Research Dissemination of Indonesian Institute of Sciences (LIPI) 2017-2020: A Bibliometric Profile

Ayu Muntiah, Athanasia Octaviani Puspita Dewi (iD)

Library Science, Faculty of Humanities Universitas Diponegoro, Indonesia

Abstract

Background of the study: Dissemination of the research results of the Indonesian Institute of Sciences (LIPI) in 2017-2020 as measured by the distribution of publications.

Purpose: This study aims to determine the bibliometric profile of research results documents owned by the Indonesian Institute of Sciences (LIPI) for 2017-2020 which have been disseminated.

Method: The research method used is a quantitative bibliometric method with descriptive statistical analysis, and co-authorship analysis and co-occurrence analysis with VosViewer software.

Findings: There are three groups of findings: document distribution, research collaboration, and research trends, it is known that: (1) research documents on Scopus excel in large number, wide scope of various publications, and description about publication status and types of document access; (2) research documents on DOAJ excel in the scope of Indonesian local publications; (3) LIPI's researcher with the most research results is Sumowodagdo S.; (4) LIPI's research collaboration is consistent with the University of Indonesia and the National University of Singapore; (5) LIPI's research trends are consistent in Indonesian studies with Indonesia as the keywords.

Conclusion: The domination of the largest number of LIPI's research documents, collaboration, and keyword is found in research results indexed by the Scopus. Increased research can be done on a list of keywords that appear less frequently. Countries and institutions that have little collaboration also need attention and increase their collaboration. Countries and institutions with frequent collaboration also need to be maintained.

Keywords: bibliometric, dissemination, research result

Introduction

The occurrence of the phenomenon of globalization in world society has led to a situation with a rapid flow of information exchange. In line with this situation, like it or not, activities that use a lot of information will also develop and grow according to the rapid and rapid flow of information that occurs. Research is an activity that massively uses information in its implementation, such as using it for references, processing research data, and even creating new information. Research activities consist of three stages such as: (1) first conceptual stage, to formulate the problem, theoretical framework and hypothesis; (2) empirical stage, to operationalize hypotheses and data analysis; and (3) the second conceptual stage, to interpret the conclusions of the findings and activities (Kriyantono, 2014). The results of research activities will be packaged in various forms of output, for example scientific publications, books, patents, industrial designs, prototypes, trade secrets and policies (Lukman et al., 2019).

The research results will be useful and have a real impact if they are distributed properly to the parties who need them. Dissemination activities then need to be carried out to ensure that research information will be spread and known by many parties (Irawan et al., 2018). In dissemination activities, the dissemination of information is carried out through the delivery of forms of research output and scientific information within it. Submitting scientific information itself can be done by considering the scientific communication approach, Barjak (2006) divides it into formal scientific communication and informal scientific communication. Formal scientific communication is carried out impersonally with certain terms and conditions, such as scientific publications in the form of journals, books and proceedings as well as scientific activities in the form of seminars and conferences. Formal delivery of information tends to be more secure, sustainable and credible (Barjak, 2006).

Not only considering the communication approach in dissemination, the choice of media as a medium for connecting information between the output and the communicant is also no less important. From time to time, developments in dissemination media continue to occur, adapting to advances in technology. In its development, dissemination media has changed a lot from print media to digital media, in Martin & Ackoff (1963) dissemination of research results at that time was mostly disseminated in print through publications and orally with discussions, while in Omasta (2019) in his research the dissemination of research results was already It is starting to become popular in online media such as scientific journals, official organizational websites, online mass media, social media and preprint sites. Dissemination of research results in Indonesia itself has also been carried out in the form of online publications, this is motivated by the existence of policies regarding research publications contained in the Technical Instructions for Minister of Research, Technology and Higher Education Regulation No. 20 of 2017. In this regulation, scientific journals are required to have online versions of publications which are also indexed with scientific databases such as Scopus, Web of Science, and DOAJ (Directory Open Access Journal), this is also supported by the existence of Sinta (Science and Technology Index) as a national scientific indexing system. Through the Sinta system, the performance of researchers, academics and institutions can be measured and then used as a basis for determining research funding (Abraham, Irawan, & Dalimunthe, 2019).

The large number and variety of research dissemination activities in online media make it a field of research opportunities. One of the research that can be carried out on this phenomenon is bibliometric research. Bibliometric research is popularly used in quantitatively measuring large amounts of scientific data (Donthu et al., 2021). This research can be used to determine the progress of dissemination of research results from a topic, field of science, author, institution, as well as region or country based on a bibliometric profile that describes and describes patterns, trends and productivity of the research results produced. Bibliometrics is divided into two types, namely: (1) descriptive bibliometrics, which measures the distribution

of publications; and (2) evaluative bibliometrics, which measures citation distribution (Pattah, 2013). Measurement of research documents using bibliometrics is generally carried out on topics, scientific fields and scientific publications.

