



A Bibliometric Analysis of Drinking Water Management on an Island using Vosviewer

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ABSTRACT

The availability of safe and clean drinking water is one of the most basic human rights that is essential for the sustainability of life for public health. Without drinking water, life as we know it today would not be possible. The main objective of this research is to conduct a bibliometric analysis in order to better understand the current knowledge and direction of research in drinking water management. This research used bibliometric analysis with VOSviewer software to investigate drinking water management. The research centered on journals indexed in Semantic Scholar, using keywords such as drinking water management, water resources, and water quality, with a maximum of 1000 results from 2000 - 2023. In the network visualization analysis, "groundwater quality" had the highest total link strength of 141 and 107 occurrences, making it the densest color. In particular, the year 2018 had the highest number of publications, with a total of 72 publications. Regarding citations, the peak occurred in 2019, with a significant number of 3930. India emerged as the country with the highest volume of research on drinking water, contributing 66 publications.

Keywords: Drinking water management, water resource management, water quality, bibliometric analysis

INTRODUCTION

Water is synonymous with life, and survival becomes virtually impossible if there is no water on Earth (Panhwar et al., 2022). Availability of safe and clean drinking water is one of the most fundamental human rights essential for the continued existence of life for the public's health. Without it, life as we know it would be impossible. Access to clean drinking water is one of the most critical factors in maintaining good health (Rahut et al., 2016). It represents a fundamental right for all human beings and is a crucial element of a sound health protection program (Organization, 2021). As the world's population grows and environmental challenges increase, ensuring public health and promoting sustainable development requires effective control of drinking water resources.

In Indonesia, the management of drinking water resources is impacted by many factors, including geographical disparities, population density, and economic disparities (Siswanto et al., 2014). Ensuring reliable access to clean drinking water remains a pressing issue, particularly in rural areas and densely populated urban centers (Odonkor & Mahami, 2020). The significance of clean drinking water cannot be overstated. It is the lifeblood of communities, a source of nourishment for individuals, and a critical factor in public health (Rivera, 2020). Sustainable development goals and a fundamental human right are based on the availability of safe drinking water (Mirumachi et al., 2021).

Providing safe drinking water is an ongoing global concern, highlighting the universal need for reliable access to clean water (Duan et al., 2021). However, the intricacies of managing drinking water resources reveal significant variations when examined within specific regional or local contexts (Carrard et al., 2019). This study focuses on a comprehensive case study on a particular Indonesian island. The study intends to uncover region-specific issues, resources, and potential possibilities for sustainable water resource management by investigating the complexities of drinking water management on the island.

Drinking water resource management presents numerous difficulties that necessitate comprehensive and long-term solutions. Providing clean and safe drinking water continues to be a challenge, with issues such as pollution and water shortage compounding the complexities of water management (Wu, 2020). Furthermore, the increasing impacts of climate change, for instance altered rainfall patterns and the development of extreme weather events, pose new challenges for maintaining a sustainable and resilient drinking water supply (Hales, 2019). Given these issues, the crucial relevance of thorough research and data-driven insights in comprehending the changing landscape of drinking water management cannot be stressed.

This paper aims to obtain a greater understanding of the current literature and research trends in drinking water management through bibliometric analysis. Bibliometrics is a reliable approach for assessing quantitative and qualitative changes in research activities over time (Xie et al., 2020). A bibliometric analysis was done using VOSviewer software. By using VOSviewer software, we can analyze scholarly outputs and identify key research themes and contributors. The data for this study was gathered using the Publish or Perish 8 software.

RESEARCH METHODS

This study employed bibliometric analysis of the journal from 2000 to 2023. Bibliometric analysis is conducted through the utilization of the bibliometrix package in the R programming language. The package, known as bibliometrix, acts as a beneficial source for quantitative research in the field of bibliometrics. Bibliometrics has been applied in numerous research fields. The data was taken from the Publish or Perish 8 software on December 13, 2023. The search that we are using is the Semantic Scholar. The Publish or Perish 8 software provides a user-friendly tool for assessing the influence of research.

The Publish or Perish 8 software compiles essential details such as keyword information, citation information, publisher, author, title, etc. As a result, 909 publications are derived and analyzed to provide an insightful and representative data perspective. Various metrics can be employed to assess

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the research's impact and productivity. To assess the impact and productivity of the research in a complete manner, this paper uses metrics including network analysis, number of publications, citations, density analysis, and analysis of research topics depending on countries.

In this paper, we used VOSviewer software as a tool to perform the visualization of the data that are gathered from Publish or Perish 8 software. VOSviewer is a bibliometric software that takes selected literature data as input and generates visual knowledge maps based on that data. VOSviewer is employed for data mapping .

