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Bibliometric Study of Waste Bank

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ABSTRACT

Bibliometrics is a statistical analysis of books, journals, articles, or other publications. Bibliometric research aims to measure outcomes, institutions, and countries of origin of researchers and map the development of scientific disciplines in new fields of science and technology. This study aims to determine trends in waste bank article writing and mapping in searching for trends in international scientific publications using the Scopus database. The bibliometric analysis method in this study was carried out using the Publish or Perish software with the keywords Waste Bank, and the article results were then grouped based on the author's profile, published article data, and the journal chosen to publish the article; then, data analysis was carried out using the VOSviewer software. This research found that for ten years from 2013-2022, articles regarding waste banks that were successfully identified totaled 92 articles. The most published articles were in 2019, with 19 pieces. The journal that has issued the most reports on waste banks is the Journal IOP Conference Series: Earth and Environmental Science which contains 21 articles. The article entitled Community-based solid waste bank program for municipal solid waste management improvement in Indonesia: a case study of Padang City has the highest number of citations, namely 41. The results of the mapping analysis using the VOSViewer software have three themes, namely "waste management policy," "solution," and "circular economy," which are still rarely researched and are the latest themes in research.

INTRODUCTION

Population growth and changes in people's consumption patterns increase the volume, types, and characteristics of waste that are increasingly diverse. Waste has become a national problem that still needs to be solved. The management still needs to face many challenges where unmanaged waste is still more significant than managed waste. Therefore, waste management needs to be carried out comprehensively and integrated from upstream to downstream to provide economic benefits, is healthy for the community, safe for the environment, and can change people's behavior (Government of Indonesia, 2008). According to Law Number 18 of 2008 concerning Waste Management, the Indonesian government emphasizes changing patterns from conventional waste management to good and environmentally sound waste management by focusing on waste reduction and handling. Waste reduction can be done using the 3R method (Reduce, Reuse, and Recycle), namely by reducing the use of items that have the potential to become waste, reusing or extending the lifespan of articles that we no longer use, and recycling items or products that are no longer used and reused into reusable raw materials.

The waste bank is one of the innovations in waste management to deal with waste problems in Indonesia. The waste bank is a concept of collecting dry waste that has been sorted by management like a bank, but what is saved is not money but garbage. This system will accommodate, sort, and distribute waste with economic value to the market

so that people get financial benefits from saving waste (Utami, 2013). The saved waste will be weighed and rewarded with a certain amount of money, then sold at a factory collaborating with a waste bank. The existence of a waste bank can change the community's stigma that waste has a value that can be utilized to become a product that has value and contains economic potential (economic opportunity). Waste banks can develop and increase public awareness of waste handling and increase the monetary value of waste to improve people's welfare (Dai & Pakaya, 2019).

Bibliometrics comes from the word Biblio or bibliography, which means book or bibliography, and metrics, which means measure. Thus, bibliometrics can be interpreted as measuring or analyzing books or literature using a mathematical and statistical approach. However, until now, bibliometrics is more widely used to measure periodicals, such as scientific magazines or journals. The bibliometric method is used to provide quantitative analytical results from written publications. This type of analysis is based on identification from a body of literature, i.e., publications in a broad sense and a particular subject area (Ellegaard & Wallin, 2015). Bibliometric studies aim to review documents or literature to describe the development of increasingly complex scientific disciplines, analyze literature related to author productivity, quote reference materials, and assist in determining or determining the use of literature. According to Uysal (In Muchsin, 2014), bibliometrics aims to provide an overview, explain, and describe the process of communication in writing through calculations and analysis. Several scientific publishing platforms that can be used as database sources for bibliometrics include Web of Science (WoS), Scopus, and Google Scholar, which have added and combined several reference capabilities.

RESEARCH METHOD

The method used in this study is a literature review with a bibliometric approach. A literature review collects several books or library materials relevant to the research's problems and objectives (Danial & Wasriah, 2009). Bibliometric analysis is an approach to examine the evolution of research domains, including topics and authors, based on the social, intellectual, and conceptual structure of disciplines (Donthu et al., 2020). Bibliometric analysis is commonly used within scientific disciplines and focuses on the quantitative study of journal papers, books, or other types of written communication (Heersmink et al., 2010). The method of bibliometric analysis in this study was carried out by defining search keywords, search results, and analyzing data.

