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MAPPING TRENDS AND RESEARCH TOPICS ON BIBLIOMETRIC PUBLIC OPEN SPACES FROM 2021-2025

Agum Muladi[1]

[1] Institut Teknologi dan Kesehatan Aspirasi, Lombok Timur, Nusa Tenggara Barat, Indonesia

ABSTRACT

This bibliometric research focuses on mapping research using the database of research articles from the ScienceDirect website. This research was conducted to understand the development of research in the field of environment, particularly on the topic of public open spaces. Data collection was conducted based on the Science Direct database with the keyword bibliometric public open spaces, the publication category being research articles, totaling 647 articles published in the years 2021-2025. Data analysis and visualization were conducted using VOSViewer. The analysis results show that the dominant research topics in bibliometric public open spaces include publication and innovation. Articles on the topic of bibliometric public open spaces found on the ScienceDirect website have research potential and opportunities divided into 7 clusters with 268 items, covering discussions on concepts, models, thoughts, approaches, effectiveness, and efficiency of articles relevant to the topic of bibliometric public open spaces over a period of 5 years. This research is still limited by utilizing the Science Direct website database with several constraints used to filter the data to be collected, then in the extraction of metadata, VOSViewer is used to create visualizations of mapping and topic clustering. Furthermore, this research can serve as a reference and inspiration for other researchers who will study the topic of bibliometric public open spaces.

Keywords: *POS, bibliometric, vosviewer, science direct*

CORRESPONDING:
Name:
Agum Muladi
E-mail:
agummuladi77@gmail.com

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1. INTRODUCTION

Urban areas are strategic zones and serve as centers for all types of activities, both governmental and commercial, which will continue to develop over time. Urban development is also accompanied by an increase in population and increasingly modern infrastructure. This provides great opportunities for economic growth and job opportunities for urban communities (Lu et al., 2021). However, urban growth also poses various challenges such as traffic congestion, pollution, and social inequality that must be addressed so that urban development can proceed sustainably.

Urban spatial planning is one type of government planning technique aimed at anticipating and regulating the growth of activities so that they do not exceed the carrying capacity of urban areas. The placement of public green spaces that stabilize the environment is another aspect of urban spatial planning design. The strategic placement of public green spaces can help reduce air pollution and improve air quality in urban areas (Wolch et al., 2014). In addition, with the presence of green open spaces, the community also has recreational areas that can enhance their well-being and quality of life. With good urban spatial planning, it is hoped that urban areas can continue to develop sustainably and provide benefits for all the communities living within them.

Bibliometric analysis is an analysis used to identify research topics with specific keywords. Bibliometric analysis can help researchers understand current research trends and identify knowledge gaps that need to be filled. Thus, the research conducted can be more relevant and provide a greater contribution in solving the problems faced by urban communities. With accurate and up-to-date information, it is hoped that urban spatial planning can continue to be improved to create a healthier and more comfortable environment for all its residents. The process of identifying research topics related to public open spaces can greatly assist researchers in the ecological field in continuously updating their studies (José de Oliveira et al., 2019). Thus, the development of research on public open spaces can provide deeper insights into the needs and preferences of urban communities. This can help the government and city planners design and manage open spaces that meet the needs and expectations of the community. Thus, the hope of creating a more sustainable and environmentally friendly urban environment can be realized.

The importance of studying bibliometrics in understanding research trends greatly assists the world of education and research in improving the quality of the produced research. Understanding research trends through bibliometrics also allows researchers to identify areas of research that are still underexplored or require more attention (José de Oliveira et al., 2019). Thus, the development of knowledge and innovation in various fields can continue to progress. In addition, bibliometric analysis can also help in evaluating the impact and contribution of research results to the overall development of science. For example, by analyzing research trends in the field of health through bibliometrics, researchers can find out that the area of research on rare disease treatments has not yet been extensively explored. This can encourage researchers to focus on that area and increase the likelihood of creating new breakthroughs in the treatment of rare diseases. However, too much focus on bibliometric analysis can also lead to research that merely follows existing trends rather than exploring new and innovative research areas. This can hinder the overall development of science. Therefore, it is important for researchers to use bibliometrics as a tool to identify research gaps that need to be filled, while still maintaining a balance between following existing trends and exploring new things. Thus, the research conducted can continue to develop holistically and provide greater benefits to society. By taking this into consideration, it is hoped that researchers can make significant contributions to the development of better and more innovative scientific knowledge.

One of the tools that can be used to visualize research trends and identify research topics that have already been conducted is VOSviewer. Vosviewer is software that can help researchers identify research trends and topics that have been previously studied. By utilizing this technology, researchers can avoid research duplication and identify knowledge gaps that can be further explored (Kirby, 2023). Thus, the research conducted will become more focused and provide a more significant contribution to the development of science. With the ability to visualize research trends and identify research topics that have already been conducted through the use of Vosviewer, researchers can be more effective in planning and executing their research. Vosviewer helps them to understand the direction and development of research in a specific field, allowing them to gain clearer insights into the issues that need to be addressed. Additionally, by optimizing the use of Vosviewer, researchers can more easily collaborate and share knowledge with their peers, thereby enabling their research to make a greater contribution to the advancement of science. The purpose of this research is to identify

and visualize the development of research topics through bibliometric analysis using VOSviewer.

2. LITERATURE REVIEW

2.1 The Significance of Public Open Spaces

"Public open spaces play a significant role in urban areas by providing social, health, environmental, and economic benefits to society and individuals. These spaces can vary in features based on the neighborhood's socio-economic status, with higher SES neighborhoods having more amenities like picnic tables, drink fountains, and trees providing shade. Additionally, they are more likely to have water features, walking and cycling paths, lighting, and signage regarding dog access and restrictions on other activities" (Crawford et al., 2008).