Bibliometric measurements can also be carried out on documents with certain regional or institutional coverage. A bibliometric study on documents resulting from institutional research was carried out by Taşkın & Aydinoglu (2015) on research results belonging to the NASA Astrobiology Institute (NAI) by looking at document distribution, collaboration and citation behavior of NAI researchers, the following year Eito-Brun & Rodríguez (2016) also conducted the same study but carried out at the European Space Agency (ESA). In Indonesia itself, bibliometric studies in institutions are still lacking, this can be seen from similar research found by researchers. Interestingly, bibliometric studies of these institutions tend to be consistently carried out at LIPI (Indonesian Institute of Sciences) research institutions, including Royani, et al (2013) who mapped LIPI and BPPT papers in the 2004-2008 publication range, Tupan (2013) with publication analysis LIPI scientific publications indexed by Scopus from 1992-2012, and Tupan & Nashihuddin (2016) who also analyzed LIPI scientific publications indexed by Scopus in the period 1973-2015. Looking at these studies, we can also see a tendency to use data sources, namely the Scopus database. Based on several existing trends, it seems necessary to continue to carry out bibliometric studies at research institutions in order to provide new findings that can add variety to institutional bibliometric measurements, especially regarding the use and selection of exploratory data sources due to the large number of scientific database sites currently available. The combination of the consistency of institutional bibliometric studies at LIPI and the opportunity to explore the use of databases, gave rise to this research with the aim of finding out how the distribution of publications from the dissemination of LIPI research results is spread across the Scopus and DOAJ databases, thus forming a bibliometric profile through which distribution findings can be identified in the form of resulting research patterns and trends. In order to produce the latest findings, the time span of the study was then focused on the 2017-2020 range.

Method

Measurement of research documents in this study was carried out using quantitative methods with a bibliometric approach. The data analysis used is descriptive statistical analysis as well as co-authorship and co-occurrence analysis with the help of VOSViewer software. Research data was taken from two scientific index sites, namely Scopus and DOAJ. The choice of Scopus and DOAJ as data sources was based on their popularity as scientific databases that index documents resulting from research disseminated in official forums or publications. Scopus was also chosen as a representation of scientific databases with special or closed access and DOAJ was chosen as a representation of scientific directories and databases with open access.

The data source used in this research is a secondary data source because it is not taken directly from the object or respondent. Secondary data is obtained and collected indirectly, the data has been combined by previous studies or published by various related agencies that have an influence on the research (Hamdi & Bahruddin, 2014). This research utilizes data documentation from these two sites which contains metadata from LIPI's latest research results, namely 2017-2020, this is because research in 1973-2015 was researched by Tupan & Nashihuddin in 2016. Documentation methods are generally carried out by reading, recording or processing material. research systematically and pay attention to the symptoms studied in a document and so on (Walidjo, 2020). The metadata was then downloaded for processing and analysis. The data download was carried out in January 2021. The total population of the downloaded metadata contained 6,223 documents. In this research, the sample used is a

saturated sample, namely a sampling technique that uses the entire existing population as a research sample (Unaradjan, 2019). Sampling is considered based on accuracy, thoroughness and data representation (Unaradjan, 2019), in bibliometric research the data studied tends to be massive in number so that the description and mapping of the data can represent the area studied cumulatively and evolutionarily according to the scope of the focus studied (Donthu et al., 2021).

Result and Discussion
Document Distribution

LIPI research results documents indexed in Scopus and DOAJ have different numbers of documents. The differences in indicators in the metadata of each site also make a slight difference in the results of the distribution of documents found. In Scopus, the indicators that can be used to describe the distribution of documents consist of scientific subject, document type, publication source, publisher, document introduction language, access type, and publication status. As for DOAJ, the indicators that can be used to describe the distribution of documents consist of the source of publication, publisher, country of publication and language of introduction of the document.
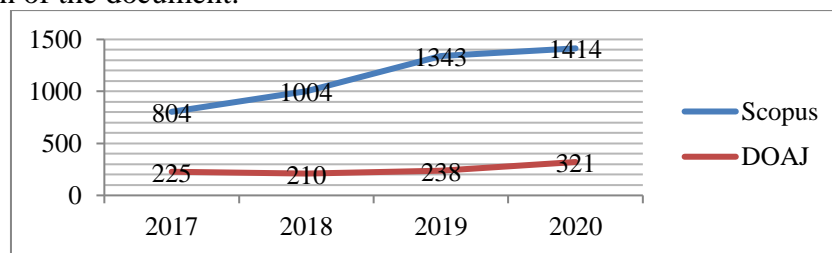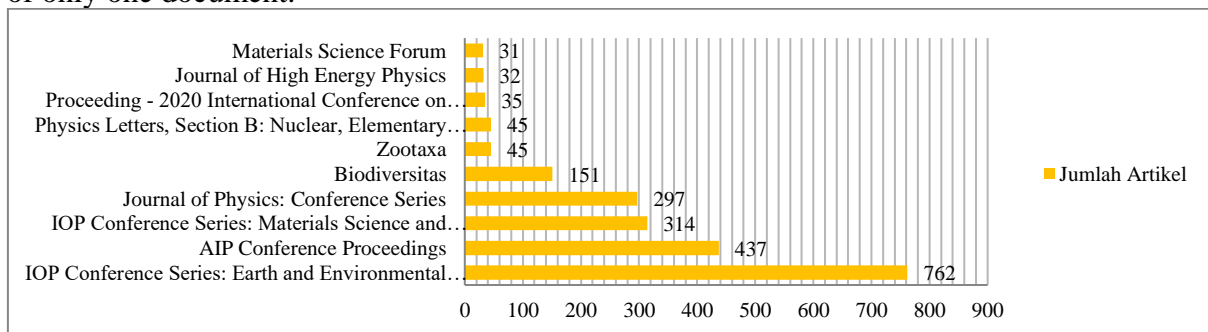

