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Role of Libraries in Sustainable Development: A Bibliometric Study

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ABSTRACT
The 2030 Agenda for Sustainable Development includes 17 Sustainable Development Goals (SDGs) that demand immediate attention from all countries, offers a blueprint for achieving world peace and prosperity. As hubs for information, expertise, and community involvement, libraries are essential to accomplishing these objectives. The growth and collaborative tendencies in research on the role of libraries in sustainable development from 2015 to 2023 are examined in this paper. 124 pertinent publications were found after a bibliometric analysis utilizing the SCOPUS database. The analysis discovered a notable upward trend in publications over time, peaking in 2023. There is growing interest in the topic, as seen by the CAGR of 84.9%. The authors exhibited a high degree of teamwork, as evidenced by their degree of collaboration or DC of 0.69 emphasizing the research's multidisciplinary character. Co-authorship analysis showed that authors worked closely together, with several clusters demonstrating this. Analyzing co-authorship across nations revealed robust worldwide networks for cooperation, with nations categorized into clusters based on their patterns of collaboration. The rising acknowledgment of libraries as important contributors to sustainable development is highlighted by this study, which also emphasizes the need for more investigation and cooperation in this field.

KEYWORDS
Sustainable Development Goals, SDGs, Libraries, Research Growth, Bibliometrics.

1. Introduction

A shared road map for achieving global peace and prosperity for now and in the future, is provided by "The 2030 Agenda for Sustainable Development", which was accepted by all United Nations Member States in 2015. The 17 Sustainable Development Goals (SDGs), which speak for an urgent call to action for all the developed and developing countries in a global partnership, are at the center of it.

They recognize that in addition to supporting economic growth, eliminating poverty and other forms of deprivation demands united efforts to fight climate change, preserve our oceans and forests, improve health and education, and minimize inequality. (*THE 17 GOALS | Sustainable Development*, n.d.). The field of sustainable development research is relatively young, and libraries are essential to accomplish the Sustainable Development Goals (SDGs). Libraries are in a special position to encourage and support the SDGs as they are centers of knowledge, information, and community participation. They do this by facilitating information access, encouraging literacy and education, encouraging innovation, and enabling people to take action toward sustainable development. Information availability is a major component of sustainable development, which considers social, economic, and environmental factors. Without such access, people and society are unable to profit from scientific

and cultural information, promote innovation, take part in civic activities, or make well-informed decisions. With the goal of giving everyone the knowledge and resources they need to use information successfully, libraries are essential to guaranteeing meaningful and inclusive access to information. Libraries have an unequaled reach and the capacity to achieve a variety of policy objectives, including those specified in the United Nations 2030 Agenda, due to their widespread presence in cities and towns globally (*Powering Sustainable Development – IFLA*, n.d.).

2. Objectives

2.1 To determine the growth of studies on Role of Libraries and Sustainable Development from 2015 to 2023.
2.2 To highlight the authorship pattern and degree of collaboration in research in Role of Libraries on Sustainable Development
2.3 To study the co-authorship of authors and countries in order to determine which authors and countries collaborate closely based on the total link strength (TLS) and number of documents

3. Methodology

Bibliometric approach was used in the study which uses the qualitative and quantitative prospect of in order to analyze the already published literature on given subject. This area uses data-driven procedures and statistical tools to assess the importance, visibility, and influence of academic publications, authors, journals, and research topics. By examining co-authorship networks, publishing trends, citation patterns, and additional bibliographic data, bibliometrics provides valuable insights into the dissemination of knowledge, the development of academic disciplines, and the identification of noteworthy work and researchers (Ashikuzzaman, 2018).Data were collected from the SCOPUS database using the keywords "Sustainable development", " Libraries" and used the search string given below.

TITLE-ABS-KEY ("LIBRARIES") AND TITLE-ABS-KEY ("SUSTAINABLE DEVELOPMENT GOALS") AND PUBYEAR>2014 AND PUBYEAR<2023

The search result gave 228 documents. The data is exported in CSV format and scrutinized. The relevance of the results is determined by observing the titles abstracts and keywords. After filtering irrelevant results, the final number of documents during the study period was found to be 124 The data then analysed using tools like MS Excel, for tabulation, statistical analysis and graphs visualization and VOSviewer was used for network visualization and mapping

4. Literature Review

A number of studies have been carried out recently applying bibliometric analysis to determine the growth of research production.

