [14]

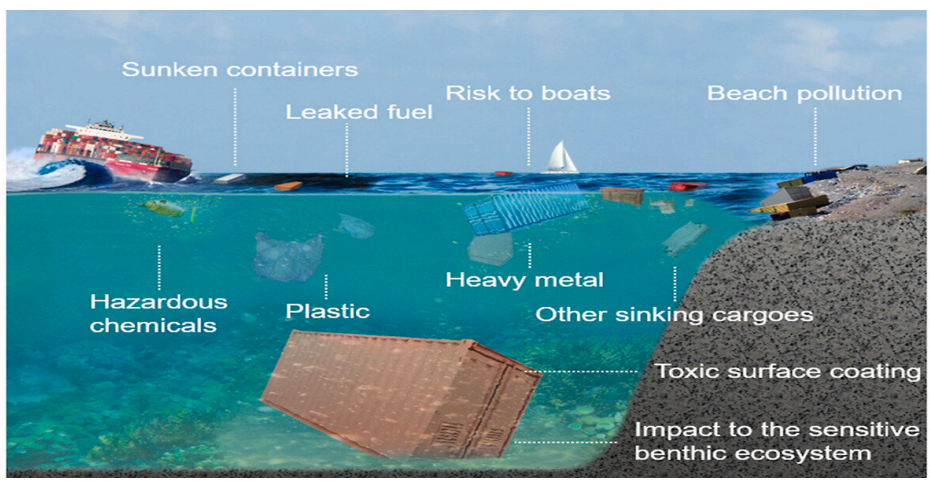


Pollution of marine resources: Pollution of water bodies is caused by impurities in the water, natural or anthropogenic influences or accidents at sea. The main drivers of water pollution are industrialization, plastics, pesticides, fertilizers, canals, agricultural growth, urbanization, eutrophication, farming, agrochemical waste, thermal pollution, oil spills, acid rain, radioactive waste, and climate change.

[14] Mentaschi, L. –Vousdoukas, M. I.– Pekel, J. F.– Voukouvalas, E.– Feyen, L. (2018): Global long-term observations of coastal erosion and accretion. *Scientific reports,* 8., (1.).

75–80% of water pollution is caused by domestic sewage. Industrial waste, pesticides, industries such as textiles, paper and pulp also pollute water. Polluted water has an unbearable odor, flora and fauna are poor. 80% of the world faces threats to water security [15].
The pollution and risks shown in *Figure 1* have a serious negative impact on the degradation of marine ecosystems.

Figure 2. Pollution and risks caused by the sunken containers [16].



The impact of climate change on the blue economy: Climate change is bringing sea level rise, ocean warming, increased vulnerability to natural disasters, and increased risks and threats to marine ecosystem services. Coastal populations are among the most vulnerable to marine-related natural disasters, including tsunamis, floods and tropical cyclones. The ocean currently absorbs about 26 per cent of the carbon dioxide released into the atmosphere, causing ocean acidity to rise to levels not seen in 30 million years or more [5].

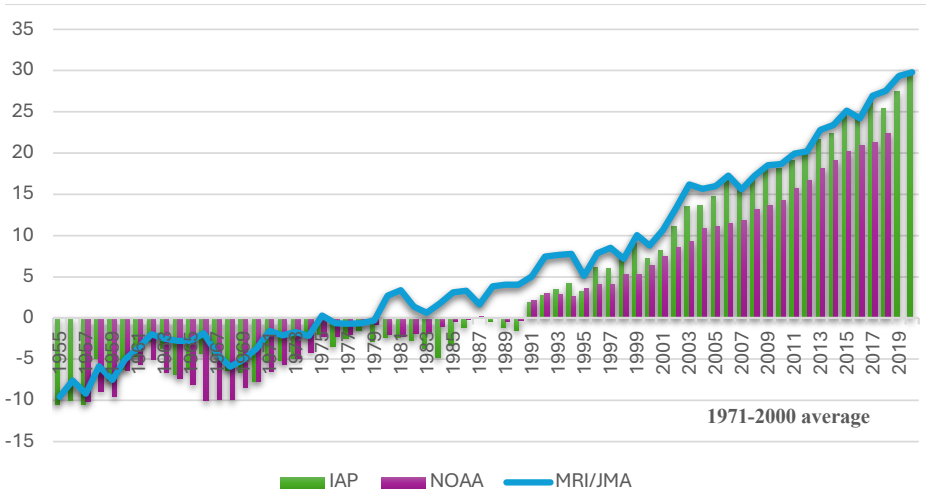
[5] Bradly, N.–Moorhouse, C. (2015): *A blueprint for ocean and coastal sustainability*. IOC/UNESCO.