A. *Defining Search Keywords*

A literature search was done using PoP software using the keyword 'Waste Bank'. The types of publications used in this study are limited to articles published from 2013 to 2022.

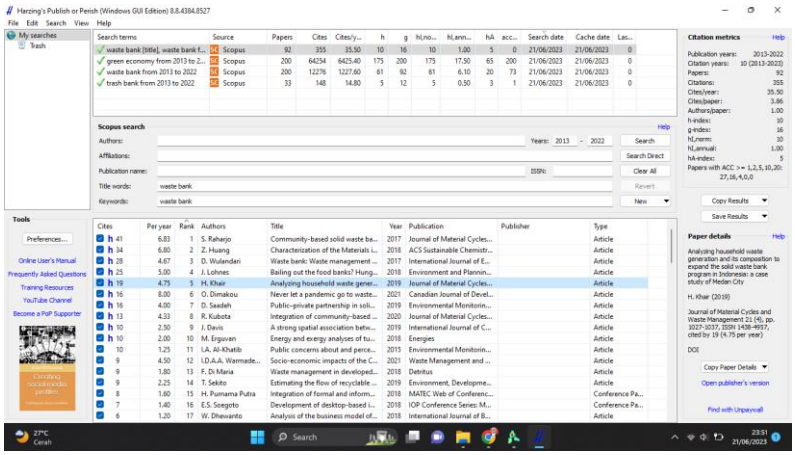

Figure 1. Scopus Database Search Through PoP

B. *Search Result*

The search results using PoP software obtained 92 articles, which will then be analyzed.

C. *Data Analysis*

The next step is to group the 92 selected articles based on published article data, author profiles, and selected journals to publish articles on "waste bank" using VOSviewer software, also to connect these groupings. VOSviewer is a software tool for creating maps based on network data and for visualizing and exploring these maps (Van Eck & Waltman, 2017).

RESULTS AND DISCUSSION

Based on the data that has been processed, the discussion is carried out as follows.

A. *Articles published in the period 2013-2022*

Figure 2 shows that from 2013-2022, articles regarding waste banks that have been identified amount to 92 articles for ten years. The highest number of article publications was recorded in 2019, with 19 articles published. The number of article publications in 2018 and 2021 was the same number publications, namely 16 articles. Article publication in 2014 found no articles published in that year.

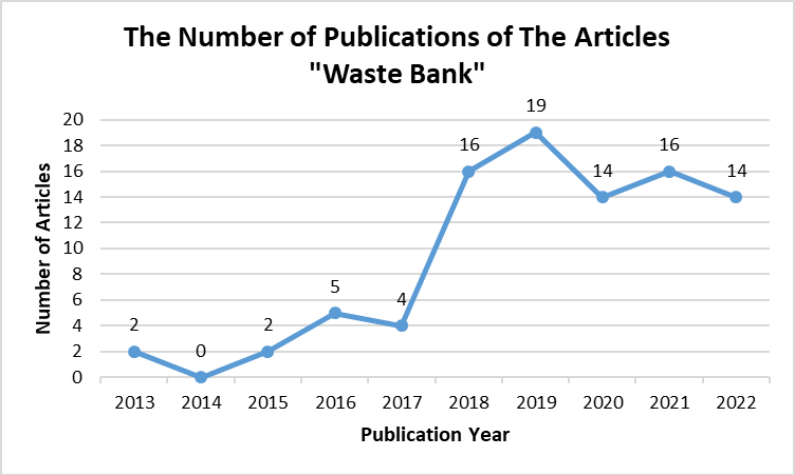

Figure 2. Number of articles on waste banks for the 2013-2022 period

B. *The Journal that Contains the Most Waste Bank Articles*

Table 1 lists the ten journals containing the most waste bank articles. It is known that the journal IOP Conference Series: Earth and Environmental Science is the journal most chosen to publish articles about waste banks from 2013 to 2022. Journal of IOP Conference Series: Earth and Environmental Science contains 21 articles on waste banks.