RESULTS AND DISCUSSION

This bibliometric analysis research utilizes data sourced from the Publish or Perish 8 software, focusing on journals available on Semantic Scholar. The search queries involve keywords such as drinking water management, water resource, and water quality, with a maximum of 1000 results. Information collected through Publish or Perish 8 software includes the amount of citations, the title, publisher, year of publications, author information, and document type.

The data gathered from Publish or Perish 8 software undergoes processing in Microsoft Excel to create graphs and tables, enhancing the readability of the information through visualization. VOSviewer software is employed to assist in this visualization, offering a clearer presentation of the bibliometric analysis results. Through VOSviewer software, the relationships between keywords and their density become apparent, providing a comprehensive overview of the research landscape within the domain of drinking water management. This software proves valuable in discerning connections and patterns in the collected data.

Network Visualization Analysis

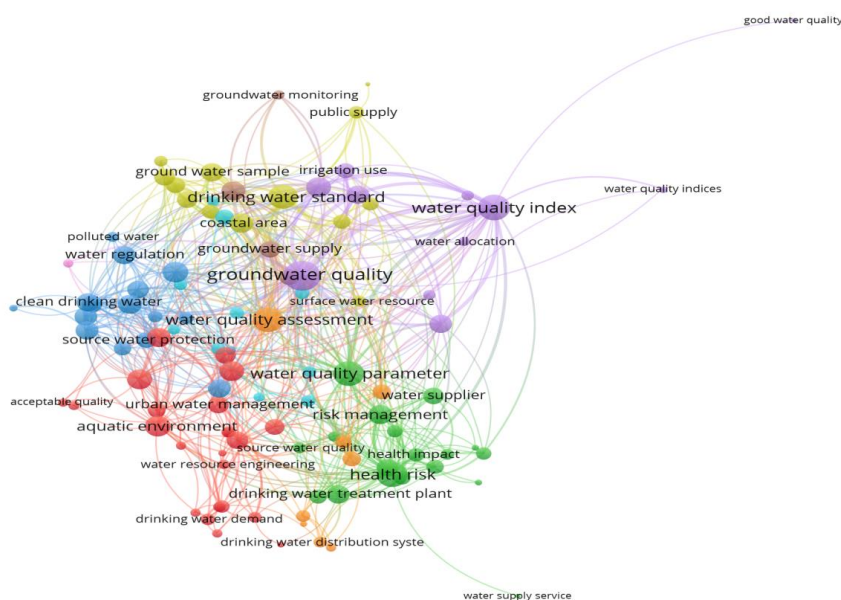


Figure 1 Relationship between keywords

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The density visualization, generated using the VOSviewer software with data collected by the Publish or Perish 8 software, focuses on keywords provided by the authors of the paper. To ensure relevance, a minimum occurrence threshold of 4 was set, resulting in 1941 terms out of 28563 meeting the criteria. Upon further inspection, it was found that only 104 terms fulfilled this threshold requirement.

In Figure 2, we present a density map resulting from an analysis of articles published in Semantic Scholar from 2000 to 2023. The one that is the densest is the term “groundwater quality”. The map exhibits a yellow pattern, where the intensity of yellow corresponds to larger circle diameters, indicating denser keyword occurrences (Maryanti et al., 2023). The fading or blending of colors into the green background suggests less frequent appearances of keywords (Finandhita et al., 2022).

Annual Analysis of Publications

This data is gathered from Publish or Perish 8 software. The data that are used is the research year from 2000 – 2023 with 1000 maximum searches using semantic scholar search. The conducted research includes the generation of a graph to illustrate the status of the quantity of relevant articles spanning from 2000 to 2023 (see Figure 3.). Out of 1000 searches, the results that came out were 909 articles.