[15] Kılıç, Z. (2021): Water pollution: causes, negative effects and prevention methods. *İstanbul Sabahattin Zaim Üniversitesi Fen Bilimleri Enstitüsü Dergisi,* 3., (2.), pp. 129–132.

[16] Wan, S.–Yang, X.–Chen, X.–Qu, Z.–An, C.–Zhang, B.–Bi, H. (2022): Emerging marine pollution from container ship accidents: Risk characteristics, response strategies, and regulation advancements. *Journal of Cleaner Production,* 376.

[17] United States Environmental Protection Agency https://www.epa.gov/climate

Figure 3. Graph of global ocean heat content change in the upper 2,000 meters of the ocean, showing the monthly average by year as compared to the annual average, for 1955–2019. Courtesy of NOAA, IAP and MRI/JMA [17]



Blue Economy and the Agenda for Sustainable Development

The 2030 Sustainable Development Goals agenda was adopted at the United Nations Sustainable Development Summit in September 2015. The Summit emphasised the importance of sustainable management of natural resources for social and economic development. It aims to protect and sustainably develop natural resources such as oceans and seas, freshwater resources, forests, mountains and land areas, as well as to protect biodiversity, ecosystems and wildlife [18].

This paper emphasises the potential of maritime-based economic development and links it to sustainable development goals. It emphasises that blue growth can be particularly beneficial for coastal communities and nations. However, this development can also bring injustice. The aim is, therefore, to learn from past injustices and maximise the potential that blue growth can provide. It is not only a social justice approach but also aims to adhere to the ”Leave No One Behind” principle

[17] *United States Environmental Protection Agency.* https://www.epa.gov/climate

[18] Sailaja, K. (2019). Sustainable blue economy-opportunities and challenges. *International Journal of Social Science and Economic Research,* 4., (03.).

of the United Nations Sustainable Development Agenda. In this context, fair proposals and development targets are proposed to make blue growth fairer and faster [19].

The health of the oceans and the biosphere is directly linked to many social and economic purposes. The targets of SDG 14 have significant implications for other goals. However, progress on indicators under SDGs often relies on an indicator that does not explain why targets are being met or not met. This can complicate making effective decisions and finding solutions. For example, the health of the biosphere at the intersection of SDG 14 with other social objectives may affect progress in other areas of society and the economy. Therefore, understanding the causal relationship between indicators within and among SDGs is crucial for better achieving the goals of sustainable development. [20].

SDG 6's objective of ensuring the availability and sustainable management of water and sanitation for all, while SDG 14 exclusively focuses on marine resources, seas, and oceans. SDG 14 addresses marine pollution (14.1), ecosystem restoration (14.2), ocean acidification (14.3), sustainable fishing (14.4), marine protected areas (14.5), fisheries subsidies (14.6), economic benefits for Small Island Developing States (SIDS) and Least Developed Countries (LDCs) (14.7) [21]

The table shows the relationship between the 14th goal of the United Nations Sustainable Development Goals (SDG) (Protection of marine ecosystems) and other goals. The table shows the "co-benefits" between SDG 14's sub-goals (14.1, 14.2, etc.) and other SDGs (SDG 1, 2, etc.) with a color scale.

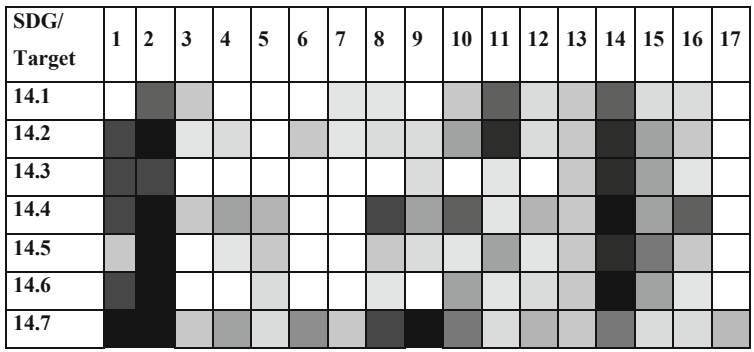
As shown in the table's title and sub-headings, it explains by colour how much a particular target (e.g. SDG 14.1) affects or is related to other targets (e.g. SDG 1). The rate of usefulness varies between 100% and 10%, but specific figures are not given because the table is not fully populated.

[19] Uhlenbrook, S.–Connor, R. (2019): *The United Nations world water development report 2019: leaving no one behind.*

[20] Nash, K. L.–Blythe, J. L.–Cvitanovic, C.–Fulton, E. A.–Halpern, B. S.–Milner-Gulland, E. J.–Blanchard, J. L. (2020): To achieve a sustainable blue future, progress assessments must include interdependencies between the sustainable development goals. *One Earth,* 2., (2.), pp. 161–173.

