



Collaborative Strategic Management for Giant Sea Walls and Coastal Resilience: Bibliometric Analysis

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ABSTRACT

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collaborative governance, collaborative strategic management, coastal infrastructure, regional resilience, sustainable development, sustainable infrastructure

This study maps and analyzes the development of global research related to collaborative strategic management, coastal infrastructure, coastal resilience, and sustainable development using a bibliometric approach. Research data was obtained from the Dimensions database through a process of filtering, duplication, and metadata selection, resulting in 1,005 scientific publications for the 2017–2026 period. The analysis was carried out using the VOSviewer software through the techniques of co-occurrence, co-authorship, co-authorship organizations, co-authorship countries, visualization overlays, density visualization, and annual publication trend analysis. The results show that the dominant themes in the research network include cities, strategy, management, innovation, technology, and resilience, which form several multidisciplinary clusters. Temporal visualizations show the shift of research from urban geography and spatial studies to strategic innovation, collaborative governance, and sustainable infrastructure. The global collaborative network shows the dominance of the United States, Australia, the United Kingdom, and China, as well as strong ties between international academic organizations. This study concludes that the study of coastal infrastructure governance is developing in a collaborative and multidisciplinary manner and is increasingly integrated with issues of regional resilience and sustainable development. The implications of this study show the importance of developing a collaborative strategic management model in supporting adaptive, inclusive, and sustainable coastal infrastructure governance.

1. INTRODUCTION

Large-scale coastal infrastructure development, a giant sea wall is no longer understood only as an engineering project, but also as a strategic governance issue involving many actors, interests, and levels of government. In this context, collaborative strategic management is important because it is able to integrate the government, the private sector, coastal communities, academics, non-governmental organizations, and the media within the framework of shared governance. The literature shows that the success of collaborative governance is influenced by Initial conditions, institutional design, facilitative leadership, collaborative processes, and Intermediate Results as a key element of the Collaborative Governance Regime (CGR) [1]. Various studies in Indonesia also show that cross-actor collaboration can improve the quality of public policy and program implementation, although it still faces challenges in the form of dominance of certain actors, weak institutional design, and limited collaborative commitment [2]. In addition, the effectiveness of collaboration is influenced by the quality of communication, trust, shared roles, and the capacity of the forum in producing sustainable collective action [3]. Therefore, the giant sea embankment is positioned as a research object that requires a

collaborative strategic management approach in supporting coastal resilience and sustainable infrastructure development. However, the literature on the giant sea wall is still scattered in areas such as collaborative governance, coastal resilience, public policy, and infrastructure development, so there is no systematic mapping available that shows the relationship between concepts, dominant themes, and directions of research development globally.

Coastal areas face multidimensional pressures in the form of sea level rise, ecosystem degradation, coastal flood risk, urbanization, and socioeconomic vulnerability of coastal communities. Coastal area management requires a governance approach that is able to integrate environmental conservation, economic development, community welfare, and climate change adaptation simultaneously [4]. In practice, collaborative approaches in the environment and infrastructure sectors often face obstacles in the form of resource inequality, technocratic dominance, weak mutual understanding, and limited access to information for local actors [3]. Therefore, the success of coastal infrastructure projects is strongly influenced by inclusive institutional design, effective deliberative forums, and collaborative capacity between actors. Face-to-face dialogue, commitment to the process, and capacity for collective action are critical factors in the success

of collaborative programs [5]. In this context, Software System Methodology (SSM) is relevant for understanding the complexity of cross-actor issues and mapping the perspectives of different stakeholders [6]. In addition, some studies confirm that the success of collaborative governance is influenced by the institution's ability to manage forums, resources, local capacity, and continuous learning processes [5]. Thus, the need for a collaborative strategic management model in the development of the giant sea wall is becoming increasingly important in supporting the adaptive and sustainable resilience of coastal areas.