Picture 1. Number of Documents (Source: Data processing results, 2023)

In the picture of the number of documents, it can be seen that the number of documents resulting from LIPI research continues to increase, especially those indexed in Scopus. The decrease in the number of documents only occurred in 2018 at DOAJ. The total number of documents indexed in Scopus is 4,565 documents, while in DOAJ there are a total of 994 documents. From the total documents, it was found that documents in Scopus consisted of several types of documents including conference papers, articles, reviews, book chapters, editorials, erratums, letters, notes, books, short surveys, and data papers. The most indexed document type in Scopus is conference paper with a percentage of 55.31%, while the least indexed document type is data paper with a percentage of 0.07%. In contrast to Scopus, documents indexed in DOAJ do not have a variety of document types. All documents indexed in DOAJ are of the scientific article type, as the name suggests, namely Directory Open Access Journal. Indexed documents only come from open access journals which are also indexed in the DOAJ system.

Documents indexed in the Scopus and DOAJ systems come from many publications which are parent documents such as journals and proceedings. Many of the research results documents indexed by Scopus come from publications entitled IOP Conference Series: Earth and Environmental Science with a percentage of 16.69%. Many of the research results documents indexed by DOAJ come from the journal Physics Letter B. The top ten publications which contain a lot of LIPI research results documents can be seen in Picture 2 and Picture 3. Sources of indexed publications are published by institutions and publishers, from the document metadata there are also listings publisher that publishes research documents. Publishers whose publications contain many LIPI research results documents include the Institute of Physics Publishing with a percentage of 28.17% on Scopus and Gadjah Mada University with 9.36%

on DOAJ. The publisher percentage Picture can be seen in Picture 4 and Picture 5. In the DOAJ metadata, publishers of publications containing research documents are also given information about their country of origin. Indonesia is the largest country that publishes research documents with a percentage of 66%. The publishing country indicator is not found in Scopus metadata, but there is a scientific subject indicator that shows popular subject findings. Documents from LIPI research indexed by Scopus are widely distributed in the subjects of physics and astronomy (14.68%) and environmental science (12.97%), while the subject with few documents is dentistry (0.01%).

Information on research results conveyed in documents must be easy to understand by recipients of the information, both the researchers themselves and the public. Of the many documents published in publications published by publishers, there are various languages used to introduce scientific information in them. Almost all LIPI research documents indexed by Scopus use English as the language of instruction (96.32%). Meanwhile, French, German and Malay only have a percentage of 0.02%, which is much less than the percentage of documents that do not contain a language of instruction (3.62%). Similar to Scopus, the most common language used in LIPI research documents indexed by DOAJ is also English with a percentage of 50.91%. However, there are quite a lot of differences in the number of languages between Scopus and DOAJ. There are 9 languages that appear and are recorded as being used in DOAJ documents, namely English, Indonesian, German, French, Arabic, Croatian, Russian, Ukrainian and Portuguese. These languages are not all used singly, only English and Indonesian are used as the main language in several documents. As for other languages, there are several documents in two languages and documents in three languages. Apart from English, the next most widely used language of instruction is a combination of English and Indonesian at 29.98%. The language of instruction that is least used in documents is a combination of English and Portuguese and a combination of English and Russian with a percentage of 0.10% consisting of only one document.
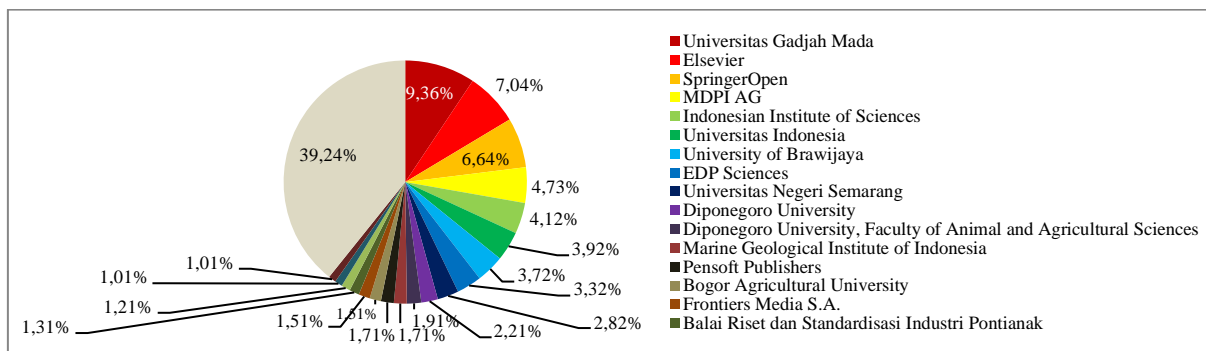