2.2 Design Principles of Public Open Spaces

"The design principles of public open spaces include ensuring that public spaces are clearly delineated from private ones, that the uses surrounding public spaces contribute to creating engaging places for users, and that spaces are designed to be visually and physically accessible to all users" (Carmona, 2019).

2.3 Challenges in Public Open Spaces

"Challenges in public open spaces are highlighted by the diverse locations and characteristics of urban streets, which serve as important public spaces in cities. These spaces face tensions in balancing functions of mobility and public interaction, while also addressing inclusivity and financial pressures. The flexibility of urban streets allows for constant renegotiation of these challenges based on user needs and desires. Further research is needed to explore how to plan for this flexibility and address the interconnected nature of these challenges" (Schönfeld & Bertolini, 2017).

2.4 The Impact of Public Open Spaces on Urban Life

"Public open spaces have a significant impact on urban life by providing social, health, environmental, and economic benefits to society and individuals. These spaces range from

private gardens to commercial squares and waterway corridors, offering opportunities for daily use and community initiatives. Best practice case studies demonstrate how urban open spaces can be incorporated into new developments to enhance urban life (Nasution & Zahrah, 2017).

3. RESEARCH METHOD

The research methodology used is bibliometric research using metadata from the science direct website with the keyword bibliometric public open spaces. One of the easiest and smartest data analysis methods in reviewing and mapping topics is bibliometric analysis. This topic review uses quantitative and numerical techniques to discuss the literature. A method called bibliometric research is used to provide a network structure to answer questions about the major themes in a particular field, their relationship to each other, and the evolution of a particular topic over time. According to the British Standards Institution, Bibliometrics is the study of documents and patterns through the use of statistical and mathematical ideas.

To maintain sustainability, google scholar metadata with a time limit of 2014-2024 was used to obtain article metadata on February 25, 2025. After finding articles with these terms with the keywords “bibliometric public open spaces” from the search results on the science direct website, 647 relevant articles were generated with search year restrictions (2021-2025), article type (research articles), and access type (open access & open archive). The metadata was then exported to RIS format. Once the metadata was downloaded, it was processed using VOSViewer software version 1.6.18.0. Research themes were identified by analyzing the titles and keywords used by the authors in their articles. The following are the steps taken in utilizing the VOSViewer software: 1) Run the VOSviewer program; 2) Select the create button on the file tab until a dialog box appears; 3) Select data create a map based on text data then select the next button; 4) Select the data source read data from reference manager files and select the next button; 5) Select the RIS tab then select the metadata file that has been downloaded then select the next button; 6) select the title and abstract fields then select the next button; 7) Select co-occurrence in the type of analysis and full counting in the counting method then select the next button; 8) Then fill in the minimum occurrences

with the number 10 and filtered 446 terms after that 60% of the total terms will be selected which results in 268 terms that are suitable, then select next; 8) select the keywords that match your wishes and un checklist those that are not suitable then select finish.