In terms of substance, the giant sea wall is directly related to the development of sustainable coastal protection infrastructure and the resilience of coastal areas. The literature shows that coastal areas face threats from sea level rise, coastal storms, abrasion, and environmental degradation that require a combination of collaborative governance, adaptive institutional design, and sustainable coastal protection [7, 8]. In recent developments, coastal protection is no longer solely dependent on a grey infrastructure approach, but has begun to integrate green, hybrid, and nature-based approaches that are able to provide ecological, social, and economic benefits simultaneously [9, 10]. Other research shows that green and blue infrastructure has an important role in reducing disaster risk and increasing the resilience of coastal areas [11]. In addition, climate-resilient development approaches in coastal urban areas are increasingly becoming a major concern in modern infrastructure planning [12]. However, the implementation of such approaches still faces challenges in terms of governance, long-term financing, collaborative evaluation, and equitable distribution of benefits to coastal communities [13]. International studies show successful coastal projects are generally built on a foundation of multi-stakeholder collaboration, policy integration, sensitivity to local contexts, and concern for ecological social justice [14, 15]. On the other hand, projects that are too technocratic tend to create social resistance and benefit gaps for the affected communities [16, 17].

In this context, the bibliometric approach is important because it is able to map the development of knowledge, research trends, scientific network structures, and relationships between concepts in the study of sustainable infrastructure and coastal governance. Bibliometric analysis allows the identification of relationships between themes such as Collaborative Governance, Nature-based solutions, Integrated Coastal Zone Management (ICZM), facilitative leadership, and collaborative evaluation in one integrated scientific landscape [11, 18]. In addition, this approach is able to show patterns of scientific production, relationships, the appearance of keywords together, a network of collaborations between countries, organizations, and authors, as well as the development of research themes over time [19, 20]. Some bibliometric research also emphasizes the importance of combining quantitative analysis with substantive readings of the context of governance policies and practices [21, 22]. Therefore, this study uses a bibliometric approach to map how collaborative strategic management models in the Giant sea wall are positioned in the global literature related to sustainable infrastructure and coastal resilience. Thus, this study is directed to fill the research gap in the form of the absence of systematic mapping of the relationship between Sea Wall giants, collaborative strategic management, and resilience of coastal areas.

This study uses the Dimensions database because it has a

wide scope of scientific publications, complete metadata, and good compatibility with the VOSviewer software. Dimension provides publication data that includes titles, abstracts, keywords, organizations, countries, and citations, supporting network-based bibliometric analysis. This database was chosen because it is able to accommodate the multidisciplinary character of research, which includes strategic management, public policy, sustainable development, and coastal environmental science. The research data was obtained through a search process using a combination of keywords that are relevant to the focus of the research. The inclusion criteria included journal articles that were directly relevant to the research theme, while conference proceedings, book chapters, editorials, and documents without complete metadata were excluded from the analysis to maintain consistency of data quality. After the screening process, 1,005 scientific documents were obtained, which were then analyzed using VOSviewer. In the visualization process, this study uses the minimum threshold for the occurrence of keywords and a certain number of documents to build a network of co-occurrence and co-authorship, so that the resulting network structure is more representative of the dominant theme of the research. For the threshold on the minimum number of documents per author in setting number 1, as well as the threshold for countries and organisations in setting number 5. Meanwhile, the threshold for the number of keyword occurrences is at least in the number setting of 10.

Based on this description, this study aims to analyze the development of the literature on collaborative strategic management models on giant sea walls related to coastal resilience and sustainable infrastructure development. In particular, this study answers how publication trends related to giant sea walls, collaborative strategic management, and coastal resilience develop in the sustainable infrastructure literature, what the most dominant scientific themes and actors are, and where the research gaps are, the basis for the development of conceptual models in the future. Thus, this research not only produces bibliometric maps but also makes conceptual contributions to strengthening collaborative governance, coastal resilience, and the development of coastal infrastructure policies that are more adaptive, inclusive, and sustainable.

