

Scientometric Analysis and Mapping of Scientific Articles on Green Libraries

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Abstract

The concept of 'Green library' is of recent origin and is under the process of evolution. The information available on 'Green Library' and 'Sustainability' is limited but continues to grow. Interconnected topics of green libraries and sustainability have received a great deal of coverage in recent years in various publications targeted toward world librarians. In this study, scientometric study is performed on the green libraries to explore further developments. In this regard, a total of 1644 documents were retrieved from the Web of Science (WoS) database using a set of relevant keywords to cover all published documents. The extracted documents were subjected to scientometric study including the contributed authors, publications, citations received, contributing countries and institutions etc.. From the data retrieved, period of 2013 to 2022. A detailed discussion on the science and developments in this field is provided including the potential applications of scientometrics. Being an evolving concept it is gaining popularity among the researchers, academicians, and library professionals all over the world.

Keywords: Green library; Sustainability; Scientometrics; VoS Viewer.

INTRODUCTION

With the advancement of science and technology your life styles are changing at a greater pace. Today, the demand for anything is

increasing rapidly, which should be recognized before the people talk about sustainable development in this fast changing world. It is nothing but the word 'Green', which is of a great significance for a healthy survival. It is observed that, over the past few years there are increasing interests towards green revolution in almost every sector and library is one of them. Libraries of today should incorporate green elements into their operations. In simple words, 'Green Library' is nothing but environment friendly or eco-library. 'Green' or 'Sustainable Libraries' are the structure that is designed, built, renovated, operated, or reused in an ecological and resource efficient manner. Basically, the 'Green Library Movement' has been emerged in the early 1990s and is gradually gaining popularity in the field of library and information science profession. Many of the library professionals of today are working on the idea of

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green library, which will use natural and regional construction material, minimize consumption of water and electricity, and also use environment friendly technology (Prafulladatta P. Kulkarni 2018). Bibliometric analysis of the publications in various disciplines has been published in numerous studies during the previous decade such as; thin film for Solar cell Fabrication (Anuja, 2020), Digital Literacy (Rajeswari, S & Praveena, K., 2019), VIT University (Dhanasekar, N & Sathya S., 2021) and Cloud Computing in Libraries (Rajeswari, S & Praveena, K, 2021). In this regard, the study is conducted on the assessment of the currently published research articles in the field of Green Libraries. However, no such bibliometric analysis was found to be conducted in the field of Green Libraries.

The bibliometric method is a prominent research tool that can systematically represent the nature of specific scientific disciplines by highlighting research hotspots and detecting research trends. The Web of Science (WOS), maintained by Thomson Reuters, is considered one of the main bibliographic sources of information. The study accumulated extensive bibliometric data on this field from the Web of Science database, between 2011 to 2022, and conducted a scientometric analysis using VOSviewer for analyzing the retrieved data. The leading journals, highly used keywords in the published articles, authors and papers with the highest citations, and relevant regions were all identified in the scientometric analysis. Our scientometric findings can help academics collaborate on research, form joint ventures, and implement sophisticated technologies for implementing Green Library system.

OBJECTIVES OF THE STUDY

1. To examine the growth on green libraries publications from 2013 to 2022 using the Web of Science platform.
2. To conduct an in-depth study on year-wise, ranking of journal, ranking of institution, country-wise, authorship pattern.

MATERIALS AND METHODS

For scientometrics analysis, the 'Web of Science' database, which is frequently used by researchers worldwide. WoS database is considered as one of the most reliable sources to get information on published work in a particular research area and hence, researchers have been widely using this

database and covers different type of publication namely peer-reviewed journal articles, proceedings editorials, book chapters and review papers. For the present work, the database of Web of Science to retrieve bibliographic data of literature on 'Topic = Green Library' from 2013 to 2022 and the number of 1644 records were gathered. Among the scientometric analysis approaches, nine techniques as follows Publication history, analysis on the variety of documents, country analysis, authors contribution analysis, keywords analysis, journal analysis, institution analysis, categories analysis, cited document frequency analysis. Consequently, these techniques have been implemented and important part of VoS viewer and Hist Cite softwares outcomes are represented.

RESULTS AND ANALYSIS

Data collected from web of science

The data collection of duration from 2013 to 2022 has been analysed. The outputs from this analysed shown in Table 1 indicate that Time span is 10 years. 1644 documents are collected from Web of Science, 8326 authors are contributing the documents following contributions by 775 Journal, 6344 Keywords, 49 countries and 2222 Institutions. Citation Score of the documents are 29122 Global citations, 56 Single authored documents, 0.197 Document per author, 5.08 Authors per documents, Co-authors per documents 5.89 and 5.23 Collaboration index.