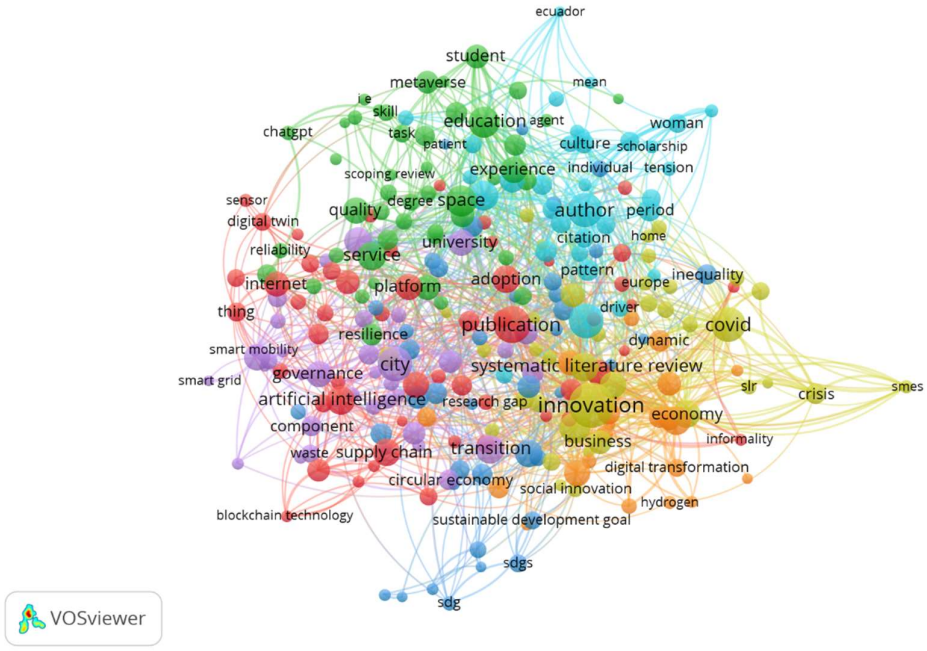
4. RESULT AND DISCUSSION

4.1 RESULT

4.1.1 Visualization of research networks and collaborations in the field of public open spaces

The VOSviewer tool allows researchers to analyze and visualize bibliometric data in a user-friendly way. By mapping out the connections between different research papers, authors, and keywords, users can gain a deeper understanding of the trends and patterns within a particular field of study. This tool can be particularly useful for identifying key research themes, influential authors, and emerging topics within a given discipline (Moral-muñoz et al., 2020). Additionally, VOSviewer can help researchers identify potential collaborators and track the impact of their own work within the scholarly community. By utilizing this tool, researchers can stay informed about the latest developments in their field and make informed decisions about their own research agenda. Furthermore, VOSviewer can assist researchers in visualizing the connections between different research topics, allowing for a more comprehensive understanding of the relationships between various concepts and ideas (Kirby, 2023). This can help researchers in identifying gaps in the existing literature and areas where further research is needed. Overall, VOSviewer is a valuable resource for academics looking to stay up-to-date with the latest research trends and collaborate with other experts in their field (Natsir et al., 2024). By harnessing the power of data visualization, researchers can enhance their knowledge and better contribute to the advancement of knowledge within their discipline. The visualization of the network can be seen as follows in Figure 1:

Figure 1. Network Visualization



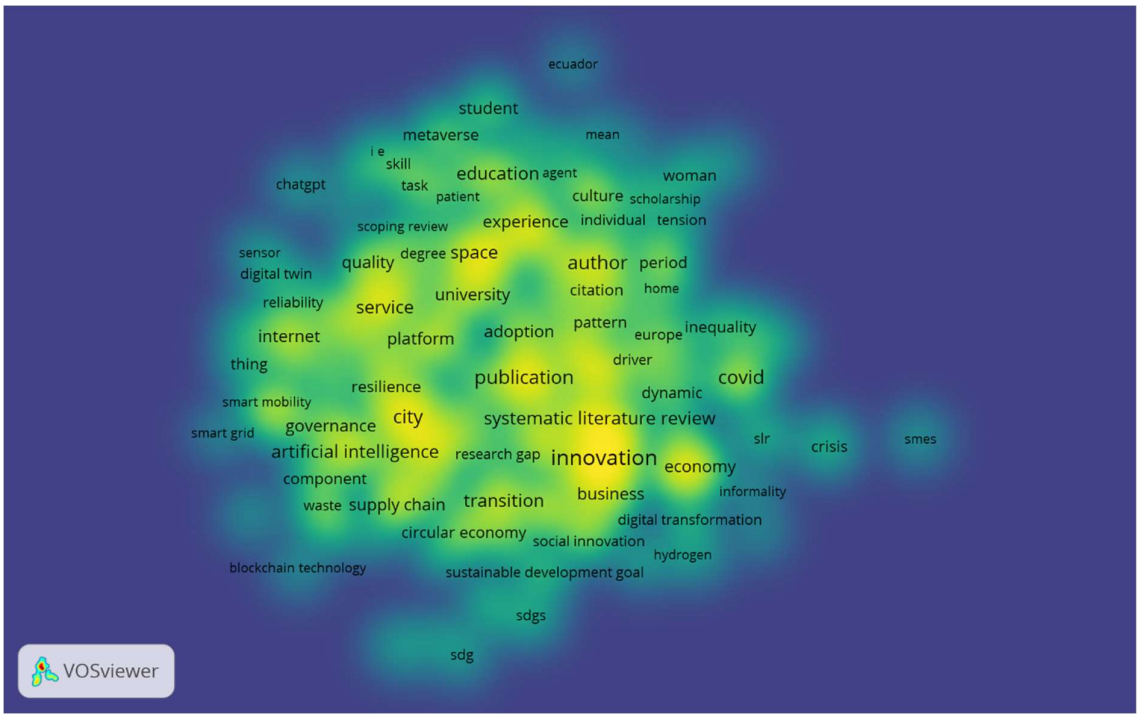
Source: Primary data, 2025

Network visualization illustrates that each generated keyword is interconnected. This interconnectedness can provide researchers with a deeper understanding of the complex web of information within their field of study. By analyzing the relationships between keywords, researchers can uncover new patterns and insights that may have been overlooked (Ji et al., 2023). Additionally, network visualization can aid in the dissemination of research findings to a wider audience, making complex information more accessible and engaging. In conclusion, VOSviewer's network visualization capabilities offer a powerful tool for advancing research and fostering collaboration within academic communities.

Furthermore, VOSviewer's ability to generate visual representations of co-authorship networks can help researchers identify potential collaborators and track the flow of ideas within their field. This can lead to the formation of new research partnerships and the development of innovative projects that may not have been possible otherwise (Fu et al., 2022). Overall, the use of network visualization tools like VOSviewer can enhance the efficiency and effectiveness of research efforts, ultimately leading to greater advancements in knowledge and discovery. For example, a group of researchers in the field of environmental science could use VOSviewer to analyze patterns of collaboration among scholars studying climate change. By visualizing co-authorship relationships, they may

discover new connections between researchers working on similar topics and uncover opportunities for interdisciplinary collaboration. This could result in the creation of groundbreaking studies that address complex environmental challenges from multiple perspectives (Cheng et al., 2021). While VOSviewer may facilitate collaboration and interdisciplinary research, it is important to consider the limitations of relying solely on co-authorship relationships as a measure of scientific impact. Other factors, such as the quality and impact of individual research contributions, should also be taken into account to ensure advancements in knowledge are meaningful and impactful. The visualization of the density can be seen as follows in Figure 2:

Figure 2. Density Visualization



Source: primary data, 2025

Density visualization can display the density of research topics related to bibliometric public open spaces. This tool can help landscape architects identify key areas of focus for their projects and prioritize strategies for promoting biodiversity and community engagement. By utilizing density visualization, professionals can make more informed decisions that benefit both residents and the environment (Yao et al., 2023). Ultimately, incorporating a holistic approach that considers input from various experts and stakeholders will lead to more sustainable and impactful urban development projects. For example, a

landscape architect using density visualization may discover that research on green infrastructure in urban parks is particularly dense, prompting them to emphasize this aspect in their design. By prioritizing strategies that promote biodiversity and community engagement in these green spaces, the architect can create a more sustainable and impactful project that meets the needs of both residents and the environment. This approach may involve collaborating with ecologists, urban planners, and community members to ensure that the project addresses a wide range of concerns and priorities (Liu, 2020). By incorporating feedback and expertise from multiple sources, the resulting urban development project can be more holistic, effective, and sustainable in the long run. However, if the architect fails to consider the specific needs and preferences of the local community, the project may face resistance and backlash from residents. Additionally, neglecting to consult with ecologists and urban planners could result in unintended negative impacts on local biodiversity and ecosystem health. While incorporating feedback from various sources can enhance the overall quality of the project, relying solely on community input may overlook important technical and environmental considerations that are crucial for long-term sustainability. It is essential to strike a balance between community engagement and expert consultation to ensure a successful urban development project (Maddaloni & Sabini, 2022).

This balance can be achieved through a participatory planning process that includes input from residents, experts, and stakeholders at every stage of the project. By fostering collaboration and communication between all parties involved, potential conflicts and challenges can be addressed proactively, leading to a more cohesive and sustainable development plan (Leal Filho et al., 2019). In addition, incorporating a holistic approach that considers social, economic, and environmental factors will help create a vibrant and resilient community that meets the needs of both current and future generations. Ultimately, by prioritizing both community engagement and expert consultation, urban development projects can achieve their intended goals while minimizing negative impacts on the environment and society. By fostering a collaborative and inclusive decision-making process, urban development projects can ensure that the voices of all stakeholders are heard and taken into account. This not only promotes transparency and accountability but also builds trust and buy-in from the community. By working together towards a common vision, urban development projects can create lasting positive change that benefits everyone involved. In

this way, sustainable urban development can be achieved through a combination of careful planning, stakeholder engagement, and a commitment to holistic, long-term thinking (Burelle et al., 2023). While collaborative decision-making can lead to a more inclusive process, it can also slow down progress and make it difficult to reach consensus among diverse stakeholders with conflicting interests. Additionally, relying solely on stakeholder input may overlook the expertise of urban planners and other professionals, potentially compromising the effectiveness of the development project.

4.1.2 Identification of key authors, journals, and keywords in the literature

The review process can also be beneficial for landscape architects who want to stay updated on the latest research and trends in the field. By keeping up with the works of key authors and recent publications, professionals can gain valuable insights and inspiration for their own projects. In addition, identifying relevant keywords can help streamline research efforts and ensure that important information is not overlooked. This proactive approach to staying informed can ultimately lead to more innovative and successful urban development projects that prioritize both people and the planet. By engaging in the review process, landscape architects can also build relationships with other professionals in the industry, fostering collaboration and the exchange of ideas. This network can open new opportunities for partnerships and projects that push the boundaries of traditional design (Bai et al., 2016). Overall, staying informed and actively participating in the review process can help landscape architects remain at the forefront of their field and create meaningful impacts in the world of urban development. For example, a landscape architect who actively participates in project reviews can collaborate with architects and engineers to design sustainable mixed-use developments that incorporate green infrastructure, such as rain gardens and permeable surfaces, to effectively manage stormwater runoff. This project can serve as a model for future developments that prioritize environmental management while meeting community needs.

By engaging in project reviews, landscape architects can also identify potential challenges or opportunities for improvement early in the design process. They can offer valuable insights and suggestions that can enhance the overall quality and functionality of the project (Portman et al., 2015). Additionally, participating in reviews allows landscape architects to stay informed about the latest trends, technologies, and best practices in their

industry, ensuring that they continue to provide innovative and sustainable solutions for their clients. Ultimately, actively participating in project reviews can help landscape architects improve their work, positively impact the built environment, and contribute to the creation of more resilient and vibrant communities. However, not all project reviews yield positive outcomes. In some cases, feedback from reviewers may be biased or based on personal preferences rather than objective criteria, leading to misguided recommendations that can compromise the original vision and goals of the project. Moreover, if the review process is not conducted effectively or transparently, it can create unnecessary delays and conflicts that hinder progress rather than promote collaboration and improvement.

This highlights the importance of having a structured and fair review process to ensure that feedback is constructive and aligned with the project's goals. Clear guidelines and criteria must be established to evaluate the project's design, functionality, and its impact on the surrounding environment. Reviewers should also be selected based on their expertise and impartiality to provide valuable insights and recommendations (Canter, 1999). By encouraging a collaborative and transparent review process, the project team can address potential issues early on and make informed decisions to enhance the overall success of the project. However, having a structured review process can sometimes lead to delays in decision-making and implementation, especially if there are differing opinions among the reviewers or if the criteria are too rigid and inflexible. Moreover, relying solely on expert reviewers can limit the diversity of perspectives and overlook important considerations from other stakeholders involved in the project.