2. RESEARCH METHODOLOGY

This study uses a quantitative approach with descriptive exploration, bibliometric analysis design, which aims to map the development of knowledge, intellectual structure, and research dynamics related to collaborative strategic management models in the construction of giant sea walls in the context of sustainable coastal infrastructure. Bibliometric analysis is widely recognized as an effective quantitative method for evaluating scientific results, identifying trends, influential authors, institutional contributions, and collaborative networks within the research domain [23]. This design was chosen because it is able to systematically identify patterns of scientific publications, relationships between concepts, and research collaboration networks based on bibliographic data. This approach is relevant to the need to understand the relationship between the concepts of collaborative governance, coastal resilience, and sustainable infrastructure development in an integrated scientific landscape. Unit analysis is a scientific document in the form

of journal articles that are indexed in international databases. The research population includes all publications relevant to keywords related to collaborative strategic management, giant sea walls, coastal infrastructure, and sustainable development. From the results of the search process, 1,005 scientific documents were obtained, which were then sampled using sampling techniques based on topic relevance and completeness of metadata. The selection of this sample is considered representative because it reflects multidisciplinary developments that include governance, public policy, and coastal environmental science. The design of this research is in line with the need to identify the knowledge structures formed in the study of collaborative governance and complex coastal infrastructure [13].

VOSviewer is used to process and visualize bibliographic data in the form of networks, density, and trends of research development. The research data was obtained from Dimension base data, which was chosen because it has a wide coverage of international scientific publications and provides comprehensive metadata such as title, abstract, keywords, authors, organizations, countries, and year of publication. The data collection process is carried out through a search strategy based on a combination of keywords relevant to the research focus, then filtered based on inclusion criteria such as document type, journal article, and topic suitability. The data obtained is then exported in a VOSviewer-compatible format for data cleansing processes such as deduplication, author name normalization, and keyword standardization. This stage is important to ensure that the resulting network analysis has a high level of accuracy and is not biased by data inconsistencies. The use of this instrument also allows

visualization of the relationships between concepts in the form of clusters that are easy to interpret. In addition, the use of this tool supports the analysis of the relationship between the themes of collaborative governance, institutional design, and coastal infrastructure development in the scientific literature. Therefore, this research instrument plays an important role in producing a systematic and comprehensive map of knowledge [15, 24].

The data collection procedure is carried out systematically and gradually so that it can be replicated by other researchers. The first stage is to determine search keywords that are compiled based on the focus of the research, which is to integrate the concepts of collaborative strategic management, giant sea walls, coastal resilience, and sustainable infrastructure. The second stage conducted a search in the Dimension database in early May 2026 by entering keywords in the title, abstract, and keyword fields. The queries included in the Dimension are Collaborative Strategic Management Models, Giant Sea Walls, and Coastal Area Resilience. The results were 40,742 journal articles. Furthermore, it is filtered by the last 10 year Publication Year from 2017 to 2026. In the Research Category filter, select 41 scientific fields of Science and 40 fields of Environmental Engineering. The results obtained 2,306 journal articles. It is then filtered on the Sustainable Development Goals, by selecting 11 Sustainable Cities and Communities, OR 13 Climate Actions, OR 7 Affordable and Clean Energy, OR 15 Life on Land, OR 12 Responsible Consumption and Production, OR 9 Industries, Innovation and Infrastructure. As a result, there were 1,005 journal articles relevant to the research topic, as described in Figure 1.