Picture 2. Publication Sources in Scopus Indexed Documents (Source: Data processing results, 2023)
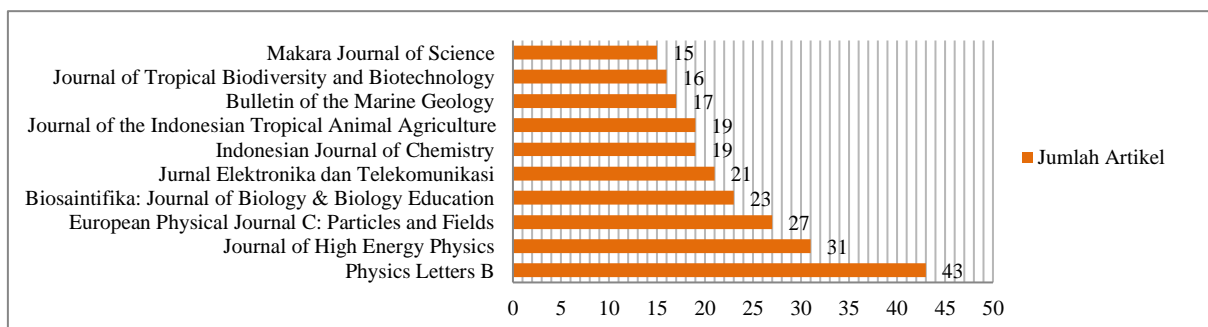
Picture 3. Publication Sources in DOAJ Indexed Documents (Source: Data processing results, 2023)
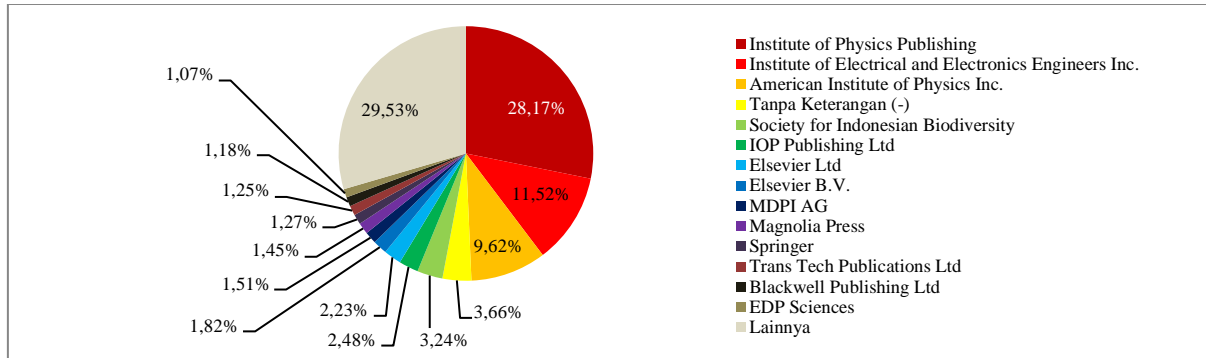
Picture 4. Scopus Indexed Document Publishers (Source: Data processing results, 2023)

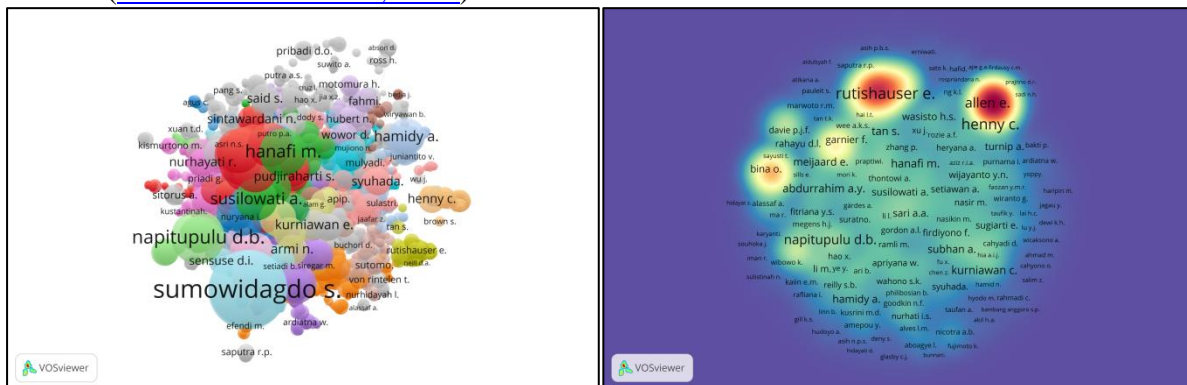Picture 5. DOAJ Indexed Document Publishers (Source: Data processing results, 2023)