Khalid et al. (2021) conducted a study to improve readers' understanding of the problems associated with sustainable growth in library and information science (LIS) by emphasizing the intricacy and diversity of these issues. To accomplish its goals, the study adhered to a comprehensive protocol based on the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses" (PRISMA). Before each chosen study could be added to the final pool of studies, it had to go through a list of identification, screening, eligibility evaluation, and inclusion procedures. Exclusion and inclusion criteria were also created. The study looked at the literatures published between 2000 and 2020 that was retrieved from the databases of LISA, LISTA, Scopus, Web of Science, and Google Scholar. The results emphasized several kinds of LIS sustainable development problems. The absence of sustainable approaches, the insufficient integration of sustainable education into LIS curriculum, the unsustainable building designs, services, and operations, and the high energy usage brought on by libraries' extended operating hours were among the main problems. Moreover, the present equipment in libraries is out-dated due to the fast progress in digital and technical domains, which adds significantly to the carbon footprint. Planning for long-term sustainable development objectives is hampered by adherence to customs and aversion to change, which exacerbates the difficulties in adjusting to these changes. In order to reap the rewards of the present and ensure sustainability for the future, it is imperative that these hurdles be overcome.

Mathiasson & Jochumsen (2022) reviewed the literatures on sustainable development and libraries in order to bring a summary and insights into a carefully selected bibliography of 102 research papers that addressed the sustainability of libraries (of all kinds), sustainable development, and the sustainable development goals (SDGs) of the UN.. An overview of the research field is provided by the analysis of the publications. Publications are divided into environmental, economic, social, cultural, and holistic categories according to how they address and comprehend the ideas of sustainable development and sustainability. Ultimately, these ideas' fundamental justifications are outlined, and their ramifications for libraries and librarians are examined.

Ensslin et al. (2022) explored the characteristics of scientific publications which examine the management of higher education institution libraries from a sustainability perspective with bibliometric analysis. The goal is to contribute to knowledge development and identify further research opportunities in this area. Utilizing the knowledge formation process-constructivist instrument, the study identified 24 papers that met the authors' definition of the issue, "Sustainable Management of Libraries in Higher Education Institutions," and were judged to have scientific value. The research, using a constructivist approach, gave serious thought to choices that strayed from conventional definitions. Using a qualitative methodology, the investigation concentrated on factors including author networks, prolific writers, and the development of sustainability perspectives. The study indicated that the majority of writers studying the sustainable administration of higher education libraries were from the Americas during the study period. It also emphasized the transition from an ecologically focused, one-dimensional understanding of sustainability to a more multifaceted one.

5. Findings

5.1 Objective 2.1 The growth of studies on Role of Libraries and Sustainable Development from 2015 to 2023

Table 1 and Figure 1 shows the year wise distribution of publications on role of libraries in sustainable development research from 2015 to 2023. It is found that in 2015 and 2016 the output was the lowest. The amount of outputs touched the highest in 2023 with 30 (24.19%) publications followed by in 2020 with 26 which are 20.97% of the total publications. The Compound Annual Growth (CAGR) from 2015 to 2023 is 84.9%.

CAGR = [V(tn)/V(t0)]1/n -1
= [30/1]1/9 -1
= 300.111 – 1
= 1.8487 -1
= 0.8487 = 0.8487 * 100
= 84.9

Where
V (tn) = Value at the end period.
V (t0) = Value at the starting period.
n = Number of years

Table 1: Year Wise Distribution of Publications

Year	No. of Publications	Cumulative	Percentage (%) of Publications	Cumulative Percentage (%)
2015	1	1	0.81	0.81
2016	1	2	0.81	1.62
2017	2	4	1.61	3.23
2018	14	18	11.29	14.52
2019	11	29	8.87	23.39
2020	26	55	20.97	44.36
2021	18	73	14.52	58.87
2022	21	94	16.94	75.81
2023	30	124	24.19	100
Total	124			

