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SOLAR POWER GENERATION RESEARCH OUTPUT THROUGH SCOPUS: A SCIENTOMETRIC STUDY

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ABSTRACT

This paper aims to quantitatively analyze the growth and improvement of solar power generation in the world in terms of publication output as reflected in Scopus database during 2000 to 2017 (18 years). Total of 22,805 papers published by the researchers in the field Solar Power Generation (SPG) in various researchers to various domains. Subject category Engineering topped with 46% of documents, in source type category Journals was 61.5% as document type and the most preferred journals were Solar Energy 4.7%. Country based analysis USA ranked 1st with 16.3% publications followed by China 14.7% and India ranked 3rd with 7.6%.

KEY WORD: *Solar Energy, Solar power, Solar Power Generation (SPG), Authorship pattern, Scientometric Analysis, Year wise.*

INTRODUCTION

Today, about four-fifth of India's need for electricity are met by fossil fuels which may best supply our needs of electricity for another 100-150 years. Sukhatme has vague that if renewable sources are to meet the whole demand in upcoming, solar power would provide ~ 47.4 per cent energy needs of the country. Ministry of New and Renewable Energy Government of India has launched Jawaharlal Nehru National Solar Mission (JNNSM) in 2010 with an ambitious target of 20,000 MW of electricity by 2022 and with the objective to establish India as a global leader in solar energy.

REVIEW OF LITERATURE

A few studies are reported in literature which has deal with solar Power Generation and allied areas. Garg and Sharma have Analysis a scientometric study of globe solar power literature from 1970-1984 using Engineering Index as the database.

Dong et al... have undertake a bibliometric study of solar power research for 20 years from 1991-2010 using Web of Science database.

Sinha examined trends in global solar photovoltaic research for two different periods 1981-1988 and 2001-2008 and solar photovoltaic research in India during 2000-2009 using SCOPUS database. These studies have used keywords which were general terms like "solar power", "solar generation", "solar cell", "solar photovoltaic", "solar cell material" etc. Therefore, the data retrieve through these keywords may not be all encompassing. The present study examines Specific Key Word "Solar Power Generation" covers a period of Eighteen Years from 2000 - 2017 retrieve the data from Solar Power Generation.

Scope

In this present study attempt to find out publication of Global Researcher in the field of Solar Power Generation. The Study is based on quantitatively examination growth and development of solar power generation globe term of publication reflects in Scopus Database during the period 2000 – 2017.

Objective of the Study

The Objective of the study is to present Growth Literature and makes the Quantitative assessment of status investigation of Solar Power Generation (SPG) research in various features.

The Specific Objectives are

- To measure the Year wise growth of Publication
- To measure the Author wise Contribution
- To measure the Document wise Distribution of Publication
- To measure the Subject wise Distribution of Publication
- To measure the Country wise Distribution of Publication
- To measure the Language Wise Distribution of Publication

Methodology

The data source of this study was Scopus (http: //www. scopus.com) multidisciplinary database and keywords obtainable in the fields title, keyword and abstract was used to recover the bibliographic records. Scopus database for the period 2000 to 2017, nearly 22805 bibliographic records of contribution in the field of Solar Power Generation over the period of 18 years. The researcher applied the search string "Solar Power Generation" that has used for the data extraction, total 22,805 records downloaded and analyzed by using MS Excel software applications as per the objectives of the study. The study aims to analyze the areas of research concentration on Solar Power Generation (SPG) during the year 2000-2017.