Completeness of research result information in documents can be the key to conveying comprehensive research results to recipients of the information. In line with LIPI's duties as a state research institution which has a role and obligation in disseminating and communicating the results of its research to the public as a form of educating the nation (Indonesian Institute of Sciences, 2021), the type of access and publication status of published documents is important to know as a condition of connection research information with other parties outside the institution. From the metadata of research documents indexed by Scopus, there are 56.73% of documents that have open access information, the remaining 43.27% do not have any information. Open access is also known as open source, namely the openness movement for the publication and archiving of scientific works or scientific documents by opening access as widely as possible (Irawan et al., 2018). In this way, it can also be said that as many as 56.73% of the 2017-2020 LIPI research documents indexed by Scopus can be accessed openly, even by the general public. The publication status in the document shows that there are two publication status statements, namely final (95.66%) and article in press (0.72%), as well as documents without information (3.61%). In contrast to Scopus, all DOAJ documents can be accessed openly. This is in line with the information in the name of DOAJ itself, Directory Open Access Journal which indexes open access journals. Scopus and DOAJ have their own differences and uniqueness as a forum that accommodates LIPI research results documents that have been disseminated. The number, variety, scope and description of documents between the two have their respective advantages.
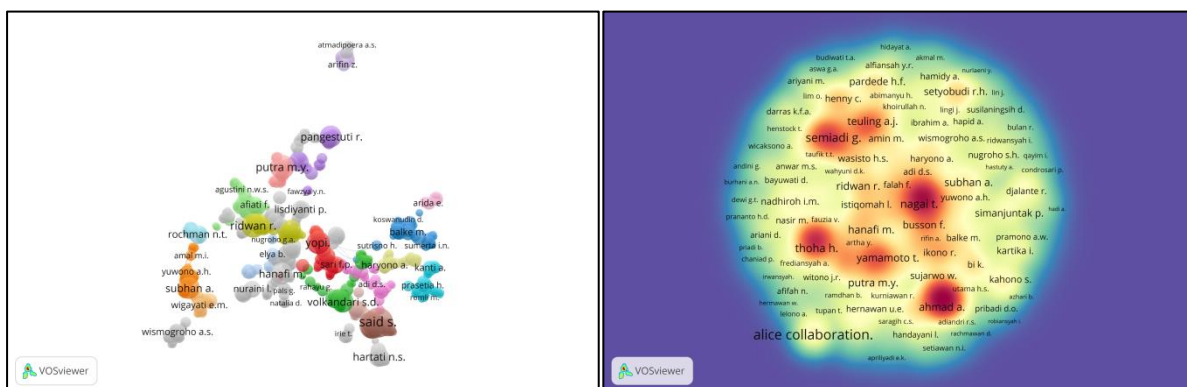
Research Collaboration

The findings from the study of documents resulting from the research carried out are not only useful for forming research dissemination strategies. In the collection of documents analyzed, a pattern of research collaboration between researchers, institutions and even countries can also be found. Of the 4,565 documents indexed in Scopus, there are 9,965 names

of contributing authors, 1,956 names of institutions from all contributing researchers, and 118 countries from all institutions affiliated with researchers. As for DOAJ indexed documents, of the 994 documents there are 2,718 names of contributing authors, 490 names of institutions from all contributing researchers, and 54 countries from all institutions affiliated with researchers. The research collaboration that occurs is visualized on a collaboration map with the help of the VOSviewer device. If you look at the map, the collaboration patterns that occur can be seen through: (1) network lines, lines that connect one item to another. Lines can be formed from research meetings between items in several documents, thick network lines indicate strong network relationships between items (van Eck & Waltman, 2021); (2) cluster, a collection of items divided into several groups and marked with certain colors in certain quantities; and (3) density, a description of the density of items marked with several colors covering a certain area. The density that occurs is an example of the number of items involved in a research area. The Scopus indexed document collaboration map can be seen in Picture 6, Picture 7, and Picture 8. The DOAJ indexed document collaboration map can be seen in Picture 9, Picture 10, and Picture 11. The map was created using network visualization with a white background and density visualization with a background. blue back. Apart from looking at the map description, the findings can also be seen from the large number of documents and total link strength, which is a value calculated from the number of meetings an author has with other authors (van Eck & Waltman, 2021).

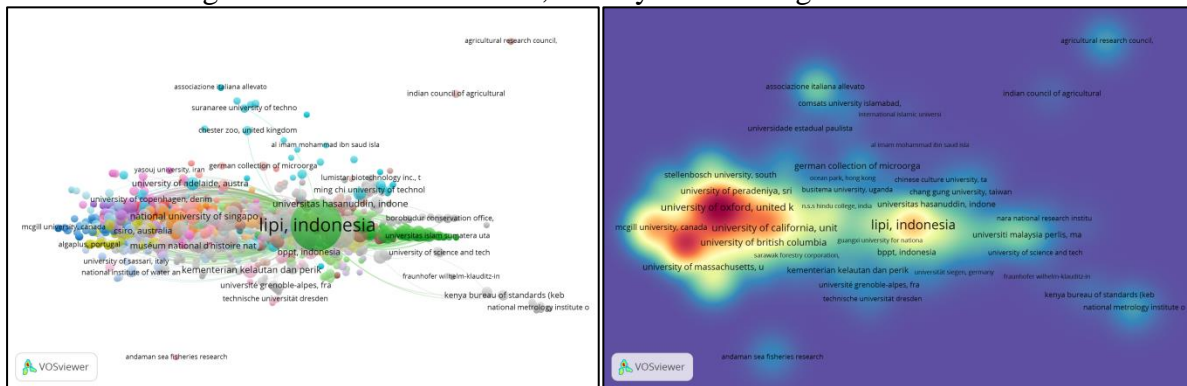Picture 6. Authorship Map of Scopus Indexed Document Researchers (Source: Data processing results, 2023)