Table 3. 1 Clustering Items In Bibliometric Public Open Spaces

Clusters	Items
Cluster 1 (53 items)	Ability, accounting, accuracy, adoption, advantage, algorithm, art, artificial intelligence, automation, big data, blockchain, blockchain technology, cluster, communication technology, company, comprehensive overview, cost, current state, determinant, digital technology, digital twin, document, employee, future research agenda, future research direction, global south, government, improvement, informality, internet, intersection, iot, keyword, machine, machine learning, majority, platform, publication,

	research area, research field, research gap, research topic, science database, Scopus, Scopus database, security, sensor, supply chain, thematic analysis, thing, transparency, web, xai
Cluster 2 (46 items)	Agent, agriculture, awareness, category, chatgpt, communication, creativity, dataset, degree, disability, diversity, education, engineering, experience, fact, feature, guideline, healthcare, higher education, I e, investigation, metaverse, new technology, perception, person, popularity, prevalence, quality, reference, resilience, safety, scoping review, service, skill, space, strength, student, task, threat, total, twitter, user, variety, virtual reality
Cluster 3 (41 items)	Access, Africa, Australia, bibliometric study, brazil, capacity, content analysis, current study, decision making, economic growth, ecosystem, ecosystem service, environmental sustainability, example, future study, Germany, health, India, individual, inequality, infrastructure, investment, life, meta analysis, nation, past, patient, population, possibility, region, regulation, research agenda, sdg, sdgs, simulation, spain, sustainable development goal, technological innovation, urban area, urbanization, water
Cluster 4 (38 items)	Academia, academic, actor, bibliometric review, business, case study, choice, conceptual framework, consumer, covid, crisis, customer, economy, entrepreneurship, Europe, firm, home, innovation, marketing, metaheuristic, notion, open innovation, operation, patent, peer, phenomenon, practical implication, research trend, scientific publication, slr, smes, social innovation, success, synthesis, systematic literature review, theme, tourism, typology
Cluster 5 (36 items)	Account, basis, better understanding, bibliometric, building, business model, circular economy, city, component, connection, consideration, construction, construction industry, effectiveness, electric vehicle, environmental impact, evaluation, governance,

	limitation, link, mobility, practical application, product, proposal, relation, scholar, smart city, smart grid, smart mobility, transition, transport, transportation, uncertainty, university, urban governance, waste
Cluster 6 (33 items)	Author, citation, comparison, content, culture, decade, difference, dissemination, driver, Ecuador, emergency, hand, indicator, initiative, journal, man, mean, number, participant, participation, pattern, period, program, sample, scholarship, scientist, series, shift, social medium, societal impact, subject, tension, woman
Cluster 7 (21 items)	Attitude, bim, climate change, digital transformation, digitalization, dynamic, economy, hydrogen, ict, landscape, last decade, manager, market, market formation, measure, pandemic, renewable energy, scale, scenario, sustainable development, variable

Source: Primary data, 2025

Clustering Items in Bibliometric Public Open Spaces is divided into 7 clusters. Each cluster focuses on a specific aspect of the research, allowing for a more in-depth analysis and evaluation of the findings. By categorizing the items into clusters, researchers can easily identify patterns, trends, and gaps in the literature, leading to a more comprehensive understanding of the topic. This structured approach can ultimately lead to more informed decision-making and successful outcomes in the research project (Canter, 1999). Moreover, the clustering of items also facilitates collaboration and knowledge sharing among researchers working on similar topics within the field. By organizing the research items into distinct clusters, it becomes easier for scholars to locate relevant studies and build upon existing knowledge. This not only enhances the quality of research but also promotes innovation and advancements in the field. Ultimately, the clustering of items in Bibliometric Public Open Spaces serves as a valuable tool for researchers to navigate the vast landscape of scholarly literature and make meaningful contributions to their respective fields.

Moreover, the platform allows researchers to engage in discussions and exchange ideas with their peers, fostering a sense of community and camaraderie within the academic world. Through these interactions, scholars can gain new perspectives, insights, and inspiration that may lead to groundbreaking discoveries and breakthroughs. In addition, the clustering of

research items in Bibliometric Public Open Spaces encourages interdisciplinary collaboration, as researchers from different fields can easily identify common areas of interest and explore potential collaborations. This interdisciplinary approach not only enriches the research process but also promotes cross-pollination of ideas and methodologies, ultimately driving progress and innovation in diverse fields (Adiansyah et al., 2024). For example, a biologist studying the impact of climate change on marine ecosystems may come across a research paper by a computer scientist developing new algorithms for analyzing large datasets. By collaborating and sharing ideas in a Bibliometric Public Open Space, they could potentially develop innovative tools for predicting and mitigating the effects of climate change on marine life. This interdisciplinary collaboration could lead to groundbreaking discoveries in both biology and computer science, benefiting society as a whole. While interdisciplinary collaboration can lead to innovative discoveries, it is also important to recognize the potential challenges and barriers that may arise when trying to integrate different fields of study (Muladi et al., 2024). Additionally, not all collaborations may result in groundbreaking discoveries, as success often depends on various factors such as funding, resources, and expertise. It is true that interdisciplinary collaboration can be beneficial, but it may also lead to conflicting methodologies and priorities between different fields, hindering progress. Furthermore, the success of such collaborations is not guaranteed and may require significant time and effort to overcome challenges.