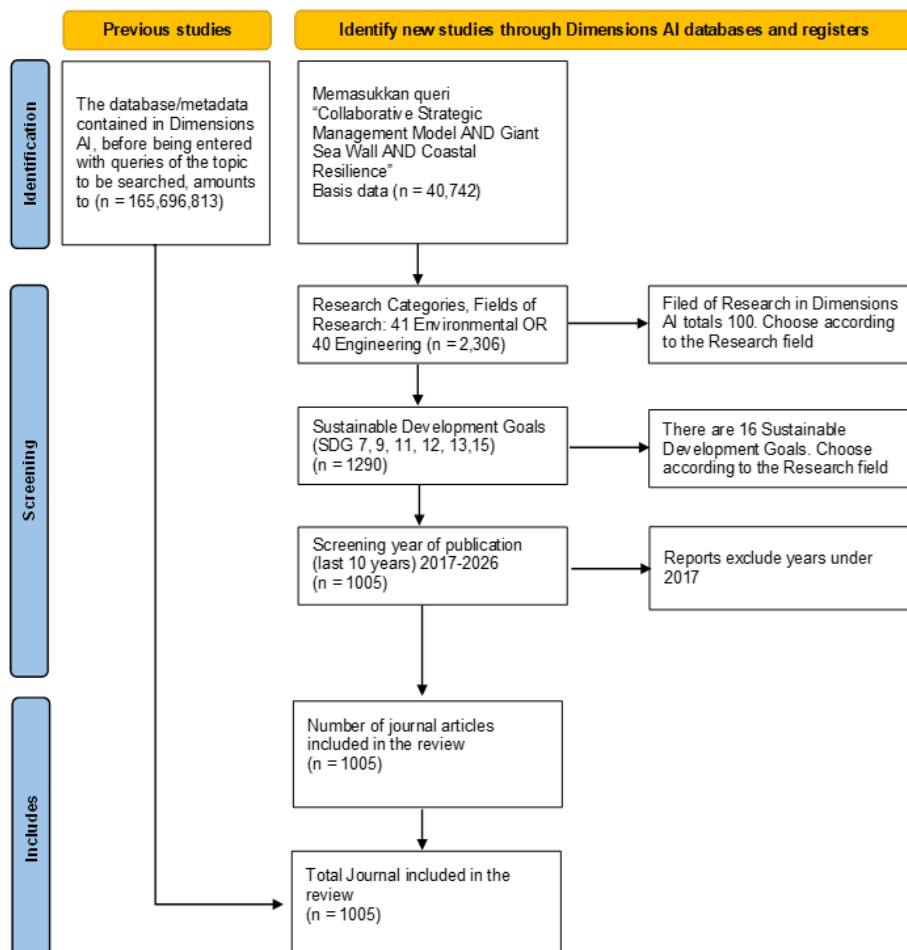


Figure 1. Prisma diagram of journal search flow relevant to journal topic

cooperation between institutions have not been widely integrated in the field of study analyzed. The University of Pennsylvania obtained the highest number of citations, which indicates the most dominant academic influence and scientific contributions. Meanwhile, Griffith University and Monash

University have the highest total link strength values, reflecting the intensity of the most active institutional collaborative relationships as well as their important role in building international scientific research and knowledge exchange networks.



Figure 7. Collaboration network between organizations
Source: VosViewer

Selected	Organization	Documents	Citations	Total link strength
<input checked="" type="checkbox"/>	griffith university	5	87	2
<input checked="" type="checkbox"/>	monash university	4	104	2
<input checked="" type="checkbox"/>	curtin university	3	171	1
<input checked="" type="checkbox"/>	university of british columbia	3	106	1
<input checked="" type="checkbox"/>	delft university of technology	3	8	0
<input checked="" type="checkbox"/>	lund university	3	43	0
<input checked="" type="checkbox"/>	peking university	3	28	0
<input checked="" type="checkbox"/>	university of pennsylvania	3	269	0
<input checked="" type="checkbox"/>	zhejiang university	3	0	0

Figure 8. 9 best universities based on analysis of co-authoring organizations

There are 9 organizations/universities, such as Griffith University, Curtin University, and Monash University, that have relatively large nodes in the network (Figure 7 and Figure 8). In addition, there are the University of British Columbia, Delft University, Lund University, Peking University, University of Pennsylvania, and Zhejiang University. The university that sends the most documents in this field is Griffith University, with 5 documents. It also indicates engagement in collaborative networking. The relationship between organizations is indicated by the lines connecting the institutional nodes. Some organizations form collaborative groups that are interconnected and relatively linear. The node size indicates the number of publication contributions from each organization. The network structure shows the

interinstitutional relationships in the development of the analyzed research.

3.6 Author collaboration network

Figure 9 shows the names of the most active journal publications in the Dimensions database, and the journals that published the research most relevant to this study: the Norwegian register level 1, the UGC journal list group II, VABB-SHW, ERA 2023, ERA 2018, ERA 2015, DOAJ, PubMed, Norwegian register level 0, and Norwegian register level 2.

