
Dynamics of Scientific Research in the Blue Economy and Sustainable Development: A Bibliometric Study for the Period (2004–2025)

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Abstract:

This study aims to analyze the scientific production related to the topic of the blue economy and sustainable development using a bibliometric approach. The study relied on a quantitative analysis of scientific publications issued during the period (2004–2025), enabling the identification of prevailing research trends and the assessment of the level of scientific impact in this field.

The findings indicate a heterogeneous evolution of research output, moving from limited early attention to rapid expansion and maturity, particularly after the integration of the blue economy into global sustainability agendas. The study also shows that scientific impact is largely concentrated in developed countries—especially the United States, the United Kingdom, and Australia—and that impact depends more on research quality and visibility than on the sheer number of publi.

Keywords: Blue economy; Sustainable development; Bibliometric analysis; VOSviewer software.

Jel Classification Codes: Q01; Q22.

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1. Introduction :

In recent decades, environmental sustainability has become a central concern in global discourse, particularly in light of escalating challenges such as climate change, marine ecosystem degradation, and the overexploitation of natural resources. Within this evolving context, the concept of the blue economy has gained prominence as a strategic framework that promotes the sustainable and responsible use of ocean and marine resources while safeguarding ecological integrity and long-term ecosystem resilience. Its growing relevance is closely linked to its alignment with international sustainability agendas, notably the United Nations Sustainable Development Goals (SDGs), and in particular SDG 14, which focuses on life below water.

The incorporation of the blue economy into global sustainability frameworks has stimulated expanding academic engagement with the topic, resulting in a substantial increase in scientific output. This expansion is reflected not only in the rising number of publications but also in the broadening thematic scope of research addressing environmental, social, and governance dimensions related to marine resources.

Nevertheless, despite this notable growth, the scientific literature on the blue economy exhibits uneven geographical and disciplinary distribution. Variations in research productivity, influence, and collaboration patterns suggest the need for a systematic and comprehensive assessment of knowledge development in this domain. In this regard, bibliometric analysis provides a rigorous methodological approach to mapping research evolution, identifying dominant themes, evaluating scientific impact, and uncovering patterns of international collaboration.

Accordingly, this study conducts a bibliometric analysis of global scientific production on the blue economy and sustainable development during the period 2004–2025. By examining publication trends, influential contributors, and structural dynamics of the field, it seeks to provide an integrated and evidence-based overview of its development, key characteristics, and emerging research directions.

The following main problem:

How have global research trends in the blue economy and sustainable development evolved during the period (2004-2025)?

Sub-questions:

1. What is the volume of global scientific production related to the blue economy and sustainable development during the period 2004-2025?
2. Which countries and academic institutions have contributed the most to the dissemination of research on the blue economy and sustainable development?
3. Who are the most prominent researchers who have contributed to the development of the scientific literature related to the blue economy and sustainable development? The introduction to the article

should contain a preface to the topic, and then introduce the research problem and make the appropriate assumptions, in addition to determining the research objectives and methodology of the study.

2. Literature Review:

Marine and coastal activities now constitute fundamental pillars of the global economy. Efforts to ensure the scientific and rational exploitation of marine resources are increasingly directed toward building a sustainable ocean economy. In this regard, the United Nations adopted 17 Sustainable Development Goals (SDGs) to address, in an integrated manner, the social, economic, and environmental dimensions of development and to promote a transition toward sustainability. Notably, SDG 14 focuses specifically on the conservation and sustainable use of oceans and marine resources, and it represents a vital foundation for the achievement of the remaining Sustainable Development Goals. (Liang, et al., 2022, p. 02)

The blue economy refers to an economic approach that seeks to enhance the value derived from marine resources and ecosystem services while maintaining their long-term viability. This is achieved through strategic investment, continuous research and innovation, and the adoption of effective policies and regulatory frameworks that support sustainable expansion of ocean-based sectors. At the same time, it places strong emphasis on environmental protection by conserving marine ecosystems and preventing degradation caused by pollution, overfishing, and other ecological threats. (Nassira, Imene, & Ouali, 2024, p. 262)