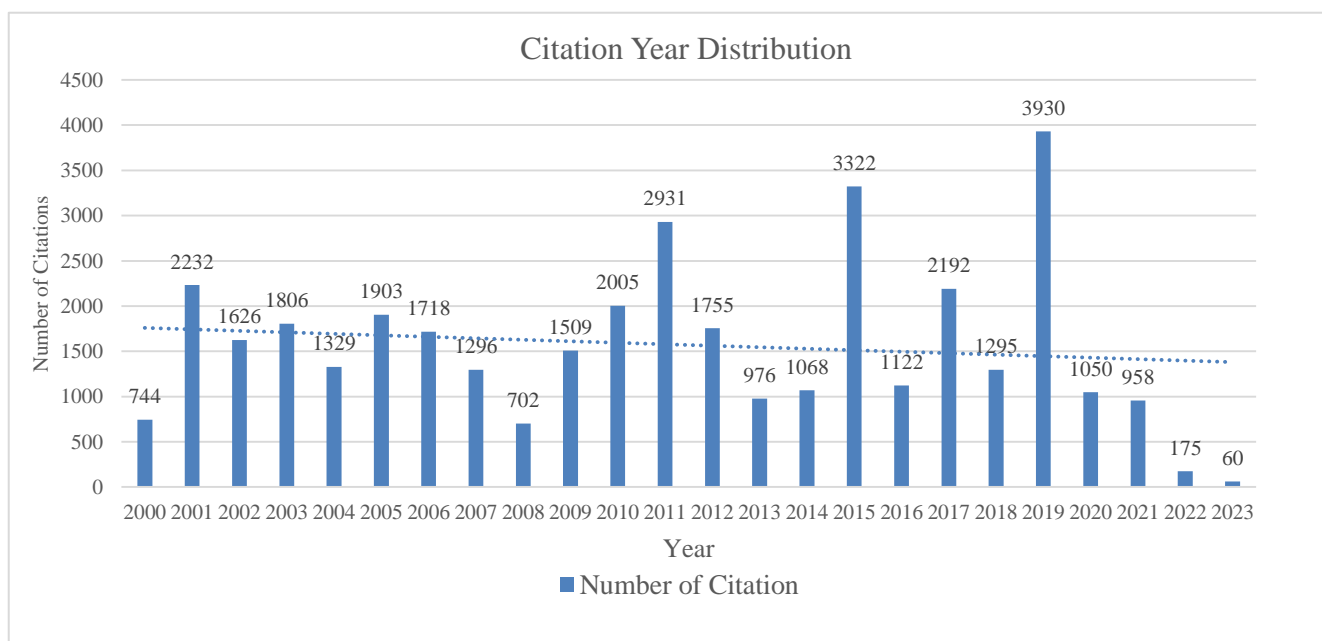


Figure 4. The Citation Year Distribution

In Figure 3, the publication year distribution shows an increasing trend. Since 2009, the number of publications has been increasing steadily. In 2022, the number of publications dropped to 37. Based on Figure 3, the highest number of published articles was in 2018 at 75 papers.

Annual Analysis of Citations

The data is gathered from Publish or Perish 8 software. The data that are used is the research year from 2000 – 2023 with 1000 maximum searches using semantic scholar search. Out of 1000 searches, the results were 909 articles. From 2000 - 2023, there were a total of 40839 citations.

In Figure 4, the graph clearly depicts a downward trendline, showcasing a decline in citations. Notably, the year 2011 stands out with a substantial count of 2931 citations, suggesting heightened scholarly attention or potentially significant contributions to the field. Additionally, the significant surge in citations in 2019, totaling 3930, indicates another period of notable influence.

The trend of citations fluctuated between ups and downs from 2000 to 2019. However, in 2020, there is noticeable drop in citations. It's essential to note that the decline in citations post-2020 doesn't necessarily imply a lack of outstanding contributions. Rather, it underscores the fact that it takes time for publications to gain widespread recognition and be cited widely (Yu et al., 2017).

Country Research Topic Analysis

This data is collected through Publish or Perish 8 software. The data that are used is the research year from 2000 – 2023 with 1000 maximum searches using semantic scholar search.

No.	Country	Amount
1.	India	66
2.	China	47
3.	Nigeria	19
4.	United States	16
5.	Iran	12
6.	Indonesia, Italy, Morocco, Ghana	9
7.	Iraq	7
8.	Mexico, Bangladesh	6
9.	Pakistan, Turkey	5
10.	Afghanistan, Arabia,	4
11.	Cambodia, Columbia, Kenya, Egypt, Sri Lanka, Serbia	3

Research activity on drinking water exhibits diverse engagement levels across countries. Based on Table 1, India leads with a substantial contribution of 66 publications, emphasizing a significant focus on managing drinking water within the nation. China closely follows with 47 publications, showcasing noteworthy research in the field.

Nigeria, the United States, and Iran display considerable engagement, with 19, 16, and 12 publications, respectively, demonstrating a varied global interest in studying and addressing drinking water issues. While nations like Iraq, Mexico, and Bangladesh show a moderate presence with 7 to 6 publications, others like Pakistan, Turkey, and Afghanistan exhibit slightly lower research activity with 5 or 4 publications.

Moreover, several countries make a limited but noteworthy contribution with 3 to 2 publications each. Lastly, nations represented by a single publication indicate a relatively lower level of research engagement in drinking water.