Picture 7. Authorship Map of DOAJ Indexed Document Researchers (Source: Data processing results, 2023)
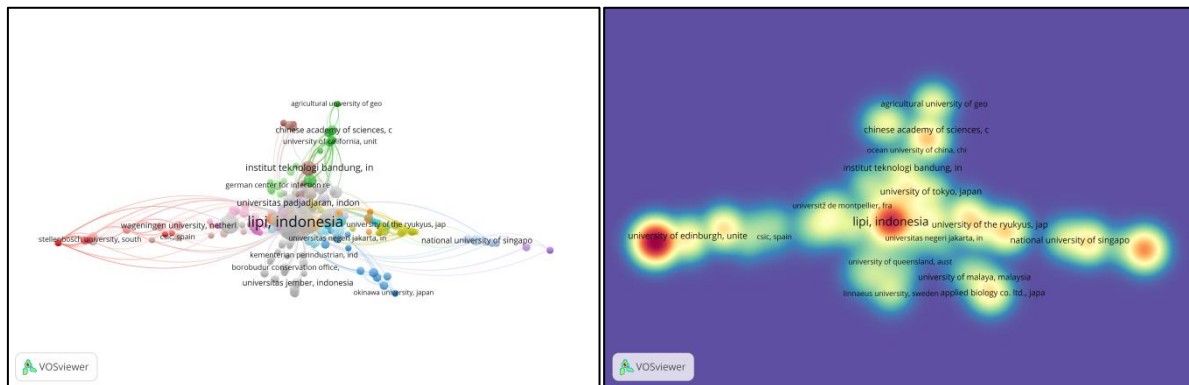
The first collaboration that is visible is the collaboration of researchers. From the findings of the researcher authorship map, the number of researchers from Scopus indexed documents is greater than the number of researchers from DOAJ documents. As previously

discussed, there are a greater number of LIPI research documents indexed by Scopus, so the difference in the number of researchers and documents indexed by DOAJ is not surprising. The number of researchers then also influences the division of research clusters. The researcher authorship maps of Scopus and DOAJ indexed documents both have the number of researcher clusters at 30 and above, but what makes them different is the number of researchers collected in each cluster. The largest cluster in the researcher authorship map indexed by Scopus contains 1,318 researcher items, while the largest cluster in the DOAJ indexed researcher authorship map is only 51 researcher items. Even though the number of researchers and research clusters on the researcher authorship map of Scopus indexed documents has a larger and more numerous number, in the density display the researcher dense areas of Scopus indexed documents have a smaller composition. It can be seen that there are only about three groups of reddish areas on the researcher's map. The red area is a sign of the density of research items in that area. On the research authorship map of DOAJ indexed documents, more research dense areas are visible in red with four large groups and small groups with yellowish red gradations around them. Collaboration between researchers on the authorship map of documents indexed by Scopus and DOAJ found no similarities in terms of links and meetings as seen from the total link strength value of the largest researchers. However, similarities were found in the name of the researcher who had the largest number of documents, namely Sumowidagdo S.

Picture 8. Institutional Authorship Map of Scopus Indexed (Source: Data processing results, 2023)


Picture 9. Institutional Authorship Map of DOAJ Indexed Documents (Source: Data processing results, 2023)

Furthermore, the second collaboration found was institutional collaboration. From the institutional authorship map presentation, the number of institutions from Scopus indexed documents is greater than the number of researchers from DOAJ documents. Just like research collaboration, this also happens because the number of LIPI research results indexed by Scopus

is greater than the number of documents indexed by DOAJ. The number of institutions also influences the division of institutional clusters on the map. In the institutional authorship map, the clusters of Scopus indexed documents number 142 and the clusters of DOAJ indexed documents number 99. In both, the cluster dominance is filled by institutional items with quite a large number of units and single clusters. Many institutional items in Scopus indexed documents are gathered in one adjacent area, making the coverage of the dense area larger. The size of the area with a dense collection of institutions can be seen in the red map area. In contrast to this, the density of collaboration in DOAJ indexed documents tends to be separate. On the map you can see that there are two areas in solid red marking a collection of institutional items, this solid red color makes these areas the most densely populated areas. Not far from the solid red area there are also several small areas with reddish yellow gradations which also indicate the density of institutional items within it.