According to the OECD, the blue economy refers to the economic activities of ocean-based industries, as well as the assets, goods, and services provided by marine ecosystems. It seeks to conserve and utilize oceans, seas, and marine resources sustainably to support sustainable development. The Sustainable Ocean for All initiative further defines the sustainable ocean economy as emphasizing the responsible use and conservation of natural resources in the world's oceans, seas, and coastal areas, in alignment with the 2030 Agenda for Sustainable Development and related ocean SDGs. (Yaqota & Noha, 2025, p. 444)

Bibliometric reviews in previous years highlight the rapid growth in publications since 2018, driven by themes such as ocean governance, marine policy, and climate adaptation, often analyzed via tools like VOSviewer and Scopus data. Leading contributors include institutions like the Chinese Academy of Sciences and journals such as Marine Policy, underscoring interdisciplinary links to environmental sciences and oceanography. (Amran, Khaw, & Harymawan, 2025, p. 03)

Accordingly, despite the significant quantitative expansion in scientific production, the literature emphasizes the need for up-to-date bibliometric analyses to monitor the dynamics of scientific research development, identify key actors, and systematically detect emerging research trends.

3. Study Methodology:

This study aims to monitor and analyze research trends on the blue economy and sustainable development during the period (2004-2025) by relying on the bibliometric method and analyzing the data of the Scopus database in order to determine the quantitative and qualitative indicators of scientific research in this field.

3.1. Instruments used in bibliometric analysis:

In this study, bibliometric analysis was relied on, which is considered a bibliometric measurement that uses quantitative indicators and analytical techniques to study the structural and dynamic characteristics of published scientific production through the analysis of publication data and reference citations, with the aim of evaluating research performance and discovering prevailing scientific trends while identifying knowledge links within a specific research field (Donthu, Kumar, Mukherjee, Pandey, & Lim, 2021), as well as a technique used to plan the intellectual structure of any research field and track the development of this field and the relationships between authors Topics and Articles (Oğuzhan , Rıdvan , & Dominik K, 2024).

In our study, VOSviewer (version 1.6.18) was relied upon, which is a program used to analyze bibliometric data and build visual maps of scientific networks such as citation networks, co-authorship, keyword sharing, and bibliographic pairing. (2010): Where we show through Table (01) the type of analysis unit and software:

Table N°1: Bibliometric Analysis Indicators

Type of analysis	Analysis Unit	Analysis Software
Co-authorship	Authors	VOSviewer
	Countries	Microsoft
Co-occurrence	All keywords	Excel

Source: Prepared by the researcher.

3.2. Data Collection and Extraction:

The Scopus database of the Dutch publishing house Elsevier was used in this study, which is one of the largest and most important global databases, because it provides internationally indexed, high-quality scientific journals that are recognized by the academic community. For the purpose of building the research sample, the following keywords: "Blue Economy AND Sustainable Development" were used by searching in the title, abstract, and keywords, where the research was conducted on 23.12.2025, which resulted in the extraction of 1053 research papers published during a period of time extending over 21 All of them are publications in English, and the documents have been limited to the main areas of knowledge, namely: business, management,

accounting, economics and finance, and social sciences, where we explain through Table (02) the stages of data extraction according to the inclusion and exclusion criteria adopted in the study:

Table N°2: Data Extraction Stages

Stages		Data
Phase 1	Database	Scopus
	History	2025.12.23
	Research Topic	Blue Economy AND Sustainable Development
	Years	All Years (2004-2025)
	Preliminary results	1539 Documents
Phase 2	Magazines	Business, Management and Accounting, Economics and Finance, Social Sciences
	Documents	All Posts
	Language	English
	Final Results	407 Publications