The results of the co-authorship analysis obtained from Vosviewer are 712, indicating the formation of several groups of writers based on collaborative relationships (Figures 10, 11, and Table 1). The first group includes writers such as Newman, Peter, Bennett, Jo, and Dominique Hes. The second group includes writers such as Beatley, Timothy, and Boyer, Heather. The third cluster includes authors such as Kaufman, Jerome, Lynch, Barbara, and Born, Branden. Other groups include writers such as Cheshmehzangi, Ali, Allam, and Zaheer. Each cluster shows a strong collaborative relationship among the authors in the group. The node size indicates the number of publications or author contributions in the dataset. The connecting line shows the collaborative relationship between authors in scientific publications. This network structure shows the distribution of individual collaborations in research.

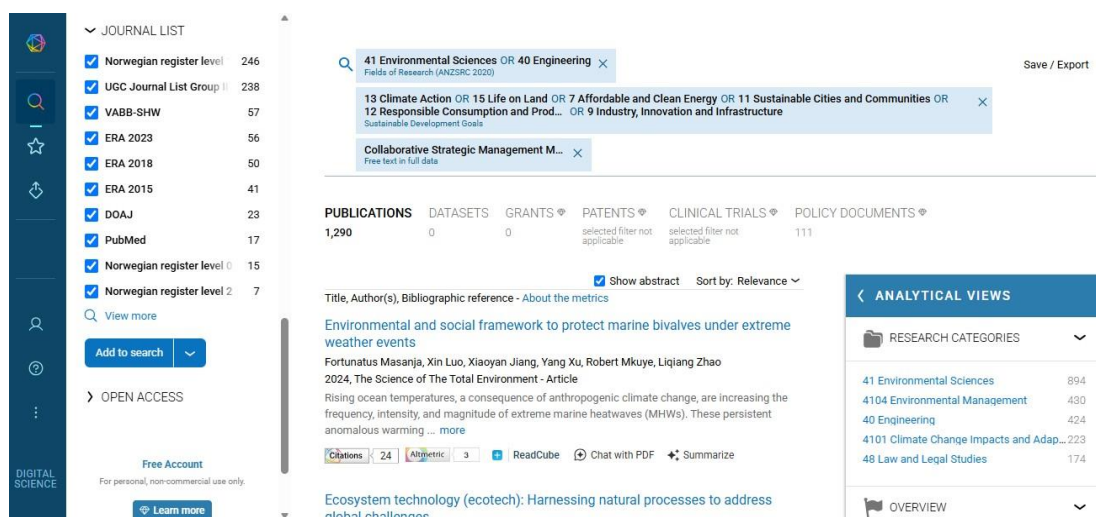


Figure 9. The number of journals in each journal list in Dimensions
Source: Dimensions, 2026

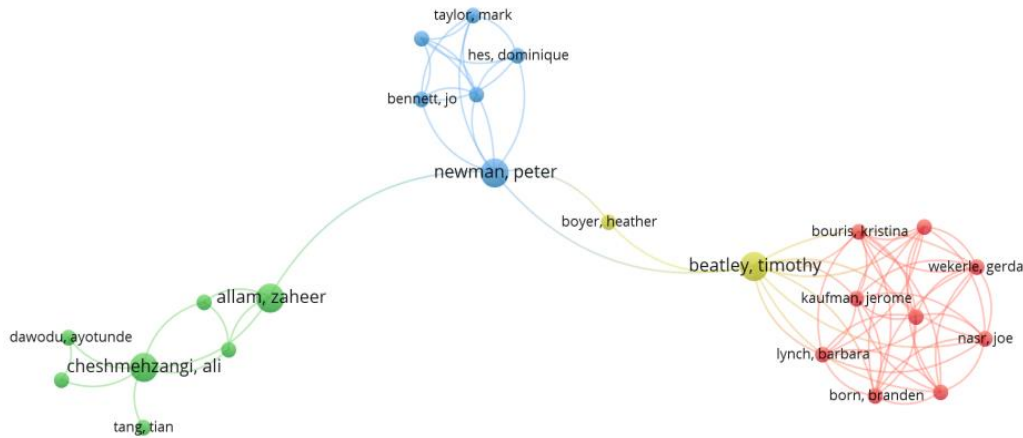
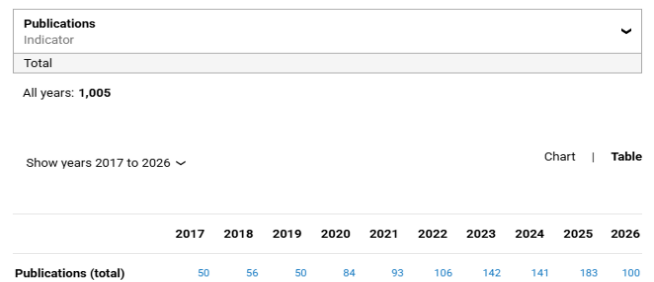