RESULT AND DISCUSSION

Year-wise distribution of Publications

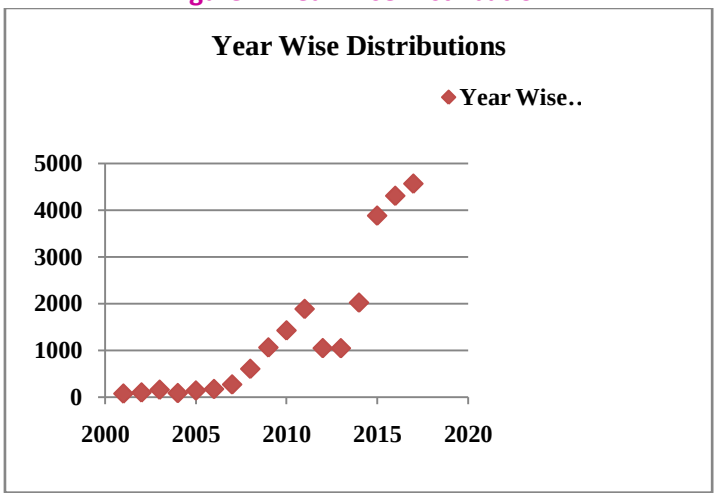
During the study period 2000 to 2017, the year wise analysis reflected with average 1267 papers per year. From the year 2000 the Solar Power Generation (SPG) Published articles in Scopus Database gradually increased. But 2012 and 2013 publishing article decreased. After the year publishing article highly increase Solar Power Generation field and topped with 4567 papers in the year 2017 and the lowest only 86 in the year 2000.These trend shows that Solar Power Generation (SPG) Publications have gradually increased. (Table 1 and Figure 1 show that the 18 years of contributions).

Table 1: Year wise distribution of publications

Sl.No	Year	Records	22805 %	Cumulate	Cumulate %
1	2000	86	0.38	86	0.377
2	2001	64	0.28	150	0.658
3	2002	88	0.39	238	1.044
4	2003	147	0.65	385	1.688
5	2004	75	0.33	460	2.017
6	2005	130	0.57	590	2.587
7	2006	162	0.71	752	3.296
8	2007	260	1.14	1012	4.438
9	2008	595	2.61	1607	7.047
10	2009	1054	4.62	2661	11.668

11	2010	1419	6.22	4080	17.891
12	2011	1880	8.24	5960	26.135
13	2012	1039	4.56	6999	30.691
14	2013	1037	4.55	8036	35.238
15	2014	2015	8.84	10051	44.074
16	2015	3881	17.02	13932	61.092
17	2016	4306	18.88	18238	79.974
18	2017	4567	20.03	**22805**	**100**

Figure 1: Year wise Distribution



Author Wise Contribution

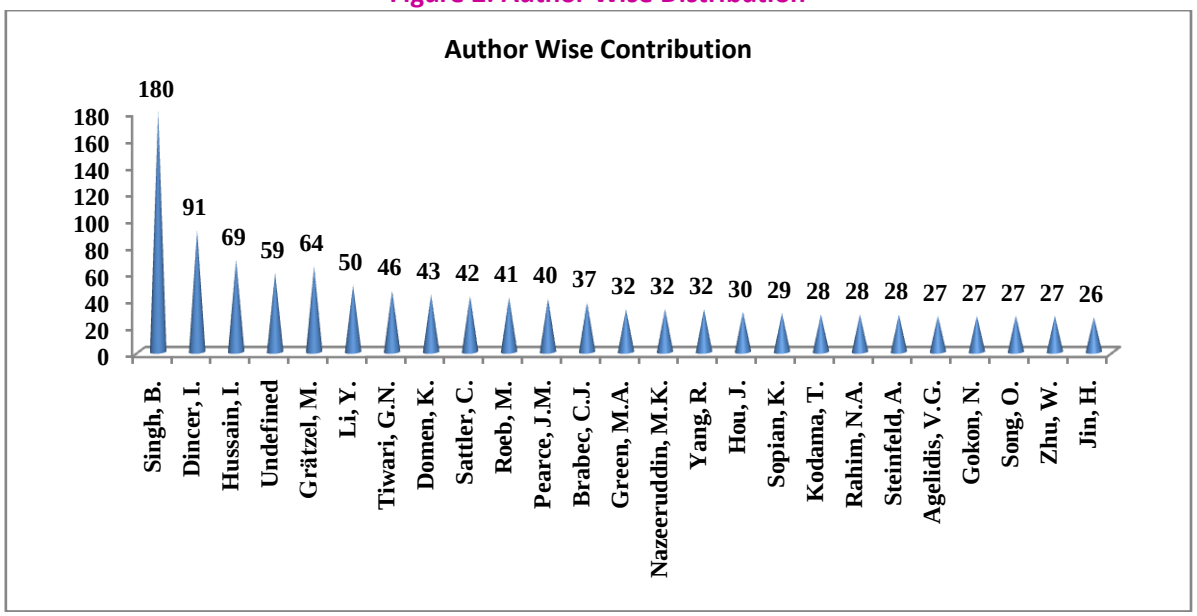
Contribution of Author Wise show, First Ranked Singh, B. publish 180 articles, Dincer I Published 91 articles and Hussain, I published 69 articles in the field of Solar Power Generation (SPG). The Total 59 articles without author name mentioned as undefined. (Table 2 Figure 2 Show Top 25 Authors Contributions).