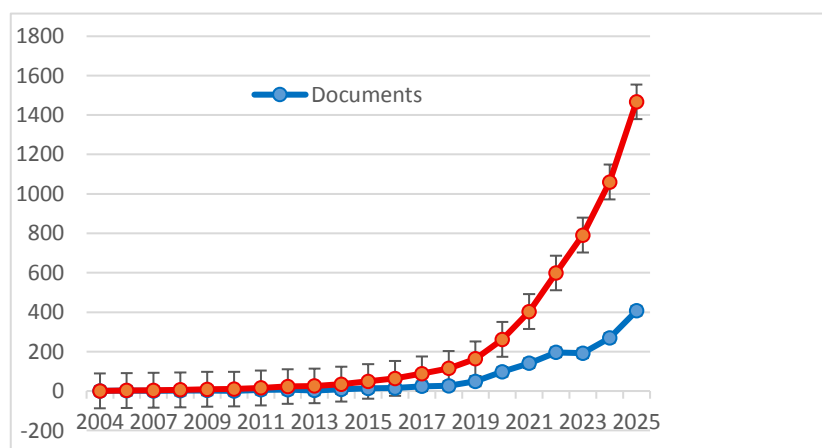
Source: Prepared by the researcher based on the SCOPUS database.

3.3. Chronological evolution of publications and growth trend:

The first scientific studies related to the topic of the blue economy and sustainable development came in 2004, when the researchers published the first study within the research sample entitled "**Simulation of the solar hot water systems diffusion: the case of Greece**", where this study focused on documenting and analyzing the main factors that contributed to the widespread use of solar energy in the production of domestic hot water in Greece through simulation models that tracked the time path of the spread of flat panel solar complexes since their first appearance In 1974, as one of the applications of renewable energies directly related to the dimensions of environmental and economic sustainability (Dimitrios & Emmanouil, 2004), although the concept of the blue economy had not crystallized in its modern terminology at the time, this study is considered one of the early beginnings that addressed fundamental issues related to sustainable development, especially the efficiency of the use of natural resources, reliance on clean energy sources and the analysis of the dynamics of the diffusion of environmental technologies.

The scientific literature has shifted from focusing on partial environmental solutions to adopting more holistic approaches that combine economic, environmental, and social dimensions, which later paved the way for the emergence of the concept of the blue economy and the growing research interest in it in the following years. The following figure shows the development of scientific production on the blue economy and sustainable development during the period (2004-2025):

Fig N°1: Evolution and cumulative number of publications on the topic of the blue economy and sustainable development during the period (2004-2025)



Source: Prepared by the researcher based on the SCOPUS database.

The above curve shows the temporal development of the volume of scientific production in the field of blue economy and sustainable development during the period (2004-2025), through the first phase (2004-2010), it is clear that there is a weakness in the number of publications, as the number did not exceed three publications per year with a slow growth in the cumulative number, which is explained by the novelty of the subject of the blue economy, especially in the scientific literature, and the limited attention to sustainable development only in this period, while the second phase (2011-2016) The third phase (2017-2019) stands out as a real turning point during which the number of publications saw a remarkable jump, especially in 2019, which recorded 49 publications, as this increase is mainly due to the integration of the blue economy. Within the international agendas for sustainable development, while the fourth phase (2020-2025) represents the stage of maturity and rapid expansion in scientific research, during which the number of annual publications experienced a sharp growth, moving from 98 publications in 2020 to 407 publications in 2025, with the cumulative number increasing to reach 1467 publications, which explains the increasing global interest in the green economy, in addition to the repercussions of green, especially the COVID-19 pandemic, which redirected scientific research towards more sustainable development models.

3.4. The most published authors on the subject:

This analysis aims to identify the researchers who have contributed significantly to the development of the scientific literature related to the topic of the blue economy and sustainable development, and this analysis helps to highlight the scientific pioneers in the field, and to understand the patterns of scientific production and its distribution among researchers, as we explain through the following table:

Table N°3: The ten most productive authors on the topic of the blue economy and sustainable development