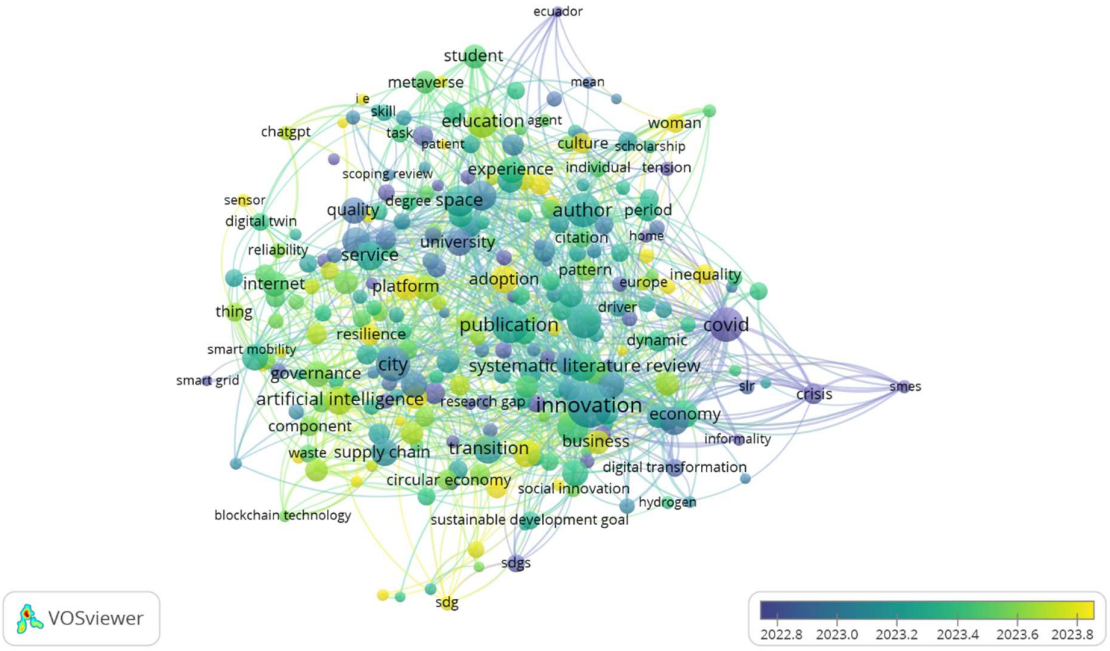
4.1.3 analysis of citation patterns and trends over time

Can provide valuable insights into the evolution of this field and help researchers identify emerging areas of interest. By tracking how often a particular study is cited and in what context, researchers can measure the impact and relevance of their work within the broader scientific community. This information can also be used to identify potential collaborators and track the influence of key thought leaders in the field. Additionally, analyzing citation patterns can help researchers identify gaps in the literature and areas where further research is needed. By keeping up with citation trends, researchers can ensure that their work remains relevant and impactful in their respective fields. For example, a researcher in the field of neuroscience might find that their study on a new treatment for Alzheimer's disease is frequently cited by other researchers working on similar topics, indicating the importance of their research in the field. By analyzing citation patterns, they

might also find that there is a lack of research on the long-term effects of the treatment, prompting them to conduct further studies to fill this gap in the literature. This proactive approach in tracking citation trends can help researchers stay at the forefront of their field and make meaningful contributions to the advancement of knowledge. Additionally, tracking citations can also help researchers identify potential collaborators who are interested in similar topics and may be able to provide valuable insights or resources for upcoming research projects. By staying informed about who is citing their work and how it is being used, researchers can connect with other experts in their field and enhance the global impact of their research. Ultimately, staying vigilant about citation trends can open new opportunities for collaboration, funding, and recognition within the scientific community. By staying informed and actively participating in scientific conversations, researchers can ensure that their work is recognized and valued by their peers.

This level of engagement with citation trends also allows researchers to identify gaps in the existing literature and areas for further exploration. By analyzing how their work is cited and referenced, researchers can gain a better understanding of the impact and relevance of their research within their field of study. This awareness can help guide the direction of future research and contribute to the advancement of knowledge in their field. In addition, staying informed about citation trends can also help researchers identify potential collaborators and build relationships with other experts who have similar research interests. By leveraging these connections, researchers can expand their networks and access new resources and opportunities for collaboration. Although citations and references are important for understanding impact and relevance, they do not always guarantee the quality or validity of the research. Collaboration and relationships should be based on more than just citation trends to ensure meaningful and productive partnerships.

Figure 3. Overlay Visualization



Source: Primary data, 2025

Overlay visualization depicts the trend of research topics each year from 2021 to 2025. This visualization can help researchers identify potential collaborators who are working on similar topics and track how those research interests evolve over time. By using overlay visualization alongside citation analysis, researchers can gain a more comprehensive understanding of the research landscape and make informed decisions about building partnerships. Ultimately, fostering genuine and collaborative relationships with other experts in the field is essential for advancing research and making a meaningful impact in academia. Collaborating with others can lead to groundbreaking discoveries and innovative solutions to complex problems. By sharing knowledge and resources, researchers can tackle challenges that may otherwise seem insurmountable. As the research landscape continues to evolve, it is crucial for scholars to adapt and embrace new methodologies and technologies to stay ahead of the curve. Engaging in meaningful collaborations can not only enhance the quality of research but also expand its reach and impact on society as a whole.

Furthermore, collaborating with colleagues from diverse backgrounds can bring fresh perspectives and approaches to research projects. By working together, researchers can leverage each other's strengths and expertise to address multifaceted issues and drive forward new advancements in their respective fields. In an increasingly interconnected

world, collaboration is essential for fostering interdisciplinary dialogue and pushing the boundaries of knowledge. By fostering a culture of collaboration, researchers can create a more vibrant and dynamic research community that is better equipped to tackle the complex challenges of the 21st century. This collaborative approach also helps to break down traditional silos within academia and encourages the sharing of resources and ideas. By pooling together different perspectives and skill sets, researchers can develop more innovative solutions and make greater strides in their research. Ultimately, fostering a culture of collaboration not only benefits individual researchers, but also has the potential to drive significant progress and breakthroughs in science and technology. For example, a team of researchers from various disciplines working together on a project to develop sustainable energy solutions may combine expertise in engineering, environmental science, and economics to create more effective and impactful solutions. By leveraging each other's strengths and knowledge, they are able to develop innovative technologies that have the potential to revolutionize the renewable energy industry. This interdisciplinary collaboration not only enhances the quality of their research, but also accelerates the pace of discovery and implementation of new technologies.