Table 1: Main Information about the Sample Data

S. No.	Details about Sample	Observed Values
1	Duration	2013-2022
2	Time Span	10
3	Total No. of Records	1644
4	Total No. of Authors	8326
5	Contributed Journals	775
6	Contributing Countries	49
7	Contributing Institutions	2222
8	Citation	29122
9	Single-authored documents	56
10	Documents per Author	0.197
11	Authors per Document	5.08
12	Co-Authors per Documents	5.89
13	Collaboration Index	5.23

Evaluate the annual output of publications

Table 2 and Figure 1 reveals that the numbers of research documents published from 2013 to 2022 are gradually increased. According to the publication output from the Figure 1 the year wise distribution of research documents, 2022 has the highest number of research documents 228 being prominent among the 10 years output and it stood in first rank position. The year 2021 has 209 research document and it stood in second position. It is occupied by the third rank 168 research documents in the year 2020. 157 documents contributed in the 2014, 2016 and 2019 attained four place. The leading citation count in the year 2013 (4335 citation) and least in the year 2022 (312 citation). It clearly indicates on the fact that the increased publication rate is not bringing the increased citation rate.

Table 2: Annual contribution on Green libraries

Year	Articles	Percent	Citation
2013	140	8.5	4335
2014	157	9.5	3739
2015	143	8.7	4195
2016	157	9.5	4057
2017	136	8.3	2669
2018	149	9.2	3638
2019	157	9.5	2041
2020	168	10.2	2036
2021	209	12.7	2100
2022	228	13.9	312
	1644	100	29122

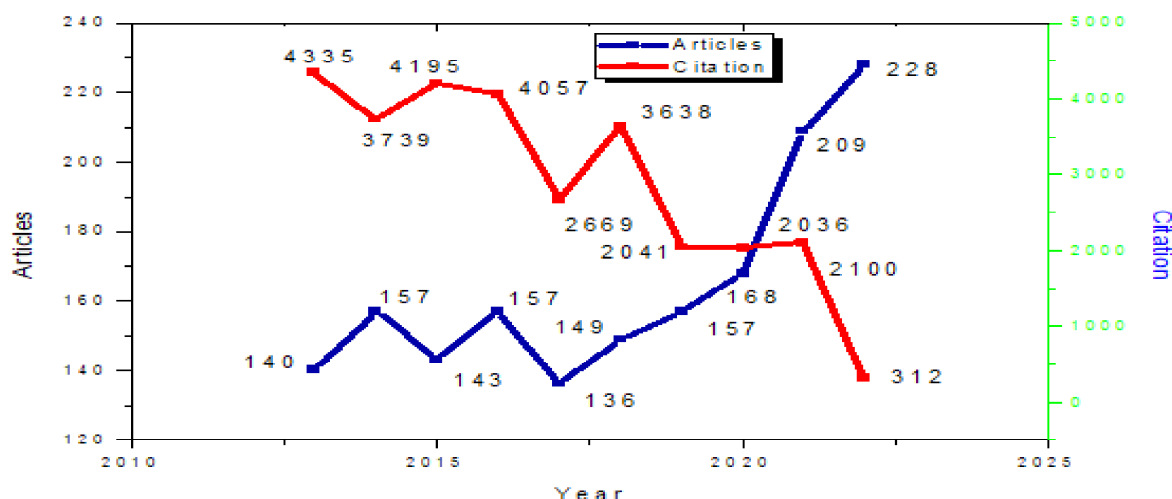


Fig. 1: Annual contribution on Green Libraries

Network visualization of Countries

Table 3 and Figure 2 shows the bibliometric map created in VoS viewer based on co-authorship and countries as unit analysis in network visualization mode. From the VoS viewer map, it is noticed that the citation link between countries with 49 nodes which were clustered into 8 groups. Each clusters are represent different colours. Cluster #1 represent began with India 173 documents have liked with

top countries are South Korea, and Iran. Cluster # 3 represent began with Germany 101 documents. Cluster #4 represent began with Peoples r china 440 documents have liked with USA, England and Japan. Cluster # 6 represent began with France 56 documents have liked with Italy. The density of the publication is indicated by the size of the nodes, while the strength of the collaboration is revealed by the thickness of the links.

Table 3: Cooperation among countries published the articles on Green Libraries (GL)

Ranking	Countries	cluster	Links	Documents	Citations
1	Peoples r china	4	36	440	8972
2	USA	4	45	414	9187

Table Cont..