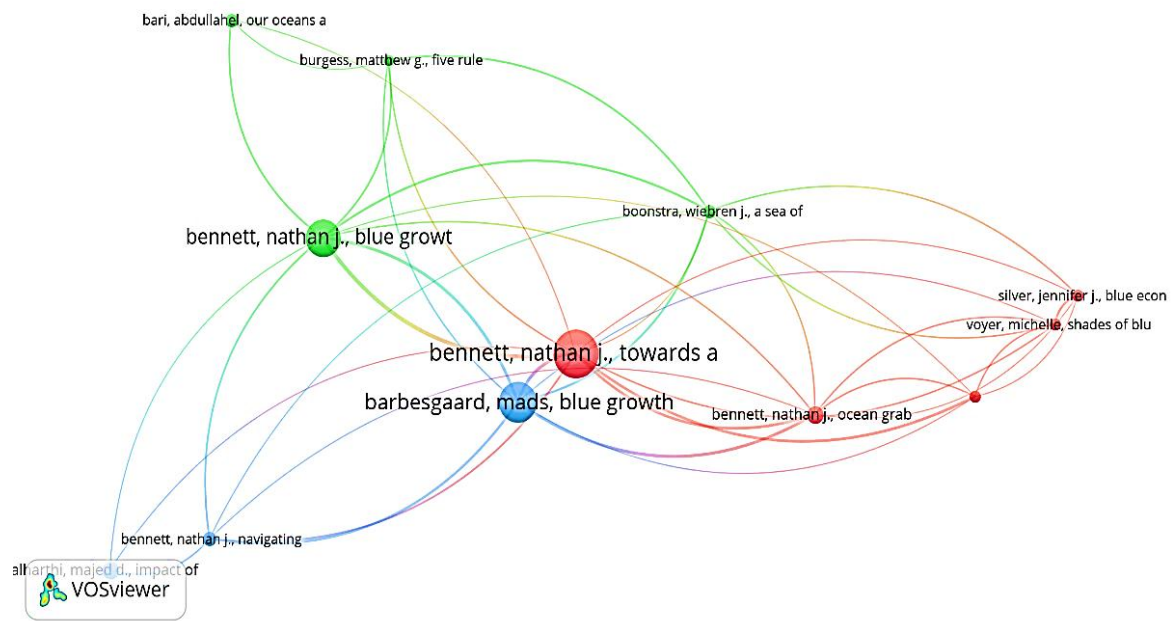
Authors	Number of Publications	Number of citations
failler, pierre	13	251
cisneros-montemayor, andrés miguel	11	245
voyer, michelle	10	637
march, antaya	7	137
ha, lethanh	5	47
Santos, Thauan	5	12
allison, edward hugh	4	240
Bennett, Michael	4	54
bennett, nathan j.	4	419
Benzaken, Dominique	4	100

Source: Prepared by the researcher based on the SCOPUS database.

The analysis of the scientific production of the most published authors in the field of blue economy and sustainable development showed that there was a clear discrepancy between the number of publications and the number of citations, which reflected the different levels of scientific influence among researchers. Failler, Pierre tops the list of authors in terms of the number of publications, with a total of 13 publications and 251 citations, demonstrating his continued research contribution to the field. Among his works, Blue Accounting Approaches in the Emerging African Blue Economy Context stands out as one of his most influential studies, focusing on the development of blue accounting approaches in the African context, and providing an analytical framework for measuring the economic, social, and environmental dimensions of the blue economy, making it an important reference in policy and evaluation studies in this field (March, Failler, & Bennett, 2023), followed by Cisneros-Montemayor, Andrés Miguel with 11 publications and 245 citations, which reflects a regular research presence and a significant scientific impact, while some researchers record a high scientific impact despite a smaller number of publications, such as Voyer and Michelle, whose number of publications reached only 10 publications but received 637 citations, which indicates the quality and importance of her research work and her great impact within the academic community, as (Bennett highlights. Nathan. J) with 4 publications and 419 citations, and Allison, Edward Hugh with 4 publications and 240 citations, which confirms that the strength of scientific impact is not necessarily related to the number of publications as much as to their importance and scope of scientific circulation, while the rest of the authors contribute between average scientific production and varying impact, which reflects the diversity of research contributions and the multiplicity of treatment angles on the topic of the blue economy and sustainable development.

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Fig N°2: The most published authors on the topic of the blue economy and sustainable development.



Source: Prepared by the researcher based on the SCOPUS database and VOSviewer software.