Furthermore, the diverse perspectives brought by each team member help to identify potential challenges and opportunities that may have been overlooked if approached from a single disciplinary perspective. This holistic approach to problem-solving allows the team to consider the social, political, and economic implications of their work, ensuring that their solutions are not only technically feasible, but also socially and environmentally sustainable. As they continue to collaborate and exchange ideas, the team is able to refine their research and develop solutions that are truly transformative in the field of sustainable energy. For example, a team of engineers, economists, and sociologists working together on a renewable energy project may uncover that using certain materials for solar panels may have negative social implications due to their environmental impact in production. By considering all perspectives, the team can find alternative materials that are both sustainable and socially responsible, leading to more innovative and effective solutions in sustainable energy development. However, it is also possible that interdisciplinary collaboration may not always lead to transformative solutions. In some cases, conflicting interests and priorities among team members may hinder the progress of the project and prevent the development of truly innovative solutions in sustainable energy. While interdisciplinary collaboration can lead to

innovative solutions, it is important to recognize that conflicting interests and priorities among team members may actually hinder progress and prevent the development of truly transformative solutions in sustainable energy. Additionally, finding alternative materials that are sustainable and socially responsible may not always be feasible or cost-effective, potentially limiting the effectiveness of the team's efforts.

4.2 Discussion

4.2.1 Interpretation of findings and implications for future research

One key aspect of building collaborations and relationships with other experts is to establish mutual trust and respect. This can be achieved through open communication, sharing of resources, and a willingness to listen and learn from one another. By fostering a collaborative environment, researchers can not only enhance the quality of their work but also contribute to the advancement of knowledge in their field. In the discussion section, researchers can delve deeper into the implications of their findings and suggest potential avenues for future research. This can help to guide the direction of future studies and contribute to the ongoing development of the field. By engaging in meaningful dialogue and exchanging ideas, researchers can build upon each other's work and push the boundaries of what is currently known. This collaborative approach can lead to breakthroughs and innovations that may not have been possible through individual efforts alone. Ultimately, by working together and valuing each other's expertise, researchers can make a lasting impact on their field and drive progress towards new discoveries and advancements.

Through collaboration and cooperation, researchers can leverage their collective knowledge and expertise to tackle complex problems and address critical gaps in the current understanding of their respective fields. By pooling resources and sharing data, researchers can accelerate the pace of discovery and foster a culture of openness and transparency in scientific research. Together, they can push the boundaries of what is known and explore innovative ideas that may not have been possible on their own. Collaboration not only enhances the quality of research but also helps build a sense of community within the scientific community, leading to stronger relationships and a more supportive environment for all involved. In the end, it is through working together that researchers can truly make a difference and leave a lasting impact on the world of

science. For example, a team of researchers from different disciplines coming together to study the effects of climate change on marine ecosystems can bring a wealth of knowledge and expertise to the table. By combining their unique perspectives and skill sets, they can develop groundbreaking solutions to protect vulnerable species and habitats, ultimately leading to more effective conservation efforts. This collaborative approach not only advances scientific understanding but also fosters a sense of camaraderie and mutual respect among colleagues, creating a positive and productive working environment for all involved. However, it is important to note that interdisciplinary collaborations can also face challenges, such as conflicting methodologies and priorities, which may hinder progress. For example, a marine biologist may prioritize field research while a climate scientist may rely more on computer modeling, leading to potential disagreements in approach and methodology.

4.2.2 comparison of results with previous studies in the field

can also present challenges, as different disciplines may use different metrics or methodologies to measure and analyze data. This can lead to discrepancies in findings and interpretations, requiring clear communication and collaboration to reconcile any differences. Despite these challenges, the benefits of interdisciplinary collaborations far outweigh the drawbacks, as they allow for a more holistic and comprehensive understanding of complex issues and problems. By bringing together diverse perspectives and expertise, interdisciplinary collaborations have the potential to drive innovation and make significant contributions to the advancement of knowledge in various fields. These collaborations also foster creativity and critical thinking, as individuals are pushed to think outside their own disciplinary boundaries and consider alternative approaches. By working together, researchers can leverage each other's strengths and address research questions from multiple angles, resulting in more robust and nuanced conclusions. In essence, interdisciplinary collaborations are essential for tackling the multifaceted challenges of our time and pushing the boundaries of what is known in science and academia.

Furthermore, interdisciplinary collaborations have the potential to drive innovation and break new ground in research. By combining expertise from different fields, researchers can approach problems from unique perspectives and develop novel

solutions. This cross-pollination of ideas can lead to breakthroughs that would not have been possible through isolated research efforts. Additionally, interdisciplinary collaborations can lead to the development of new methodologies and techniques that can be applied across various disciplines, further advancing the collective knowledge base. Ultimately, the benefits of interdisciplinary collaborations extend beyond individual research projects, shaping the future of academia and driving progress in society as a whole. For example, a collaboration between computer scientists and biologists could lead to the development of groundbreaking algorithms for analyzing genomic data, revolutionizing the field of personalized medicine. Similarly, a partnership between environmental scientists and engineers could result in innovative solutions for addressing climate change, such as the development of sustainable energy technologies.