Figure 10. Collaborative writer network



Figure 11. Minimum document count threshold for authors

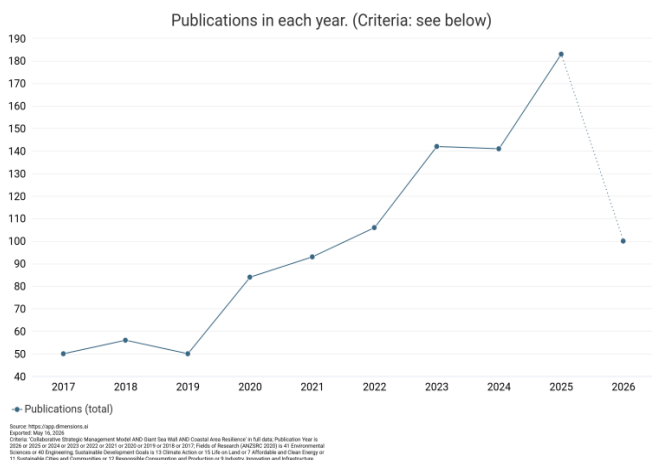


The visualization shows the number of publications published in each year.

Figure 12. Development trend of the number of scientific publications per year (2017–2026)
 Source: Dimension

3.7 Growth in the number of publications per year

Publication development data in Figure 12 shows the distribution of the number of scientific articles from 2017 to 2026. In 2017, there were about 50 publications, then increased in 2018 to about 56 publications, and decreased again in 2019 to about 50 publications. In 2020, there was a significant increase to about 84 publications, and it increased again in 2021 to about 93 publications. In 2022, the number of publications increased to about 106 publications, and increased again in 2023 to about 142 publications. In 2024, there will be a decrease to around 141 publications and an increase again in 2025 to around 183 publications. By 2026, the number of recorded publications will be around 100 (partial data). This distribution shows the variation in the number of publications from year to year. This data also shows fluctuations in the production of scientific publications during the observation period (10 years). The highest number of publications was recorded in 2025.



4. DISCUSSION

This discussion integrates empirical findings from bibliometric analysis with previously used literature, systematically compiled based on research questions, accompanied by the significance, scientific contributions, implications, and limitations of the research.

4.1 Discussion of research question 1: Configuration of the strategic environment and dynamics of multi-actor governance

The bibliometric findings show that the configuration of the strategic environment in this study is dominated by the relationship between keywords such as cities, resilience, communities, policymakers, and strategies that empirically form a multidimensional network structure between social, policy, and environmental actors. These results show that the strategic environment in the context of coastal infrastructure development is not a single entity, but rather the result of a complex interaction between various elements such as urbanization, environmental risks, and public policies. The interconnectedness between these keywords in network visualization shows the integration of social, ecological, and institutional dimensions in a single governance system that interacts with each other. In addition, the high density of

keywords such as communities and practitioners suggests that non-state actors have an important role in shaping these governance dynamics. This shows that governance is not only government-centric, but involves a wider network of actors in the process of planning and implementing policies.

These findings are consistent with the concept of collaborative governance, which emphasizes the importance of multi-stakeholder engagement in public decision-making, where interaction between government, the private sector, and communities is key to successful policy implementation [26]. In this context, the resulting keyword network shows that the structure of relationships between actors is horizontal and network-based, rather than hierarchical. Furthermore, the presence of keywords such as Policymakers and Capacity in the same cluster as durability shows that institutional capacity is an important factor in determining the effectiveness of governance. This is also in line with the view that policy

failures are often caused by institutional fragmentation and weak coordination between actors [26, 27].