The tendency for LIPI to collaborate with other institutions in Scopus and DOAJ indexed documents can be seen from the agencies with the most documents. The University of Indonesia and the Bogor Agricultural Institute appear in the top three institutions with the most documents on both indexation sites, Scopus and DOAJ. Meanwhile, CERN and the National University of Singapore are the foreign agencies that have the most documents on the two agency authorship maps. In total links strength, the same thing happened as in the researcher's authorship map, namely that no similarity was found in the value of the largest meeting. Apart from the tendency for the most institutions, there are also institutions that only have one document and one meeting in their collaboration, there are 1,060 and 304 institutions in Scopus indexed documents and 304 and 46 institutions in DOAJ indexed documents that only collaborate on one document. The first number of institutions corresponds to the number of documents and the next number of institutions is the total link strength.
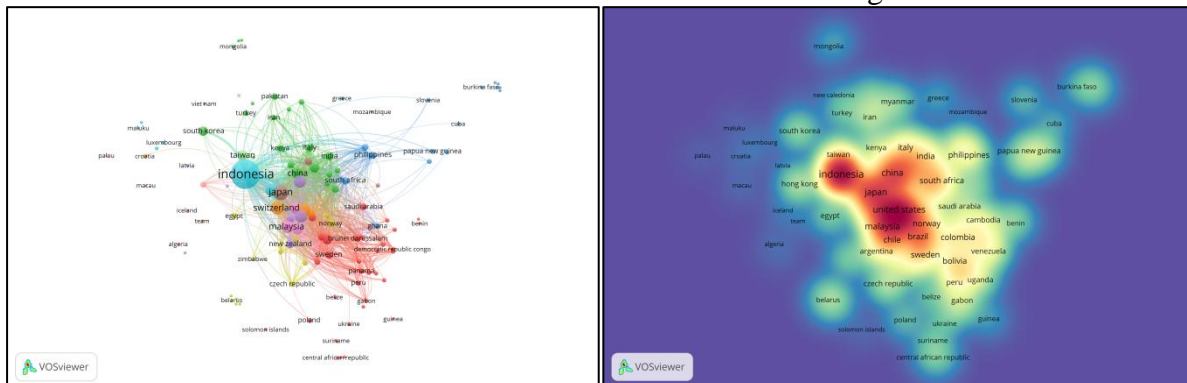
Picture 10. Country Authorship Map of Scopus Indexed Documents (Source: Data processing results, 2023)
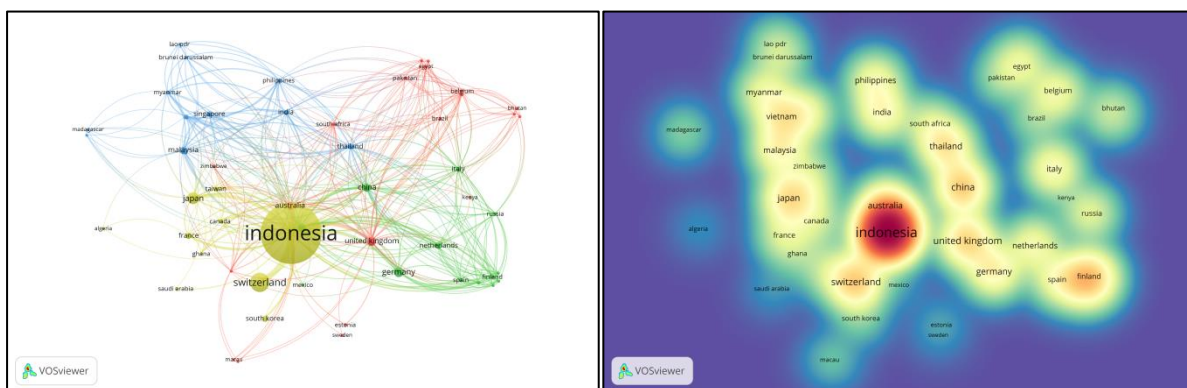
Picture 11. Country Authorship Map of DOAJ (Source: Data processing results, 2023)

Finally, the third collaboration that is visible is state collaboration. On the country authorship map, the number of countries from Scopus indexed documents is greater than the number of countries from DOAJ documents. Similar to the discussion of the two previous collaborations. The number of countries on the map also influences the division of clusters on the map. There are more clusters of country authorship maps of documents indexed by Scopus than clusters of country authorship maps of documents indexed by DOAJ. However, when compared with the two previous collaborations, the number of country clusters in both is smaller. The map of country authorship of documents indexed by Scopus only consists of 11 clusters, and the map of country authorship of documents indexed by DOAJ consists of 4 clusters.

Almost similar to the density of the country authorship map, the country items in the country authorship map of documents indexed by Scopus are also mostly gathered in one adjacent area, making the coverage of the dense area of country items bigger. The density of items on the country authorship map of DOAJ indexed documents is mostly concentrated in the area around the Indonesian items. The tendency for collaboration between countries in the two country authorship maps of LIPI research documents indexed by Scopus and DOAJ shows a tendency for collaboration with Japan and Switzerland, this is shown by the large number of documents affiliated with these two countries. Many collaborative meetings were held with researchers from Indonesia and Japan, this is shown by the inclusion of the two countries in the top 5 countries with the largest total link strength values. The lowest collaboration between countries occurred in 32 and 14 countries which only appeared in one document, while the lowest collaboration in terms of total link strength values occurred in Sweden, Algeria, Kenya, Palestine and Palau.