3.5. Cooperation of States:

The cooperation of countries represents one of the main axes in the analysis of scientific production, through which it shows the level of integration and interaction between researchers and research institutions across different countries, where we show through the following table the countries that have researched and published the most on the topic of the blue economy and sustainable development:

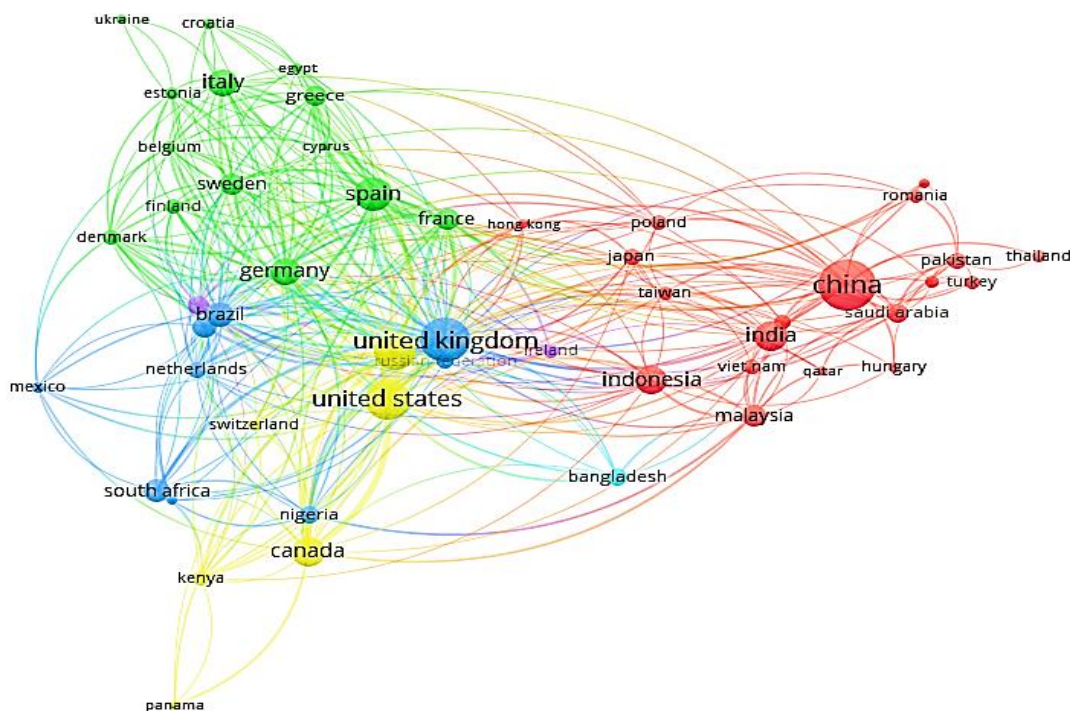
Table N°4: The countries with the most research and publication on the topic of the blue economy and sustainable development.

Countries	Number of Publications	Number of Citations
China	124	1646
united kingdom	94	2380
united states	78	2542
Australia	63	2396
Spain	56	735
Canada	44	1708
India	43	714
Indonesia	39	157
Germany	37	737
Italy	34	376

Source: Prepared by the researcher based on the SCOPUS database

Table (04) shows the geographical distribution of scientific production in the field of blue economy and sustainable development, where we observe a clear disparity between countries in terms of the number of publications and the number of citations, where China tops the list of countries in terms of the number of publications with a total of 124 publications and 1646 citations, which indicates the large volume of research production and the increasing interest of Chinese academic institutions in blue economy issues, especially in the fields of coastal development, on the other hand, both the United States of America and the United Kingdom record higher levels of scientific influence despite The number of publications is relatively less, as the United States achieved 2542 citations against 78 publications, while the United Kingdom recorded 2380 citations against 94 publications, which reflects the quality of published research and the strength of its dissemination in the international academic community, and Australia stands out as one of the leading countries in this field with 63 publications and 2396 citations, indicating its research focus on environmental sustainability, and countries such as Canada and Spain contribute to enriching the scientific literature with varying levels of scientific impact. Developing countries, such as India and Indonesia, appear to have significant scientific output in terms of the number of publications, but the number of citations remains relatively limited, which may prove the novelty of research or its weak international reach, while European countries record moderate research contributions, which generally indicates that this geographical distribution in scientific research is mainly concentrated in developed countries.