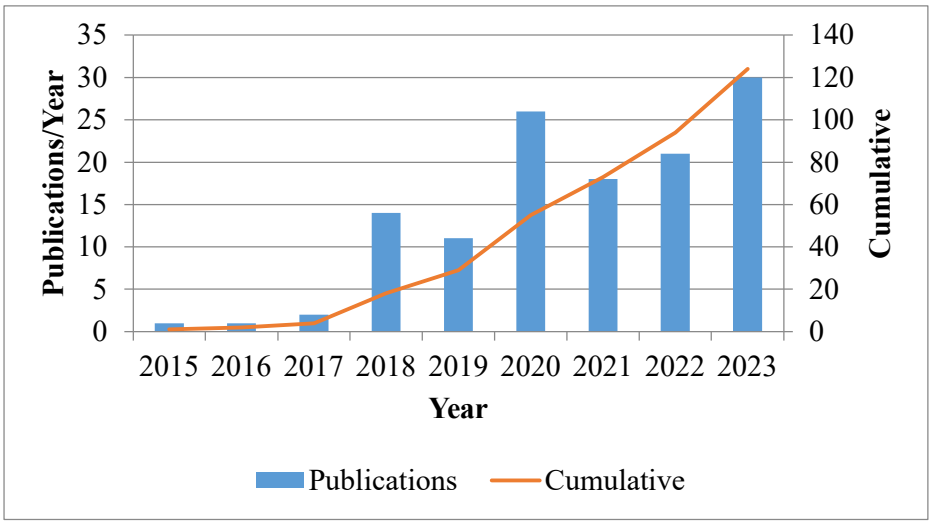


Figure 1: Distribution of Publications during 2013-2023

5.2 Objective 2.2 Authorship Pattern and Degree of Collaboration

The Table 2 shows the "Authorship Pattern" and "Degree of Collaboration" (DC) in research in roles of libraries in the
sustainable development goals during 2015-2023 globally. The table indicates that the degree of collaboration i.e., DC= 86/ (86+38) = 0.69.

Table 2: Authorship Pattern and Degree of Collaboration

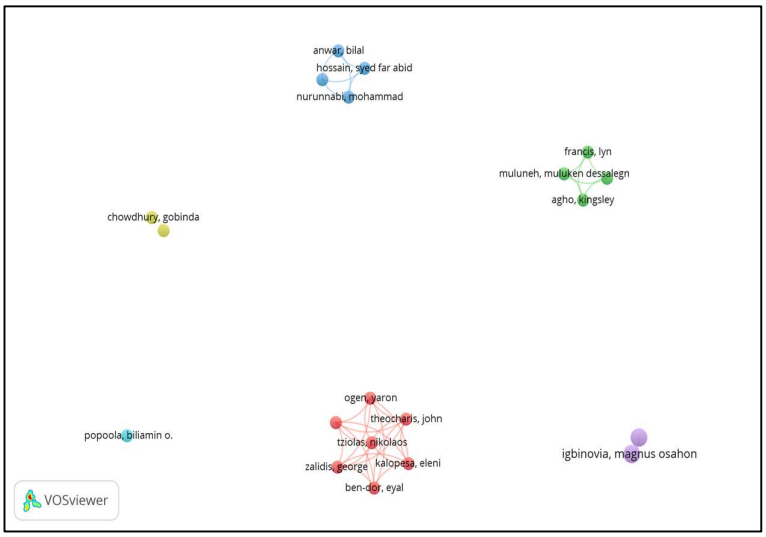
Authorship Pattern		
Number of One Authored Publications	38	Degree of Collaboration (DC)
Number of Two Authored Publications	40	0.69
Number of Three Authored Publications	20	
Number of Four Authored Publications	16	
Number of Five Authored Publications	5	
Number of more than Five Authored Publications	5	
Total No. of Publications(N)	124	
Number of Co-authored Publications (Nm)	86	

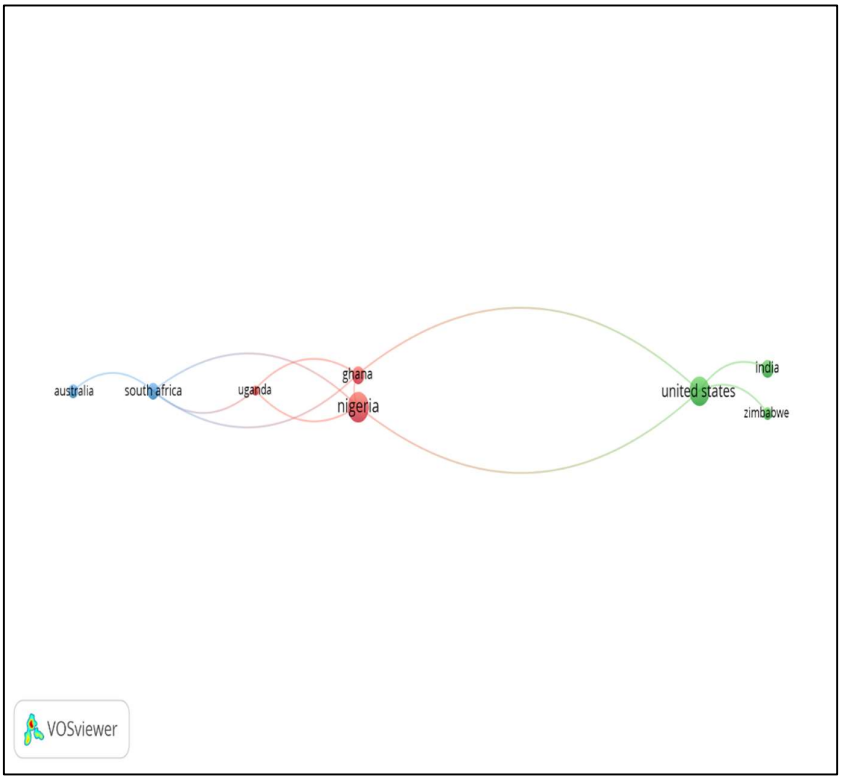
Objective 2.3 Co-authorship of authors and co- authorship of countries