Table 2: Author Wise Contribution

Sl.No.	Author	Publications	%
1	Singh,B	180	5.04
2	Dincer I	91	2.54
3	Hussain, I	69	1.93
4	Gratzel, M	64	1.79
5	Undefine	59	1.65
6	Li,Y	50	1.40
7	Tiwari, G.N.	46	1.28
8	Domen K	43	1.20
9	Sattler,C	42	1.18
10	Roeb,M	41	1.15
11	Pearce, J,M	40	1.20
12	Brabec, C.J	37	1.04
13	Green, M.A	32	0.90
14	Nazeeruddin, M.K	32	0.90
15	Yang, R	32	0.90
16	Hou, J	30	0.84
17	Sopian, K	29	0.81

18	Kodama, T	28	0.78
19	Rahim, N.A	28	0.78
20	Steinfeld, A	28	0.78
21	Agelidis, V.G	27	0.76
22	Gokon, N	27	0.76
23	Song, O	27	0.76
24	Zhu, W	27	0.76
25	Jin, H	26	0.73

Figure 2: Author Wise Distribution



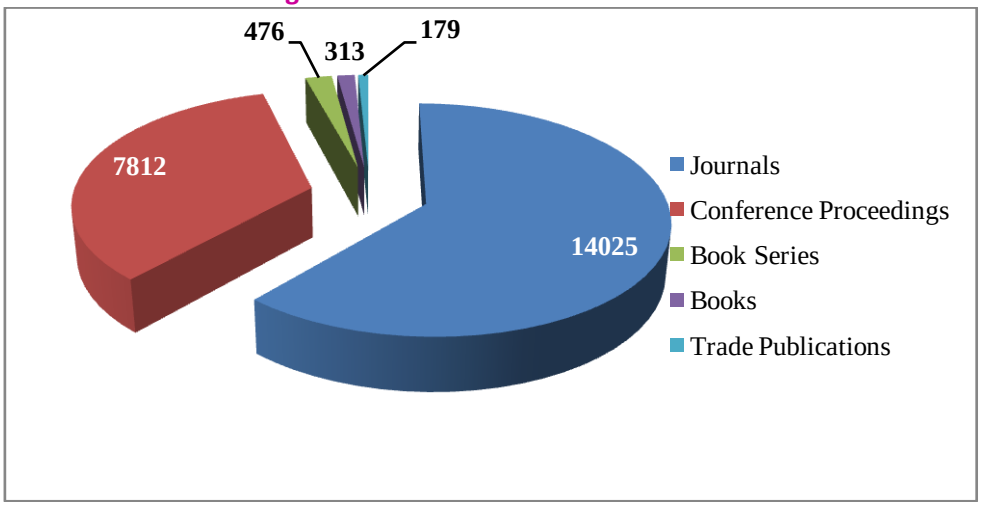
Document Wise Distribution

The Global Level Solar Power Generation (SPG) Published in Scopus Database (2000 – 2017) was produce 22,805 Publications. The maximum Number of Publication was Journals 14025 (61.50 %) , Conference Proceedings 7812 (34 %) , Book Series 476 (2 %), Books was published 313 (1.4 %), and Trade Publications was 179 (0.8 %) . (Show the Document wise Distribution in Table 3, and Picture 3)