Furthermore, interdisciplinary collaborations can also lead to the creation of new academic fields and research areas that bridge the gap between traditional disciplines. This can help to break down silos within academia and foster a more holistic approach to problem-solving. Additionally, interdisciplinary collaborations can also lead to increased funding opportunities, as funding agencies are increasingly looking for projects that demonstrate a multidisciplinary approach. This can help researchers secure grants and resources that may not have been available to them otherwise. Ultimately, interdisciplinary collaborations have the potential to drive innovation and make significant contributions to society by tackling complex challenges from multiple angles. However, a detailed counterexample to this would be when researchers from different disciplines have conflicting methodologies and theories, making it difficult to find common ground and collaborate effectively. Additionally, interdisciplinary collaborations can sometimes result in dilution of expertise and focus, leading to less impactful outcomes compared to projects with a singular disciplinary approach.

Despite these challenges, successful interdisciplinary collaborations have been shown to produce groundbreaking discoveries and solutions that would not have been possible with a singular disciplinary approach. One key factor in overcoming these obstacles is effective communication and mutual respect among team members, allowing for the integration of diverse perspectives and expertise. By fostering a collaborative environment where all voices are heard and valued, interdisciplinary teams can leverage their differences to create innovative and impactful outcomes. While

interdisciplinary collaborations may lead to groundbreaking discoveries, they can also be hindered by conflicting methodologies and priorities, potentially leading to inefficiencies and disagreements within the team. Additionally, the time and effort required to establish effective communication and mutual respect among team members may delay progress and limit the overall productivity of the collaboration.

4.2.3 recommendations for using Bibliometric Analysis in studying public open spaces

One way to mitigate these challenges is through the use of bibliometric analysis in studying public open spaces. By examining the research and publications in this field, teams can gain a better understanding of existing knowledge and identify gaps that need to be addressed. This can help streamline the collaboration process by providing a solid foundation of information for team members to build upon. Furthermore, bibliometric analysis can help teams identify key researchers and institutions in the field, allowing them to establish connections and partnerships that can enhance the overall impact of their work. By leveraging bibliometric analysis, teams can also track the impact and influence of their own research within the public open spaces domain. This can help researchers assess the reach of their work and make informed decisions on how to best disseminate their findings to key stakeholders. Overall, the use of bibliometric analysis provides valuable insights that can guide teams towards more effective and impactful research outcomes in the field of public open spaces.

Furthermore, by analyzing citation patterns and identifying key collaborators in the field, researchers can identify emerging trends and potential areas for collaboration. This can lead to new research opportunities and help teams stay at the forefront of advancements in the field. Additionally, bibliometric analysis can also help researchers identify gaps in the existing literature and pinpoint areas where further research is needed. By utilizing this data-driven approach, teams can ensure that their research is not only impactful, but also relevant and timely in addressing the current challenges and opportunities in public open spaces. For example, by conducting a bibliometric analysis, researchers may find that there is a lack of studies on the impact of green spaces on mental health in urban areas. This could prompt them to collaborate with experts in psychology and urban planning to conduct a study on this topic, filling a crucial gap in the literature and potentially influencing policy decisions related to public open spaces.

Furthermore, by using advanced statistical techniques such as regression analysis and machine learning algorithms, researchers can uncover complex relationships between various factors affecting the quality of public open spaces. This can lead to more targeted interventions and strategies for improving the design and management of these spaces, ultimately enhancing the well-being of individuals and communities. Additionally, by leveraging geospatial data and remote sensing technologies, researchers can gain a better understanding of how different environmental factors, such as air quality and vegetation density, impact the overall user experience in public open spaces. This interdisciplinary approach to research can provide valuable insights for policymakers, designers, and managers looking to create more inclusive and sustainable public spaces for all. However, in some cases, overly relying on technology and data may overlook the importance of qualitative aspects such as cultural significance or historical context in shaping public spaces. For example, a park with rich historical value may be undervalued if solely assessed based on geospatial data metrics, leading to potential loss of community identity and connection to the space.

This highlights the need for a balanced approach that incorporates both quantitative and qualitative methods in evaluating and designing public spaces. By considering the social, cultural, and historical significance of a place in conjunction with data-driven analysis, stakeholders can ensure that public spaces are not only efficient and functional, but also meaningful and reflective of the community they serve. This holistic approach can help create public spaces that are not only inclusive and sustainable, but also enriching and memorable for all who use them. While incorporating qualitative methods can provide valuable insight into the social and cultural significance of a public space, relying solely on data-driven analysis can overlook important practical considerations such as accessibility and safety. A balanced approach that considers both quantitative and qualitative factors is essential to creating public spaces that are truly functional and meaningful for all members of the community.

5. CONCLUSION AND SUGGESTION

A. Conclusion

Based on the research conducted, a total of 268 keywords were obtained, divided into 7 clusters, covering concepts, models, thoughts, approaches, effectiveness, and efficiency of articles relevant to the topic of bibliometric public open space over a 5-year period. This research is still limited by utilizing the Science Direct website database with several constraints used to filter the data to be collected, then in the metadata extraction, VOSViewer is used to create visualizations of mapping and topic clustering.

B. Suggestion

1. Exploring strategies for resolving conflicts in interdisciplinary collaborations, such as establishing clear communication channels and finding common ground in methodologies.
2. Investigating the impact of conflicting priorities on the overall progress of interdisciplinary projects and ways to mitigate these challenges.
3. Analyzing case studies of successful interdisciplinary collaborations that have overcome methodological differences to achieve impactful results.
4. Discussing the importance of flexibility and adaptability in interdisciplinary research teams to accommodate varying approaches and perspectives.
5. Examining the role of leadership and project management skills in facilitating effective communication and coordination among team members with diverse backgrounds and expertise.

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