Table 1. The journal that publishes the most waste bank articles

Name of Journal	Jumlah Artikel
IOP Conference Series: Earth and Environmental Science	21
E3S Web of Conferences	6
Journal of Material Cycles and Waste Management	4
Journal of Physics: Conference Series	3
Environmental Engineering and Management Journal	2
Environmental Monitoring and Assessment	2
International Journal of Innovation, Creativity and Change	2
IOP Conference Series: Materials Science and Engineering	2
MATEC Web of Conferences	2
Planning Malaysia	2

C. *Article with the Most Number of Citations*

The data in Table 2 illustrates that an article entitled Community-based solid waste bank program for municipal solid waste management improvement in Indonesia: A case study of Padang City (Raharjo, 2017) is an article that has the highest number of citations, namely 41 citations. This is followed by an article entitled Characterization of the Materials in Waste Power Banks and the Green Recovery Process (Huang, 2018) with 34 citations. This is followed by an article entitled Waste Bank: Waste management model in improving local economy (Wulandari, 2017), which has 28 citations. This can be used as a reference source for further research on waste banks.

Table 2. Article with the Most Number of Citations

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No	Authors	Title	Year	Source	Cites
1	S. Raharjo	Community-based solid waste bank program for municipal solid waste management improvement in Indonesia: a case study of Padang city	2017	Journal of Material Cycles and Waste Management	41
2	Z. Huang	Characterization of the Materials in Waste Power Banks and the Green Recovery Process	2018	ACS Sustainable Chemistry and Engineering	34
3	D. Wulandari	Waste bank: Waste management model in improving local economy	2017	International Journal of Energy Economics and Policy	28

4 *Keyword Trends Analysis*

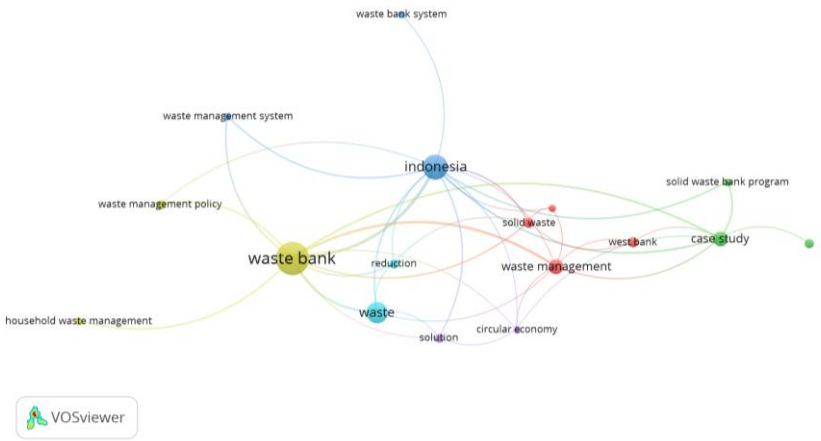

Figure 3. Circles Network Visualization

The results of the Circles Network Visualization software VOSviewer in Figure 3 show that there are 6 clusters consisting of 17 themes related to waste banks, namely:

1. Cluster 1 (in red) consists of 4 themes, namely: active waste bank, solid waste, waste management, waste bank
2. Cluster 2 (in green) consists of 3 themes, namely: case studies, waste bank programs, waste management
3. Cluster 3 (in blue) consists of 3 themes, namely: Indonesia, the waste bank system, the waste management system
4. Cluster 4 (yellow) consists of 3 themes, namely: household waste management, waste banks, waste management policies
5. Cluster 5 (purple in color) consists of 2 themes, namely: circular economy, solutions
6. Cluster 6 (Tosca color) consists of 1 theme, namely: reduction, waste