Table 3: Document wise Distribution

Sl. no.	Document Type	Publications	%
1	Journals	14025	61.50
2	Conference Proceedings	7812	34.26
3	Book Series	476	2.09
4	Books	313	1.37
5	Trade Publications	179	0.78
Total		**22805**	**100**

Figure 3: Document wise Distribution



Subject Wise Contribution

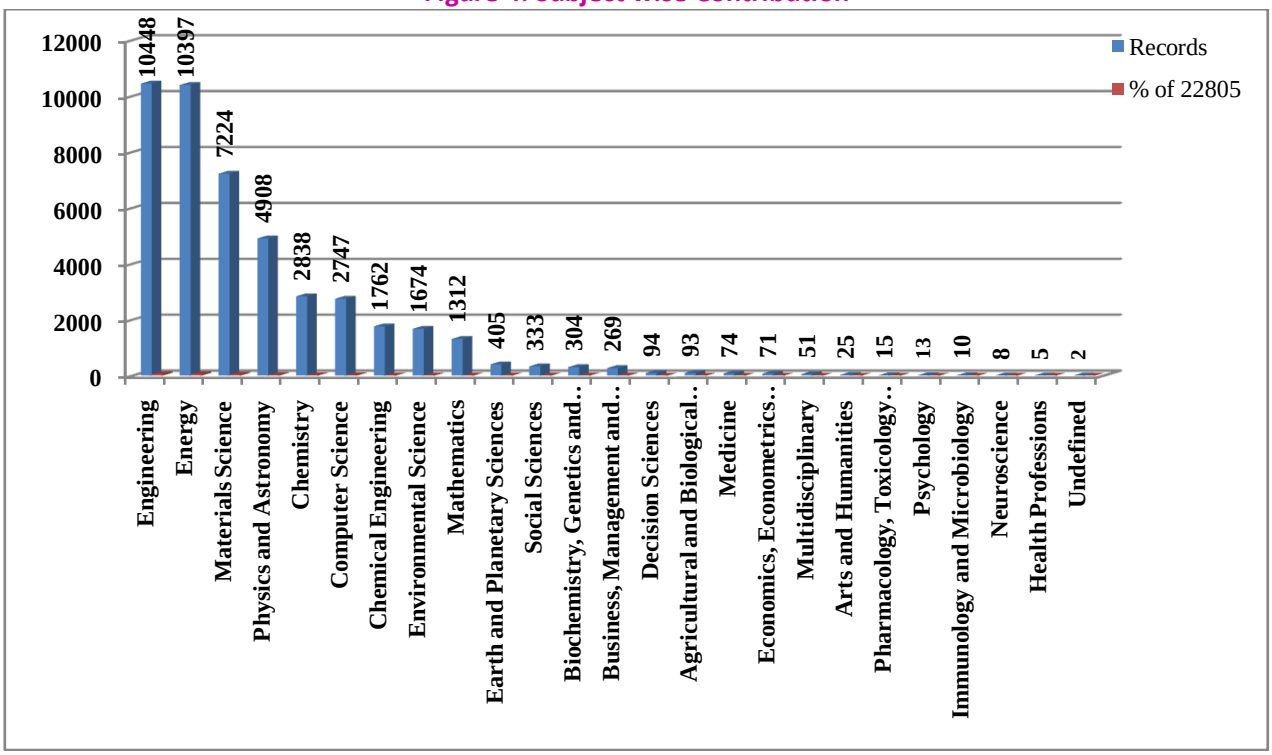
The global Solar Power Generation (SPG) has produced 25 research areas in the Scopus database classifies papers it indexes Engineering 10448 (23.176%), Energy 10397 (23.062%), Materials Science 7229 (16.024 %) and so on. (Table 4 and Figure 4 clearly show the Research Areas/ Subject wise contributions)