Figure 2 was created to visualize the co-authorship of authors using VOSviewer. The figure is generated taking the type of analysis as co-authorship and author as the
unit of analysis. Taking the full counting algorithm and the maximum number of authors per document as 25, 25, the number of authors connected is found to be 20 with the minimal number of documents of an author as 1 and the minimum number of citation of an author as 15. For these 20 authors out of 280 total authors, the co-authorship links with other authors are calculated. The circles (or nodes) represent a single author and the size of the circle is directly proportional to the number of papers in the name of the author.

Six clusters are created from these writers. Authors grouped together with similar colors signify their close cooperation, and
the lines that connect them show that they have collaborated on projects together. Cluster 1(Red) has 7 authors like Eyal Bendor, Eleni Kalopesa,Yaron Ogen, John Theocharis, Nikolaos Tsakiridis, Nikolaos Tziolas and George Zalidis. Cluster 2 (Green) has 4 authors like Kingsley agho, Iyn Francis, Muluken Dess Muluneh and Virginia Stulz. Cluster 3 (Blue) has 4 authors Bilal Anwar, Syed Far Abid Hossain, Mohammad Nurunnabi and Zhao
Xi. Cluster 4(Yellow) has 2 authors like Gobinda Chowdhury and Rita Marcella & cluster 5 (Violet) has 2 authors Magnus Osah Igbinovia and cluster 6 (Black) has only 1 author i.e. Biliamin O Popoola.

Figure 3 shows the co-authorship of countries using VOSviewer software. Here, the picture is generated taking the analysis type as co-authorship and countries as the unit of the analysis. Considering minimum number of documents of each country as 3, 12 countries out of 51 countries were selected and for each 12 countries, the total link strength (TLS) of the co-authorship links with the countries was calculated and the countries with greatest TLS were selected. The figure displays the largest set of connected countries consisting of 8 countries and further grouped under 3 clusters. . The circles (or nodes) represent a single country and the size of the circle is directly proportional to the amount of papers in the name of the country. Cluster 1 (Red) consists of 3 countries such as Ghana, Nigeria and Uganda, cluster 2 (Green) consists of 3 countries including India, United States and Zimbabwe and. cluster 3 (Blue) consists of 2 countries i.e. Australia and South Africa.





6. Conclusion

The analysis of scholarly works concerning the function of libraries in sustainable development research across the years 2015 to 2023 indicates a noteworthy upward trend in interest and development in this domain. The data indicates a notable increase in publications over time, with the lowest production seen in 2015 and 2016. After a consistent upward trend, the greatest amount of publications was recorded in 2023. The Compound Annual Growth Rate or CAGR of 84.9% for the whole time highlights this rising trend even more. The year 2023 saw a significant rise in publications, accounting for 24.19% of the total. This suggests that research activity has peaked, either due to improved study methodology, higher funding, or raised awareness. The relevance of additional research and actions in this subject is highlighted by these findings, which underline the rising acknowledgment of libraries as vital players in sustainable development. A high level of cooperation among academics is revealed by the examination of authorship patterns and collaboration in research on the roles of libraries in achieving Sustainable Development Goals (SDGs) during the study period internationally, with a collaboration index or

degree of collaboration (DC) of 0.69 suggesting that a significant portion of the study in this area is carried out in collaboration with others, illustrating the topic's multidisciplinary character and the value of other points of view. A tight collaboration among multiple clusters of writers is revealed by the co-authorship analysis shown in Figure 2. These clusters imply that different research groups collaborate on initiatives within the topic of study. The patterns of collaboration between nations in the field are depicted in Figure 3. Strong worldwide networks for collaboration are shown by the grouping of nations into three broad groupings. For instance, Ghana, Nigeria and Uganda are included in Cluster 1 (Red), which suggests that these nations collaborate to a considerable extent. Cluster 2 (Green) represents yet another cluster of nations with strong links to research, including India, United States and Zimbabwe. Australia and South Africa are included in Cluster 3 (Blue), which shows a lesser yet significant degree of cooperation between these nations.

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