Fig N°3: Inter-country co-authoring network.



Source: Prepared by the researcher based on the SCOPUS database and VOSviewer software.

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The network shows that China is one of the main centers of international cooperation, as it is linked to a large number of Asian and European countries, which reflects the expansion of Asian research cooperation in the topics of the blue economy and sustainable development, and the United States of America and the United Kingdom are prominent as two pivotal nodes in the network, as they play a central role in linking several research clusters, especially with Western European countries such as France and Spain, which reflects the scientific status of these two countries and their ability to facilitate cross-regional cooperation. This networking reflected that scientific research in the field of blue economy and sustainable development is global and collaborative, with research leadership concentrated in a limited number of developed countries and a gradual expansion of the participation of developing countries through international cooperation networks.

3.6. Cooperation of Research Institutions:

Research institution cooperation is a form of scientific partnership that is established between different universities, research centers or scientific bodies with the aim of producing joint research, as it is considered an important indicator in bibliometric analysis, as it reflects the degree of institutional cohesion, the level of scientific integration, and the extent to which institutions are able to engage in broad research networks to address complex and interdisciplinary issues (J.Sylvan & Ben R. , 1997), where we show through the following table the most researched institutional countries on the topic of the blue economy and sustainable development:

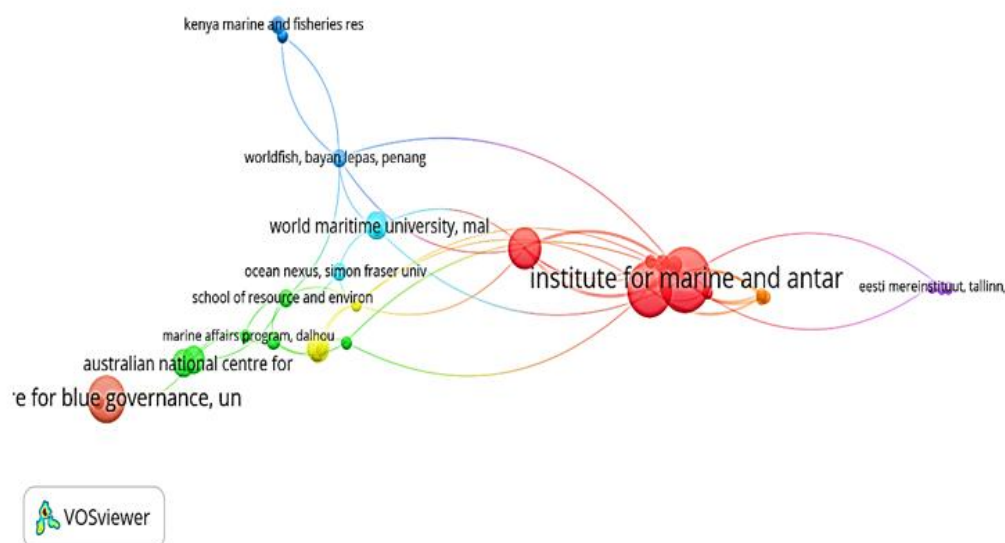
Table N°5: The most researched institutions on the topic of the blue economy and sustainable development.

Institutions	Number of Publications
institute for marine and antarctic studies, hobart, ts, australia	14
centre for marine socioecology, university of tasmania, hobart, ts, Australia	12
centre for blue governance, university of portsmouth, portsmouth, hampshire, united kingdom	10
commonwealth scientific and industrial research organisation, canberra, act, Australia	9
australian national centre for ocean resources and security, university of wollongong, wollongong, nsw, australia	6
institute for the oceans and fisheries, the university of british columbia, vancouver, bc, canada	6
leibniz center for tropical marine research, bremen, bremen, Germany	6
national economics university, hanoi, viet nam	6
uit The Arctic University of Norway, Tromsø, Troms and Finnmark, Norway	6
world maritime university, malmo, skane, Sweden	6

Source: Prepared by the researcher based on the SCOPUS database.