Table 4: Subject Wise Contribution

Sl.No	Research Area	Records	%
1	Engineering	10448	23.176
2	Energy	10397	23.062
3	Materials Science	7224	16.024
4	Physics and Astronomy	4908	10.887
5	Chemistry	2838	6.295
6	Computer Science	2747	6.093
7	Chemical Engineering	1762	3.908
8	Environmental Science	1674	3.713
9	Mathematics	1312	2.910
10	Earth and Planetary Sciences	405	0.898
11	Social Sciences	333	0.739
12	Biochemistry, Genetics and Molecular Biology	304	0.674
13	Business, Management and Accounting	269	0.597
14	Decision Sciences	94	0.209
15	Agricultural and Biological Sciences	93	0.206
16	Medicine	74	0.164
17	Economics, Econometrics and Finance	71	0.157
18	Multidisciplinary	51	0.113
19	Arts and Humanities	25	0.055
20	Pharmacology, Toxicology and Pharmaceutics	15	0.033
21	Psychology	13	0.029
22	Immunology and Microbiology	10	0.022
23	Neuroscience	8	0.018
24	Health Professions	5	0.011

25	Undefined	2	0.004
Total		**45082**	**100**

Figure 4: Subject wise Contribution



Country wise Distribution

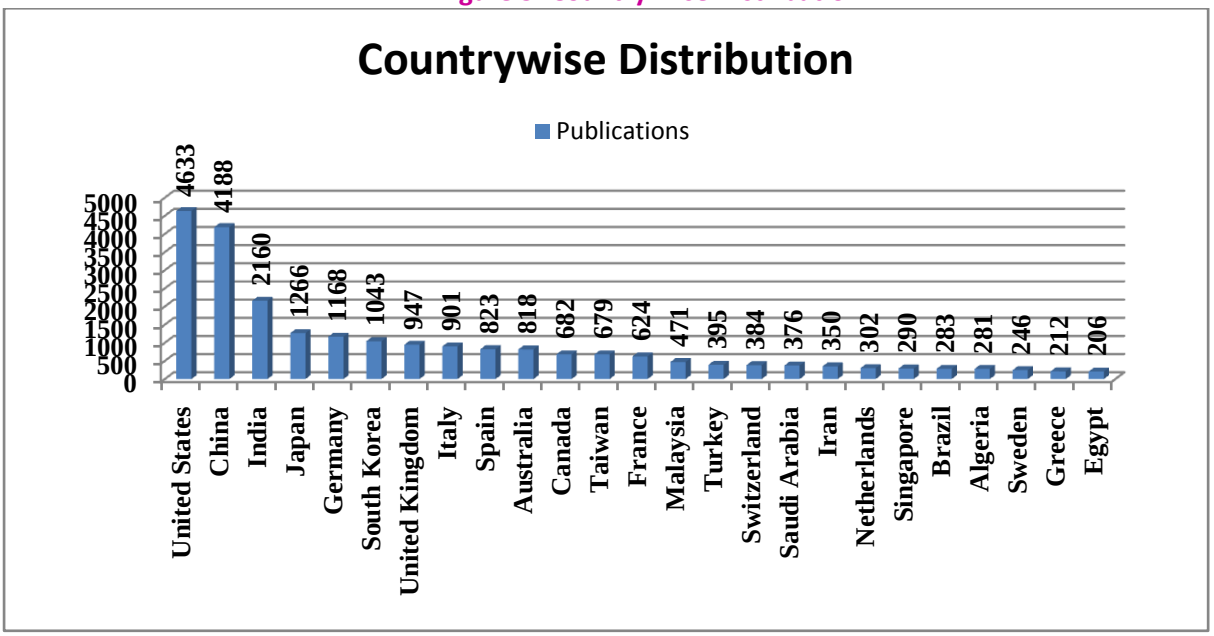
The Country wise distribution was 138 different Countries with 20885 articles in the field of Solar Power Generation (SPG) in Scopus Database. United States topped with 4633 (20.32 %) publications, China 4188 (18.36 %) and India published 2160 (9.47 %) publication with 3rd position. (Table 5 and Figure 5 show the top 25 countries contribution in the field).