3	India	1	21	173	2376
4	Germany	3	36	101	2409
5	England	4	32	95	1534
6	Japan	4	23	93	1208
7	South korea	1	19	65	1494
8	France	6	28	56	1781
9	Italy	6	22	54	1346
10	Iran	1	12	52	725

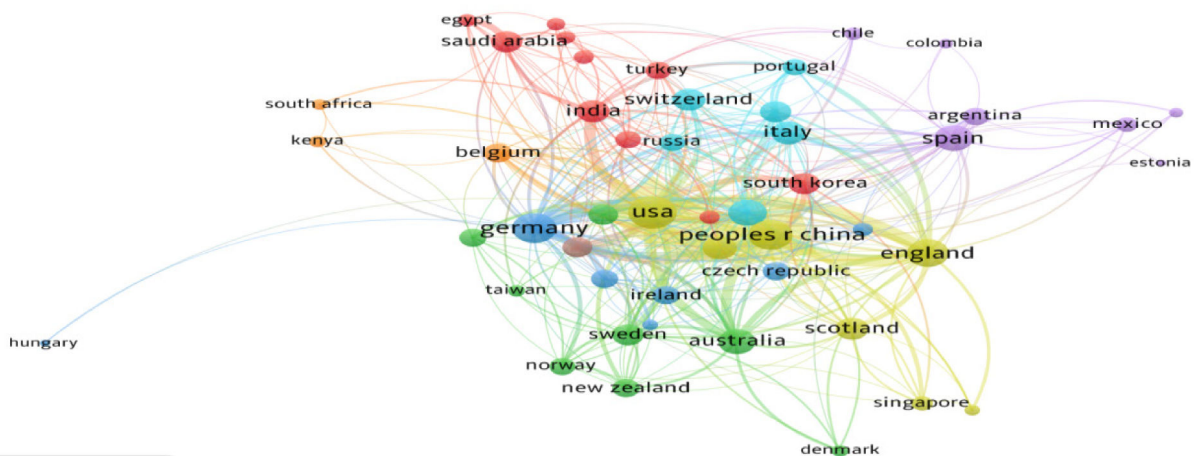


Fig. 2: Cooperation among countries published the articles on Green Libraries (Source: VOSviewer)

Network visualization of Authors

Authors analysis criterion represents the contribution of authors of scientific publications on Green Libraries and results of this analysis are provided in Figure 3. The Authors were only highlighted since it can be seen from the Figure that, Zhang Y rank the highest with 19 (409 Citation) literature published, followed by Wang L15 (327 Citation), Li X 12 (327Citation), Wang J 12 (178Citation), Li J 11(173Citation), Li Y10 (204 Citation) and other remaining publication below 10 records.

Table 4 Authors Published on Green Libraries (GL)

Ranking	Authors	Articles	Citation
1	Zhang Y	19	409
2	Wang L	15	327
3	Li X	12	345
4	Wang J	12	178
5	Li J	11	173
6	Li Y	10	204
7	Wang Y	9	105
8	Chen Y	8	73
9	Zhang J	8	83
10	Li L	7	88

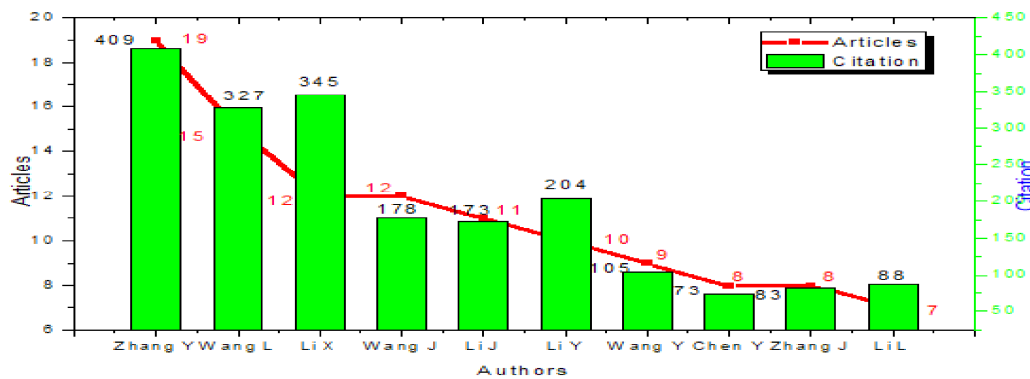


Fig. 3: Author productivity on Green Libraries

Ranking of journals

Table 5 and Figure 4 presented the ranking of Journal with numbers of literature published on the subject. The Journals were only highlighted since it

can be seen from the Figure that, Plos One rank the highest with 45 (1043Citation) literature published, followed by Scientific Reports 26 (551 Citation), ACS Synthetic Biology 24 (472Citation) and other remaining publication below 20 records.