The results of VOSviewer Overlay Visualization software in this image show the trend of article writing themes in Scopus-indexed journals from year to year. Trending themes of article writing related to Employee Performance and Work Environment. From the longest year to the last year is marked with purple, blue, Tosca, dark green, light green, and yellow themes. There are several main focuses in this study, including Work Engagement, work-life balance, and organizational commitment. This interest

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reflects an increased awareness of Work environment issues related to employee performance. This shows that the field of Employee Performance and Work Environment is becoming increasingly relevant and important for Management researchers and practitioners in dealing with Work environment issues in the management of an organization. This indicates that the need for deeper research and understanding of Employee Performance and Work Environment continues to increase along with changes and complexity in organizational and managerial systems. This development highlights that employee performance is very important in an organization because good performance will contribute to the achievement of organizational goals. In this context, factors such as Work Engagement, Work-Life Balance, and Organizational Commitment have a significant role in determining employee performance levels. Studies on Employee Performance and Work Environment have shown that the relationship between these factors and employee performance is complex and interrelated.

Direction for the study of Employee Performance and Work Environment (2014-2023)

The image below is the result of VOSviewer analysis using the density visualization feature, which is one method to identify topics that often arise and have the potential to be further investigated in research on Employee Performance and Work Environment. In the following text, density is used to search for and identify relevant information for longer research on the topic of Employee Performance and Work Environment. In the concept of using density in VOSviewers, it can be observed that yellow indicates topics that are frequently discussed, while green is a topic that has not received much attention and, therefore, can be a starting point for further research.

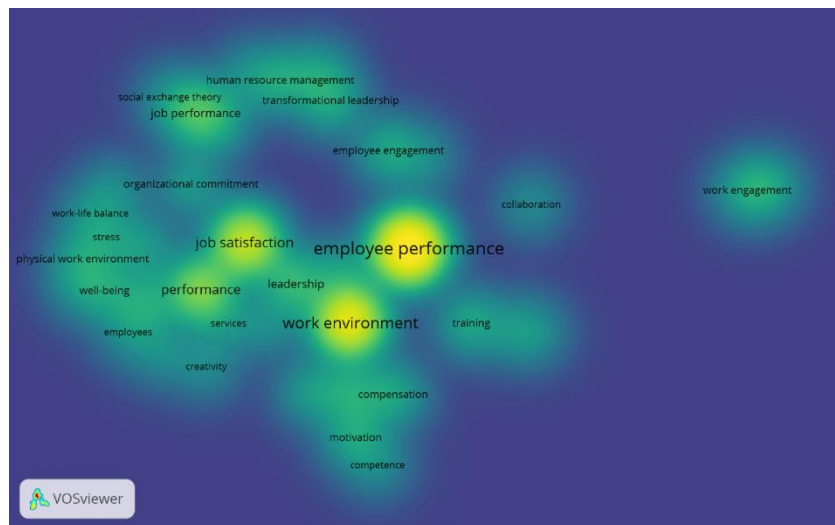


Figure 7 Visualise overlay Employee Performance and Work Environment (2014-2023)

Figure 7 shows the level of saturation of topics given yellow in the study, which are Employee performance, work environment, job satisfaction, and performance. These topics have become a major focus of the Employee Performance and Work Environment study. Strong evidence in yellow suggests that these topics have received considerable attention in the academic literature and are widely studied. On the other hand, the green color represents Compensation, leadership, training, work-life balance, and work engagement. Shows that these topics have not received much attention in the Employee

Performance and Work Environment study. The aforementioned green color provides evidence that the area in question is still open for more in-depth future research, offering an opportunity to learn more and deepen understanding of a particular area in the context of Employee Performance and Work Environment. By focusing on underexplored areas of the world, researchers have the opportunity to investigate complex dynamics and explore topics that may not yet be fully understood in the academic literature.

CONCLUSION

This study employs bibliometric analysis to uncover research topic networks, aiming for a comprehensive understanding of existing literature and trends in drinking water management. Utilizing Publish or Perish 8 software, we retrieved 1000 articles from Semantic Scholar, covering the period from 2000 to 2023.

Keywords such as groundwater quality and water quality index emerge as central to the research topic, highlighting their relevance. Examining research activity across countries, India stands out with a substantial contribution of 66 publications, reflecting a significant focus on managing drinking water within the nation.

Analyzing publication data reveals a consistent increase in the number of publications over the years, with the highest count observed in 2018. Similarly, citations peaked in 2019. This suggests a growing trend in research activity related to drinking water management, indicating a continued upward trajectory in the coming years.

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