Table 5: Country wise Distribution

Sl. No	Country	Publications	%
1	United States	4633	20.32
2	China	4188	18.36
3	India	2160	9.47
4	Japan	1266	5.55
5	Germany	1168	5.12
6	South Korea	1043	4.57
7	United Kingdom	947	4.15
8	Italy	901	3.95
9	Spain	823	3.61
10	Australia	818	3.59
11	Canada	682	2.99
12	Taiwan	679	2.98
13	France	624	2.74
14	Malaysia	471	2.07
15	Turkey	395	1.73

16	Switzerland	384	1.68
17	Saudi Arabia	376	1.65
18	Iran	350	1.53
19	Netherlands	302	1.32
20	Singapore	290	1.27
21	Brazil	283	1.24
22	Algeria	281	1.23
23	Sweden	246	1.08
24	Greece	212	0.93
25	Egypt	206	0.90

Figure 5: Country wise Distribution



Language wise Distribution

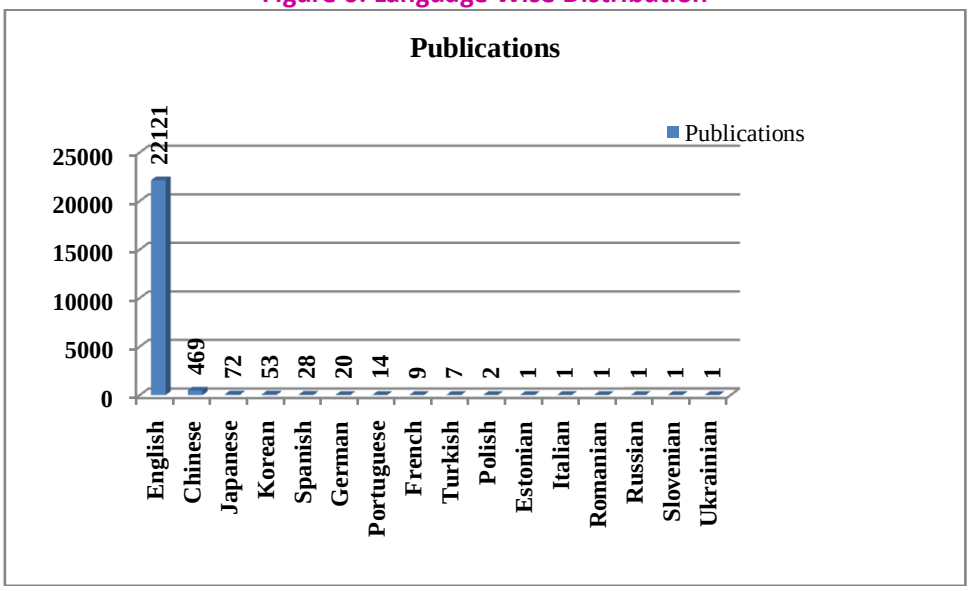
Among the language wise distribution in Solar Power Generation (SPG) publication in Scopus database during 2000 to 2017, English Language topped with 22121 (97 %) publications followed by Chinese with 469 (2.057 %) , Japanese 72 (0.316 %) and so on . (Table 6 and Figure 6 show that language wise distribution).

Table 6: Language Wise Distribution

Sl.No.	Language	Publications	%
1	English	22121	97.00
2	Chinese	469	2.057
3	Japanese	72	0.316
4	Korean	53	0.232
5	Spanish	28	0.123
6	German	20	0.088
7	Portuguese	14	0.061
8	French	9	0.039
9	Turkish	7	0.031
10	Polish	2	0.009
11	Estonian	1	0.004

12	Italian	1	0.0045
13	Romanian	1	0.004
14	Russian	1	0.004
15	Slovenian	1	0.004
16	Ukrainian	1	0.004
17	Undefined	4	0.018

Figure 6: Language Wise Distribution



CONCLUSION

This Paper quantitatively analysis the contribution made by the Solar Power Generation (SPG) Research Literature, as reflected in Scopus Database. During 18 years period the United States is lead in Solar Research publication and ranked 1st with 20.32 % followed by China 18.36 % and India ranked 3rd 9.47 %. Among the languages English topped 97 % publication followed by Chinese 2.05 % and so on. Year wise analysis shows in Solar Power Generation field topped with 4567 papers in the year 2017 and the lowest only 86 in the year 2000.These trend shows that Solar Power Generation publication gradually increased.

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