Through the table, we note above the analysis of the most contributing research institutions in the field of blue economy and sustainable development, a clear concentration of scientific production within a limited number of universities and research centers specialized in marine and coastal studies, which reflects the specialized and interdisciplinary nature of this research field, and the Institute for Marine and Antarctic Studies in Hobart, Australia, tops the list of the most published institutions with a total of 14 publications, which reflects its research leadership in issues of marine systems and environmental sustainability, followed by the Centre for Marine Socioecology – University of Tasmania with 12 publications, and the Centre for Blue Governance – University of Portsmouth in the United Kingdom has a prominent scientific presence with 10 publications, which confirms its recent interest in marine governance and sustainable development issues, while the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in Australia comes with 9 publications, and the rest of the institutions appear with a convergent scientific output of 6 publications each, this geographical and institutional diversity reflects the breadth of global interest Research approaches between environmental, economic and social aspects.

Fig N°4: Inter-research cooperation network in the world.



Source: Prepared by the researcher based on the SCOPUS database and VOSviewer software.

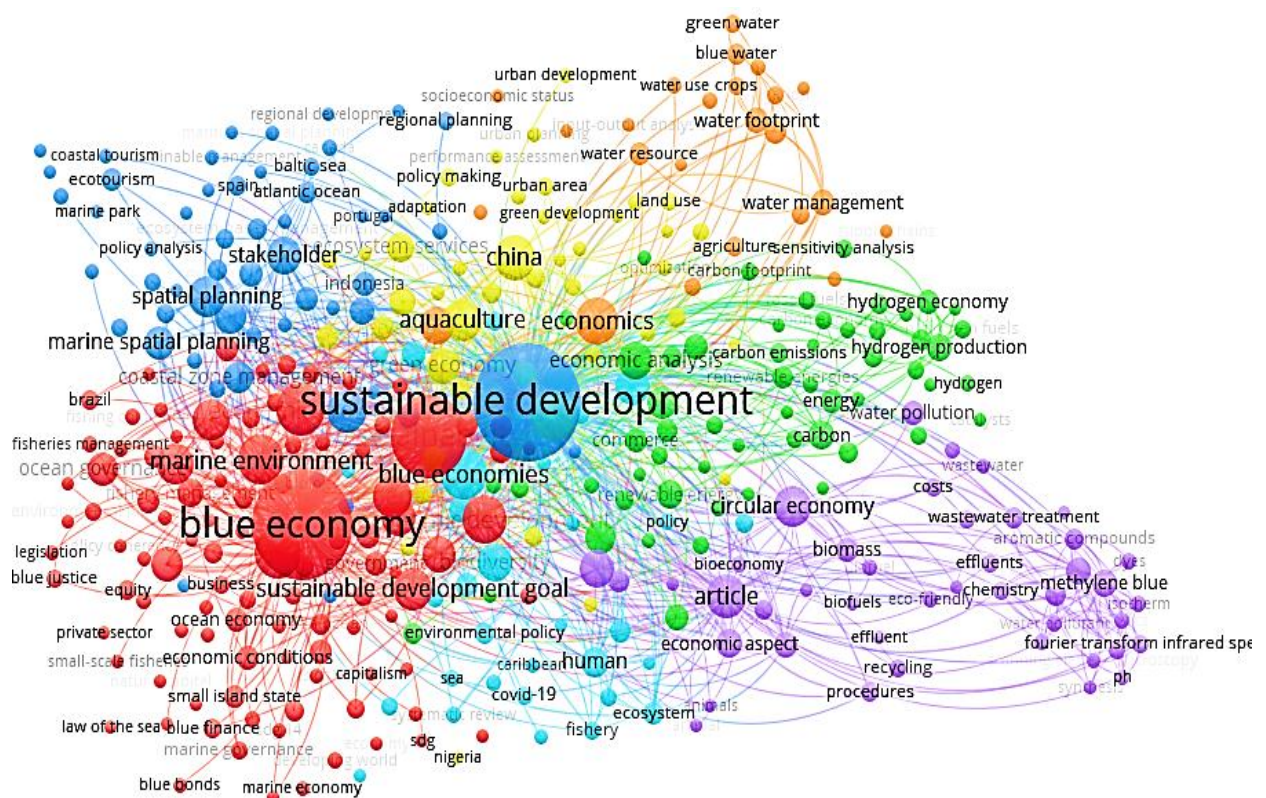
The network also shows the participation of institutions from Africa, Asia and Europe, which confirms the international and multi-regional nature of research cooperation in this field, i.e. institutional cooperation in the field of blue economy and sustainable development is centered around a limited number of leading institutions that act as points Scientific Foundation.