Table 5 Journal published on Green Libraries (GL)

Ranking	Journal	cluster	Links	Documents	Citations
1	Plos One	7	3	45	1043
2	Scientific Reports	8	4	26	551
3	ACS Synthetic Biology	9	7	24	472
4	Chemistryselect	3	3	18	116
5	Green Chemistry	6	2	18	501
6	RSC Advances	3	7	18	348
7	Frontiers in Microbiology	7	1	17	113
8	Bmc Genomics	1	1	16	526
9	Tetrahedron Letters	3	2	13	280
10	ACS Sustainable Chemistry & Engineering	5	3	12	137

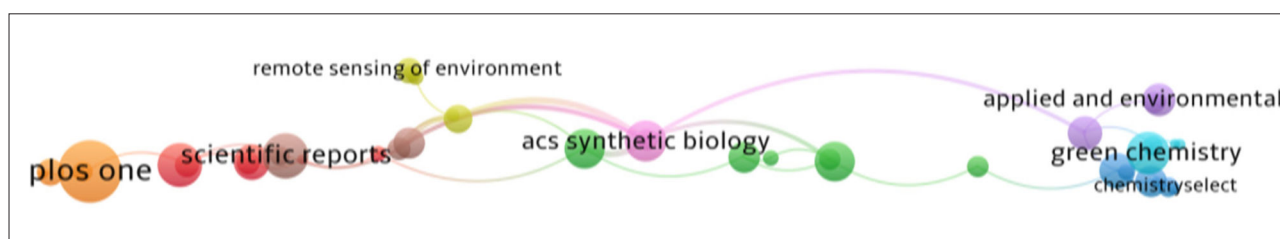


Fig. 4: Journal published on Green Libraries (Source: VOSviewer)

Ranking of Institutions

Institutional analysis facilitates the researchers to identify the dominating institutions working actively in the specified research domain for their postdoctoral studies, research exchange activities and study tours. Institutions have

participated in the studies related to Green Libraries during the period of 2013 to 2022. Top institutions are shown in Figure 5 and table 6. Chinese AcadSci is the largest contributor publishing 45 documents. Chinese AcadAgrSci is the second position 25 documents and remaining are below 20 documents.

Table 6 Institution published on Green Libraries (GL)

Ranking	Institution	cluster	Links	Documents	Citations
1	Chinese AcadSci	5	22	45	1930
2	Chinese AcadAgrSci	14	9	25	534
3	Univ Chinese AcadSci	5	4	18	324
4	Univ Tokyo	12	5	18	325
5	Nanjing AgrUniv	8	6	17	254
6	UnivCalif Berkeley	13	15	16	572
7	Univ Florida	7	10	16	294
8	Tsinghua Univ	4	4	14	984
9	UnivCalif San Diego	13	5	14	388
10	RheinWestfalTh Aachen	7	3	12	120

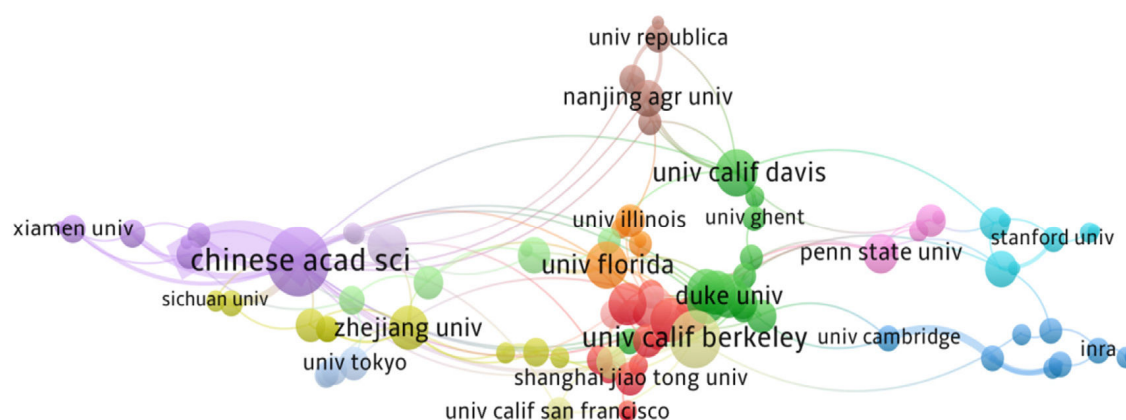


Fig. 5 Institution published on Green Libraries

CONCLUSION

The scientometric study has brought together the knowledge on publications related to Green Libraries are available from the Web of Science (WoS) database. Scientific publications followed exponential trend during the period of the study 2011-2022. It was performed to visualize panorama of publications, the most prominent authors, institutions, countries, research categories, and journals. These indicators are intended to facilitate researchers in analysis of existing literature which could improve the research direction for better scientific contribution. The result of this study may be effectively used by academia as well as policy-makers, who would like to explore appropriate methods to promote the technologies.

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