The significance of these findings lies in their ability to empirically map the structure of strategic environments, which were previously only conceptually described in the literature. Using a bibliometric approach, this study provides visual and quantitative evidence of how actors and issues are interconnected in governance systems. The scientific contribution of these findings is to strengthen the argument that the construction of the Giant Sea Wall should be understood as a complex multi-actor collaborative system. The practical implication is the need for an institutional design that can effectively accommodate cross-sector interactions. However, the limitation of this study is the inability to directly measure the quality of interactions between actors, since the analysis is based only on data from scientific publications.

Table 1. A prolific and dominant author in a network of research collaborations

No.	Author Name	Cluster	Network Characteristics	Productivity Indication/ Collaboration
1	Peter Newman	Blue	Becoming the main link between research clusters	Has the highest collaboration connectivity
2	Timothy Beatley	Yellow	Connect with several authors on sustainability clusters	Dominant on the theme of resilience and sustainability
3	Ali Cheshmehzangi	Green	Have a strong network with the theme of urban resilience	Productive in sustainable urban research
4	Zeheer Allam	Green	Collaborate with Cheshmehzangi	Focus on smart cities
5	Kristina Bouris	Red	Part of a dense collaboration cluster	Active in the theme of governance and innovation
6	Greda Wekerle	Red	Have strong relationships in a collaborative network	Contributing to urban studies and policy
7	Jerome Kaufman	Red	Connect with some core authors	Focus on policy planning and collaboration
8	Barbara Lynch	Red	Have an intensive collaborative relationship	Dominant in community and governance issues
9	Brandon Bom	Red	Closely related to innovation clusters	Contributor to the urban sustainability study
10	Heather Boyer	Yellow	To be the link between the blue and red clusters	Have a strategic role in the interconnection of themes

4.2 Discussion of research question 2: Design of a collaborative strategic management model

The results of the analysis show that the keywords strategy, management, innovation, and technology have a central position in the research network, showing that the design of collaborative strategic management models is closely related to the integration between managerial approaches and technological innovation. The interconnectedness between these keywords shows that strategy functions not only as long-term planning but also as an adaptive mechanism capable of responding to environmental changes. In addition, the presence of keywords such as opportunities, applications, and tools indicates that the implementation of the strategy requires concrete operational instruments. This network structure shows that the collaborative strategic management model is not static, but rather dynamic and based on the integration of various resources.

These findings are in line with the concept of strategic management, which emphasizes the importance of the formulation, implementation, and evaluation of strategies in achieving organizational goals [28, 29]. In addition, the existence of the keyword "Innovation" in the same group as "Strategy" Demonstrates that innovation is an integral part of the strategic management process. It also reflects the importance of an organization's absorption capacity in integrating external knowledge into strategic decision-making processes. In a collaborative context, this integration becomes

increasingly complex as it involves many actors with different interests.

The significance of these findings lies in their ability to show that collaborative strategic management models should be designed as adaptive and innovation-based systems. The scientific contribution of this study is to provide empirical evidence regarding the relationship between strategy, innovation, and collaboration in the context of coastal infrastructure development. The practical implication is the need to develop a management model capable of integrating technology and innovation into collaborative processes. However, the limitation of this study is the inability to specifically identify the mechanisms of strategy implementation in a specific empirical context.

4.3 Discussion of research questions 3: Research trends and gaps

The results of the overlay visualization show that the research has shifted from focusing on geographical aspects to a more strategic and innovation-based approach. Keywords such as cities and geography, which were dominant in the early period, suggest that previous research focused more on spatial aspects. However, in more recent periods, keywords such as innovation, technology, and sustainable development goals have emerged, which can be described as the direction of research towards a more integrative approach. Further, the emergence of keywords such as policymakers and solutions

suggests that research is increasingly oriented towards policy implementation and practical solutions.

These findings are in line with the growing literature showing that sustainable infrastructure research is increasingly aligned with the integration of environmental, social, and economic aspects [25]. Further, this shift suggests that research is no longer descriptive, but rather focuses on developing workable solutions. However, this analysis also reveals research gaps in the integration of strategic management concepts and coastal resilience. This can be seen from the lack of keywords that directly connect the two concepts.