Research Trends

Based on the description of the findings that have been explained, a research trend can be seen in the disseminated LIPI research results documents. Research trends are obtained from keyword indicators. The use of keywords is seen from the number of occurrences, namely the number of occurrences of keywords in a document and total link strength, namely the number of meetings between keywords (van Eck & Waltman, 2021).
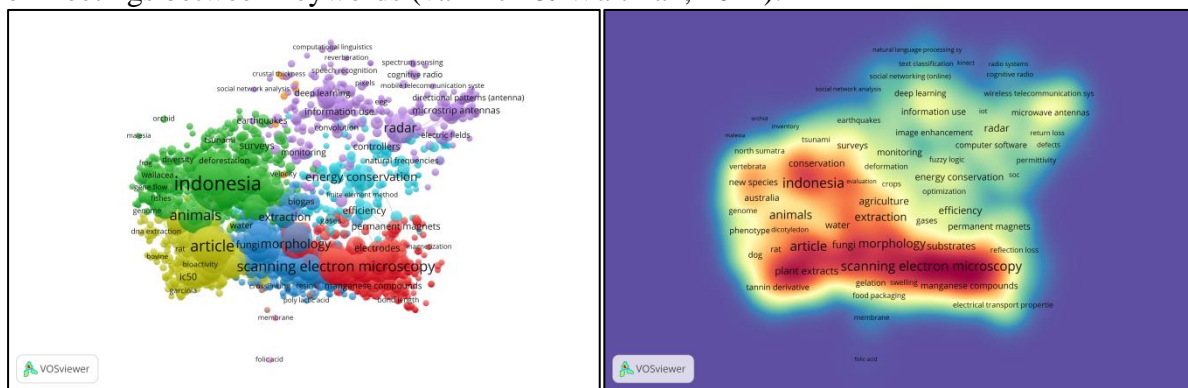
Picture 12. Scopus Indexed Document Keyword Map (Source: Data processing results, 2023)
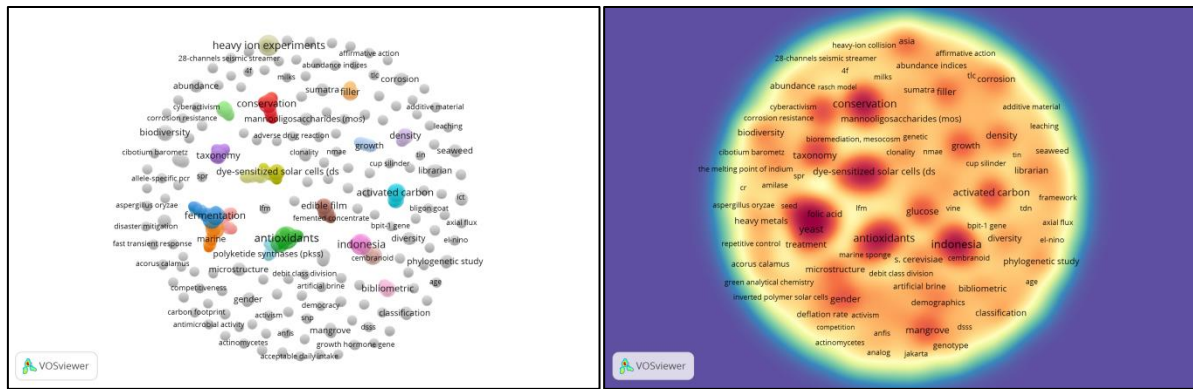
Picture 13. Keyword Map of DOAJ (Source: Data processing results, 2023)

In Scopus indexed documents, the most keywords in terms of the number of occurrences consist of Indonesia, articles, and nonhuman. The keywords with the most total link strength are articles, Indonesian and nonhuman. In DOAJ indexed documents, the keywords with the most occurrences consist of antioxidants, heavy ion experiments, and Indonesia. The keywords with the largest total link strength are Indonesia, antioxidants, and conservation. In this way, there is a tendency for keywords in the dissemination of LIPI research results to be found in research topics and trends that discuss Indonesia. Interestingly, the tendency to use Indonesian keywords in documents resulting from this research actually occurred in previous similar research conducted by Tupan (2013), the most common keywords in this type of research were also Indonesia, article, and nonhuman. From both indexing sites, there are also keywords that are rarely used because they have low total link strength values, such as neutrino physics, morphological feature characteristics, lipid production, Indonesian perspective ASEAN, Carita Bay Waters, discrete Markov method, forecast discharge, macroalgal, and quark. plasma gluons. From the findings of this research trend, it is hoped that research exploration on other topics can be further improved, not only continuing to occur on topics contained in popular keywords that are widely used.

Conclusion

The largest number of distributions of LIPI research results is found in research results documents indexed by the Scopus database, while the research results are the least distributed in LIPI's Instagram account. Scopus as a means of gathering research documents has advantages in terms of coverage of the number of documents, variety of publications, and information on publication status and type of document access. Meanwhile, DOAJ as a means of collecting research documents has advantages related to publication coverage in local publishers and coverage of Indonesian language documents. The low value of collaboration in institutions and countries such as Sweden and Palau can be used as a basis for increasing research collaboration in countries that rarely collaborate with LIPI. Increasing research activities can also be carried out on keywords for which few research results have been found, such as neutrino physics, morphological feature characteristics, lipid production, and others. Bibliometric measurements in this research are limited to the distribution of publications only, improving a more evaluative study can be completed by measuring the distribution of citations through citation, co-citation and biblioPictureic coupling analysis.

Authors' Contributions

All authors have contributed to the final manuscript. The contribution of all authors: conceptualization, methodology, formal analysis, writing original draft preparation, writing review and editing. All authors have read and agreed to the published version of the manuscript.

Conflict of Interest

All authors have no conflict of interest related to this study.

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