3.7.Terminology Analysis:

The analysis of the terms used in the bibliometric study provides a comprehensive view of the main axes and trends related to the subject of study, as it is a scientific method that employs quantitative and statistical

methods to study the terms and keywords used in the published scientific production, by measuring their frequency and the relationships between them, with the aim of revealing the conceptual structure and the main research trends of the subject of the study (Ivan & Tomaž , 2015). The analysis of the common frequency of terms in titles, summaries and keywords was conducted using VOSviewer software to build term networks, the minimum frequency was determined ten times with the exclusion of words with a general meaning, in addition to the integration of words with similar concepts, where we show through the figure the number of results reached:

Fig N°5: Keyword Network.



Source: Prepared by the researcher based on the SCOPUS database and VOSviewer software.

Through the network of keywords related to the topic of the blue economy and sustainable development, we note that the term "sustainable development" emerges as the most centralized and large node, which indicates that it is the framework concept in which the various research trends related to the blue economy intersect, reflecting the dominance of the sustainability dimension in the modern literature. It is also based on the term "Blue Economy", it is related to several concepts such as Ocean economy, marine environment, Blue finance... The network also reveals the formation of several other thematic interrelated environmental, institutional, and technical clusters of the blue economy, especially with regard to governance and clean energy, as this strong interdependence between the terms reflects the interdisciplinary nature of this research field, along

with the gradual transformation of the literature from theoretical approaches to applied approaches that support sustainability.

4. Conclusion:

Bibliometric analysis provided a comprehensive view of the bipolar scientific production of the Blue Economy and Sustainable Development during the period 2004 to 2025 relying on the Scopus database as a reliable source of bibliometric publications and indicators, during which the study used quantitative and visual tools such as network maps, frequency analysis and calculation of citation indicators... etc., in order to clarify the temporal development of research production and identify the most productive and influential researchers, institutions and countries, and the analysis also focused on the patterns of authorship and international cooperation, where the results revealed the following:

- The analysis of the temporal development of scientific production concluded that research in the field of blue economy and sustainable development has gone through several different stages, as it has moved from the stage of limited attention to the stage of maturity and rapid expansion, which reflects the increasing scientific and practical importance of this field;
- The analysis of the scientific output of the most published authors in the field of blue economy and sustainable development showed that there is a clear discrepancy between the volume of scientific production and the level of impact measured by the number of citations, which confirms that scientific impact is not necessarily related to the number of publications, but rather to the quality, relevance and extension of the works within the academic community;
- The geographical distribution of scientific production in general indicates that research in the field of blue economy and sustainable development is concentrated mainly in developed countries, especially the United States of America, the United Kingdom, and Australia, which combine the quality of scientific production with the strength of its influence within the international academic community;
- The institutional distribution indicates that scientific research in the field of blue economy and sustainable development is mainly led by academic and research institutions specialized in marine sciences and marine economics, with the increasing involvement of institutions from different geographical regions in order to enhance the international and participatory nature of this research field;
- The study showed a relative weakness in the contribution of developing countries, both in terms of the volume of scientific production and the level of impact compared to developed countries, which reflects a research and knowledge gap that requires strengthening research capacities and supporting international scientific cooperation;

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- The results showed that blue economy studies are no longer limited to environmental and economic aspects, but are paying increasing attention to the social dimension in the context of achieving sustainable development.

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