[21] UN (2016): *Final list of proposed sustainable development goal indicators.* Report of the inter-agency and expert group on sustainable development goal indicators (E/CN.3/2016/2/Rev.1), Annex IV. United Nations, New York.

Figure 4. Co-benefits between SDG 14 targets and other SDGs (colour scale) [22]



[22] Cortês, A. (2023): Blue planet law and ecological sustainability in the Twenty-First century. In: *Blue Planet Law: The Ecology of our Economic and Technological World*. pp. 3–19. Cham: Springer International Publishing.

[23] Ebarvia, M. C. M. (2016): Economic assessment of oceans for sustainable blue economy development. *Journal of Ocean and Coastal Economics,* 2., (2.).

Economic Contribution of the Blue Economy

National income accounts traditionally focus on economic indicators like GDP to gauge a country's performance. However, this approach overlooks the full spectrum of a nation's wealth. Coastal and marine ecosystems, along with biodiversity, play crucial roles in the economy, yet they're often not fully considered. These natural resources, along with human and social capital, are significant contributors to a nation's wealth and well-being. For instance, they provide essential services like flood protection, fisheries, and tourism revenue. By solely relying on GDP, we miss out on assessing the sustainability and inclusivity of economic growth. Recognizing the value of these diverse assets is essential for more comprehensive and accurate assessments of national economic performance [23].

The Blue Economy encapsulates a strategic approach to harnessing the vast resources of our oceans in a sustainable manner. It's not just about exploiting these resources for economic gain but doing so in a way that fosters long-term prosperity while safeguarding the health and integrity of marine ecosystems. This paradigm emphasizes not only economic growth but also improved livelihoods and job creation, particularly in coastal communities whose well-being is intricately tied to the health of the oceans. By embracing sustainable practices in sectors like fisheries, aquaculture, tourism, renewable energy, and biotechnology, the Blue Economy aims

to unlock the immense potential of our oceans while ensuring that future generations can continue to benefit from their bounty. It's about striking a balance between economic development and environmental conservation, recognizing that the two are interconnected and interdependent. In essence, the Blue Economy represents a holistic approach to ocean governance, one that prioritizes sustainability, equity, and resilience in the face of global challenges like climate change and biodiversity loss [24]. Its economic contribution is significant and multifaceted:

Fisheries and Aquaculture

– Fisheries and aquaculture are central to the Blue Economy, providing food security, employment, and income globally. Fisheries harvest wild fish stocks, while aquaculture cultivates seafood. They sustainably manage marine resources, supporting coastal communities and economies. These sectors also preserve cultural traditions and social cohesion. However, sustainability is crucial amid threats like overfishing and pollution. Effective management strategies are needed to ensure their long-term viability while safeguarding marine ecosystems [25].

Shipping and Transportation

– Maritime transport is a cornerstone of the Blue Economy, facilitating about 90% of global trade. Ports, shipping lanes, and related infrastructure are vital for economic activities by enabling trade and commerce. They create employment and drive economic growth in coastal regions. Additionally, maritime transport supports ancillary industries like shipbuilding and maritime technology, enhancing economic diversification and innovation. However, sustainability concerns, including pollution and greenhouse gas emissions, require integrating environmental principles into maritime practices for long-term viability. Through innovation and regulation, the sector can continue to drive global trade while promoting a sustainable Blue Economy [26].

[24] Bethel, B. J.–Buravleva, Y.–Tang, D. (2021): Blue economy and blue activities: opportunities, challenges, and recommendations for the Bahamas. *Water,* 13., (10.).

[25] Ayilu, R. K.–Fabinyi, M.–Barclay, K. (2022): Small-scale fisheries in the blue economy: Review of scholarly papers and multilateral documents. *Ocean & Coastal Management,* 216.

[26] Nikčević, J.–Škurić, M. (2021): A contribution to the sustainable development of maritime transport in the context of blue economy: The Case of Montenegro. *Sustainability,* 13., (6.).

Tourism and Recreation

– Tourism and recreation play pivotal roles in the Blue Economy, with coastal and marine destinations attracting visitors for activities like diving, snorkeling, and beach vacations. These experiences not only generate revenue for coastal communities but also bolster local economies through tourism-related services and businesses. Many regions depend heavily on tourism as a primary source of income and employment, highlighting the economic significance of sustainable coastal and marine tourism initiatives in fostering livelihoods and supporting community development within the Blue Economy paradigm [27].