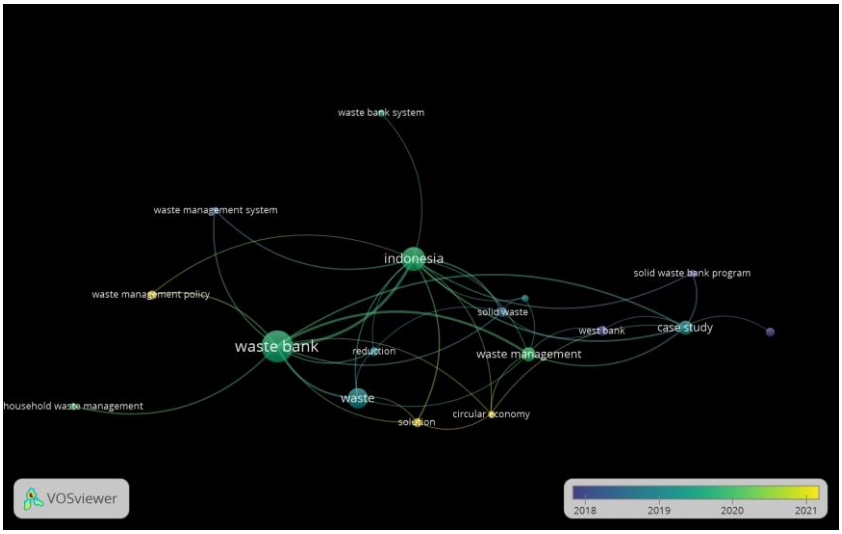

Figure 4. Circle Overlay Visualization

The Circle Overlay Visualization Visualization software VOSviewer results in Figure 4 show the trend of article writing themes in Scopus-indexed journals by year. The trend of writing article themes related to bank waste from the oldest year to the newest year is marked by purple, blue, tosca, dark green, light green, and yellow. This means that the themes "waste management policy", "solution", and "circular economy" in yellow are the newest themes related to waste banks. These themes can be updated references for further research.

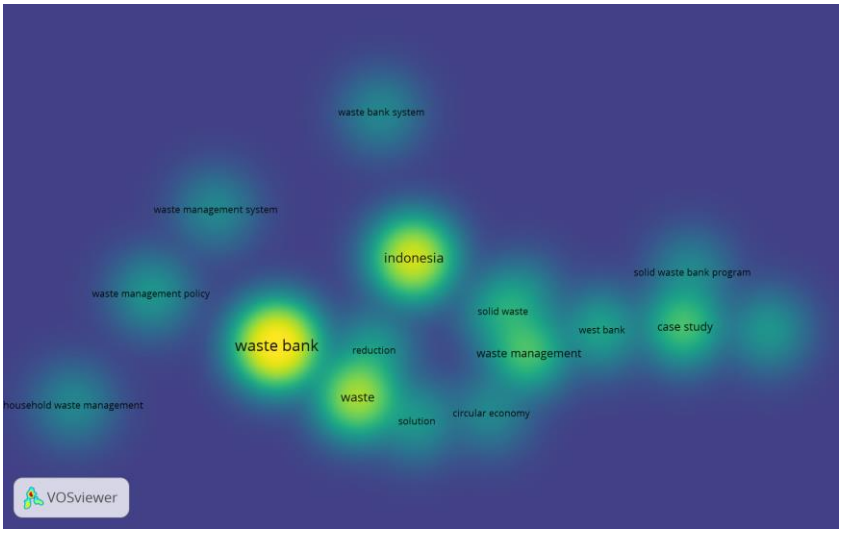

Figure 5. Density Visualization

The results of the Density Visualization software VOSviewer in Figure 5 show the density or density. A bright yellow color indicates the thickness of the research theme. The lighter the color of a theme, the more research has been done. The dimmer the color means that the theme is rarely researched. Dimly colored themes such as "circular economy", "household waste management", "waste management system", "waste bank

system", "solid waste bank program", "waste management policy", "active waste bank", " solution", "reduction" are themes that can be used as a reference for further research.

CONCLUSION

Based on the results and discussions that have been carried out, it can be concluded that for ten years, from 2013-2022, articles regarding waste banks have been identified, a total of 92 pieces. The highest number of article publications was recorded in 2019, with 19 articles published. Then, from the list of 10 journals that published the most articles about waste banks, the most chosen article from 2013 to 2022 was the IOP Conference Series Journal: Earth and Environmental Science, which contained 21 articles. In comparison, the paper with the highest number of citations is The Community-based solid waste bank program for municipal definite waste management improvement in Indonesia: a case study of Padang City (Raharjo, 2017) which has cited as many as 41 citations. The results of the mapping analysis using the VOSViewer software have three themes related to waste banks, namely "waste management policy," "solution," and "circular economy," which are still rarely researched and are the latest themes in research. This theme can be an opportunity to conduct further research.

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