The significance of these findings lies in their ability to identify the direction of research development and the remaining gaps. The scientific contribution of this research is to provide a foundation for further research focusing on the integration of strategic management and coastal resilience. The practical implication is the need for policy development based on an integrative approach. The limitation of this study is its inability to fully explain the factors that led to this shift in research trends.

4.4 Scientific contributions of research

This research makes a significant contribution to the field of collaborative strategic management by integrating bibliometric approaches into the analysis of coastal infrastructure development. Its main contribution lies in its ability to systematically map the structure of knowledge and the relationships between concepts. Furthermore, this research contributes to the development of a conceptual model that integrates aspects of regional strategy, collaboration, and resilience. Thus, this research not only enriches the literature but also provides a foundation for the development of a more comprehensive theory.

4.5 Research implications

The implications of this study include both theoretical and practical aspects. Theoretically, this research strengthens the concept of collaborative governance in the context of strategic management. In practice, this study provides recommendations for policymakers in designing more effective governance models. Furthermore, this study also shows the importance of integrating technology and strategies in infrastructure development.

4.6 Research limitations

This research has several limitations that need to be considered in interpreting the research results. First, this study uses secondary data that is limited to scientific publications indexed in the Dimensions database, so that the results of the study are greatly influenced by the scope of metadata and the availability of documents in the database. Second, the bibliometric approach used focuses more on the quantitative relationship between keywords, authors, organizations, and countries, so it has not been able to explain in depth the substantive context, policy dynamics, and factors that cause the shift in the research theme. Third, the use of VOSviewer only visualizes network patterns and connections between bibliographic elements without conducting an in-depth qualitative analysis of the content of the research document. In addition, the main limitation of this study is the data search

strategy that does not specifically target the keyword giant sea wall, so the results of the analysis are more representative of coastal infrastructure governance, coastal resilience, and sustainable development in general than specific studies of the giant sea wall. Therefore, the interpretation of the research results needs to be understood in a broader context related to collaborative governance and coastal infrastructure governance. Further research is recommended to use a search strategy that is more specific to the theme of the giant sea wall and combine bibliometric approaches with qualitative methods, systematic literature reviews, or case studies to gain a more comprehensive and contextual understanding.

5. CONCLUSION

This study maps the development of global research related to collaborative strategic management, coastal infrastructure, coastal resilience, and sustainable development through a bibliometric approach to 1,005 scientific publications from the Dimensions database, analyzed using VOSviewer. The results of the study show that the global knowledge structure is formed in several main clusters dominated by the themes of cities, strategy, management, innovation, technology, and resilience. Network visualizations show strong links between urban development issues, collaborative governance, and sustainable infrastructure development in the context of coastal areas. In addition, the overlay visualization shows the shift in research focus from urban geography and spatial studies to strategic innovation, resilience, and sustainable infrastructure. Collaborative networking between authors, organizations, and countries also shows that research in this field is developing multidisciplinary and collaboratively at a global level. However, this bibliometric analysis did not specifically identify the giant sea wall as the dominant keyword in the research dataset. Therefore, the findings of this study represent a more general development in coastal infrastructure governance and coastal resilience research than specifically addressing the governance of giant sea walls. However, the results of the study still show that collaborative strategic management approaches are strongly linked to the development of sustainable coastal infrastructure and strengthening regional resilience.

This research contributes to identifying knowledge structures, research trends, and relationships between themes in the study of coastal infrastructure governance and sustainable development. The findings of the study show that the issues of collaborative governance, resilience, innovation, and sustainable infrastructure are increasingly integrated in global research. In addition, this study also shows the importance of a multidisciplinary approach in understanding the complexity of coastal infrastructure governance involving many actors and interests. For further research, it is recommended that case study validation be carried out on coastal infrastructure projects in specific regions, such as Jakarta or the Netherlands, to understand the empirical implementation of collaborative strategic management. Future research can also develop comparative governance models between countries or between coastal regions to identify the most effective patterns of collaboration. In addition, bibliometric approaches can be combined with mixed methods such as systematic literature reviews, in-depth interviews, Delphi, or institutional analysis to produce more operational and workable governance models. Thus, future research is

expected to be able to strengthen the development of coastal infrastructure policies and governance that are more adaptive, inclusive, and sustainable.

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