Renewable Energy

– Within the Blue Economy framework, renewable energy development emerges as a key component, encompassing the exploration and utilization of sources like offshore wind, tidal, and wave energy. These sustainable alternatives hold promise in furnishing clean energy solutions, diminishing reliance on fossil fuels, and mitigating environmental impacts. Offshore wind farms, harnessing powerful coastal winds, and innovative technologies tapping into tidal and wave energy potential present avenues for transitioning towards greener energy landscapes, aligning economic progress with environmental stewardship [28].

Biotechnology and Pharmaceuticals

– Biotechnology and pharmaceuticals stand as integral facets of the Blue Economy, tapping into the vast reservoir of bioactive compounds found within marine organisms. These organisms harbor potential solutions for pharmaceuticals, cosmetics, and various industries. Bioprospecting and biotechnology research unlock novel insights, fostering innovation and driving economic growth within the Blue Economy framework. By harnessing the diverse biochemical properties of marine life, industries can develop sustainable products while simultaneously promoting conservation efforts to preserve marine biodiversity and ecosystems for future generations [29].

[27] Spalding, M. J. (2016): The new blue economy: the future of sustainability. *Journal of Ocean and Coastal Economics,* 2., (2.).

[28] Pires Manso, J. R.–Martínez Vázquez, R. M.–Milán García, J.–de Pablo Valenciano, J. (2023). Renewable Energies and Blue Economy: *New Trends in Global Research. Energies,* 16., (10.).

[29] Uddin, S. A.–Islam, M. M. (2019): Blue biotechnology, renewable energy, unconventional resources and products as emerging frontiers at Sea. *Journal of Ocean and Coastal Economics,* 6., (2.).

Marine Minerals and Resources

– Marine minerals and resources constitute a vital component of the Blue Economy, harboring valuable deposits such as oil, gas, manganese, cobalt, and rare earth elements beneath the ocean floor. Sustainable extraction of these resources holds the potential to drive economic development by providing essential raw materials for various industries. However, responsible extraction practices are imperative to mitigate environmental impacts and safeguard marine ecosystems. Balancing economic gains with environmental preservation is paramount in ensuring the long-term sustainability and prosperity of the Blue Economy [30].

Waste Management and Pollution Control

– Waste management and pollution control are integral components of the Blue Economy, encompassing initiatives to combat marine pollution and manage waste effectively. Activities range from cleanup campaigns targeting plastic pollution to the advancement of technologies for recycling marine debris. These endeavors not only preserve marine ecosystems but also foster economic opportunities within the waste management and recycling sectors. By addressing environmental challenges, such as plastic pollution, the Blue Economy promotes sustainable development while creating jobs and stimulating innovation in waste management practices [31].

Conclusion

In summary, the Blue Economy concept represents a contemporary and increasingly prominent approach to addressing the strategic management of the world's water bodies and oceans. It acknowledges the intricate balance between advancing societal development and progress while simultaneously safeguarding the invaluable resources found within our oceans.

At its core, the primary objective of the Blue Economy is to capitalize on the myriad economic opportunities presented by oceanic ecosystems while

[30] Nham, N. T. H.–Hoa, T. T. M. (2023): Influences of digitalization on sustaining marine minerals: A path toward sustainable blue economy. *Ocean & Coastal Management,* 239.

[31] Kathijotes, N. (2013): Keynote: Blue economy-environmental and behavioral aspects towards sustainable coastal development. *Procedia – Social and Behavioral Sciences,* 101., pp. 7–13.

also ensuring responsible stewardship to mitigate potential risks and preserve these vital resources for future generations.

Central to the discourse surrounding the Blue Economy is the recognition of the imperative to meet current societal demands without compromising the ability of future generations to meet their own needs. This ethos is deeply rooted in the principles of sustainable development, emphasizing the importance of adopting strategies that promote long-term ecological and economic resilience.

Research efforts within the realm of the Blue Economy focus on illuminating and addressing the prevailing challenges that confront oceanic ecosystems. These challenges include issues such as overfishing, pollution, habitat destruction, and climate change, all of which pose significant threats to the health and vitality of our oceans.

Crucially, stakeholders engaged in Blue Economy initiatives seek to align their efforts with the United Nations' Sustainable Development Goals (SDGs), recognizing the interconnectedness of socio-economic development, environmental sustainability, and global well-being. By addressing these challenges head-on and implementing innovative solutions, stakeholders aim to foster a harmonious relationship between economic growth and environmental conservation.

Through collaborative endeavors and the adoption of forward-thinking approaches to resource management, the Blue Economy strives to pave the way for a more sustainable and resilient future. In this vision, human prosperity and ecological integrity are not mutually exclusive but rather complementary elements of a holistic paradigm that seeks to ensure the health, vitality, and longevity of our planet's greatest natural resource: the oceans.