Citations and Publications on Disaster Management Research during 2012-2021: A Scientometric Study

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ABSTRACT-

The present study has analyzed nearly the year-wise growth of citations and publications on Disaster management research publications during the 10-years study period between 2012 to 2021 with 14841 research publications and 164179 citations. From the study, a maximum of 2248(15.15%) research publications are contributed in the year 2021. The authors a maximum of 43(16.17%) research publications are contributed by Shaw, R., and the United States. The RGR is 2.94 in the year 2012 and 0.16 in the year 2021. This study confirmed that the RGR is decreasing trend. At the same time doubling time was found that 0.24 in the year 2012 and 4.24 in the year 2021 and it is confirmed that doubling time is an increasing trend. For the subjects, a maximum of 4635(43.37%) research publications are contributed by Earth and Planetary Sciences, and the authorship pattern with 2246 research publications are contributed by single authors, and the average degree of collaboration is 0.85. The average CC is 0.57, the average CI is 3.18, and the average MCC is 3.18. The time series analysis statistical application will be expected in the year 2025 to be around equal to 14,424 and in the year 2030 around equal to 20,894. So that time serious analysis confirmed that the publications are increasing trend. The document type a maximum of 9984(67.27%) research publications are contributed by articles, and the journals a maximum of 721(25.81%) research publications are contributed by the Natural Hazards. The Institutions have a maximum of 265(19.333%) contributions to be Chinese Academy of Sciences, and the country has a maximum of 2774(23.23%) research publications contributed by the United States. The highly cited papers of 768 citations are received for the publication of Lindell, M.K., and Perry, R.W. (2012) The Protective Action Decision Model: Theoretical Modifications and Additional Evidence, Risk Analysis, 32(4):616-632.
Keywords: Co-authorship Index, Collaborative Co-efficient, Collaborative Index, Degree of Collaboration, Modified Collaborative Co-efficient,

INTRODUCTION

Disaster Management can be defined as the organization and management of resources and responsibilities for dealing with all humanitarian aspects of emergencies, in particular, preparedness, response, and recovery in order to lessen the impact of disasters. It means that all such measures should be taken so that hazards cannot take the form of disasters. Since we cannot prevent the coming of many natural hazards but can reduce their harmful effects through

proper management so that the loss of life and property can be minimized. As we know, the present danger is not from natural disasters, but human disasters. Disasters are the consequences of natural or human hazards. Therefore, through disaster management, we can prevent hazards from being turned into a disaster. Disaster management broadly encompasses the management before, during, and after a disaster. It simply means planning various steps to reduce the aftermath of a disaster, planning an effective response system, planning rehabilitation, and also preparing disaster-resilient communities in our very own layman's language. This management can be categorized into three steps:
1) **Pre-disaster management** It is related to rescue even before any possible disaster arises. The most important purpose of this is to mitigate human loss. That also includes the development of information technology systems; mobilization of resources for necessary action, assessment of disaster, and issuance of a warning to the people through media, radio, etc. transporting the people to a safe place in case of disaster occurrence, etc.
2) **Management during Disasters:** This is one of the important phases which depends on the level of the pre-disaster management phase. The process of quick action and the help of the victims of the disaster-prone areas, transporting them to safe areas are the base of this. In this, food, clothing, and health facilities are also provided to the people.
3) **Post-disaster management:** In this particular phase, redevelopment and reconstruction of affected areas are done. Also, the administration is bound to help affected people by providing them with employment or compensation.

Scientometric Study

The application of mathematical and statistical methods to books and other media processes of written communication and the nature and course of a discipline is known as bibliometric. In continental Europe, the term popular is Scientometric it considers publication cannot and citation count as two bibliometric parameters which are used in scientometric research. Today bibliometrics has emerged as a subject in its own right with various facts. The other developed area of bibliometrics is informetric; Info metrics is that branch of knowledge that employs mathematical and statistical techniques to quantity documents or their components and concepts: measure their growth, propagation, use, and obsolescence, establish knowledge governing these factors.

Scientometrics is concerned with measuring the degree to which knowledge progresses. It was first defined by Nalimov and Mulcjenko (1971) as "the quantitative method of research on the development of science as an informational process". According to Tague-Sutcliffe (1992), scientometrics is "the study of the quantitative aspects of science as a discipline or economic activity. It is part of the sociology of science and has application to science policy-making. It involves quantitative studies of scientific activities, including, among others, publication, and so overlaps bibliometric to some extent". Hess (1997) defined scientometrics as the "quantitative study of science, communication in science and science policy". Some of the main themes of scientometrics are the measurement of impact, citation analysis, mapping science, and, the use of scientific indicators for policy and management context.

REVIEW OF LITERATURE

Sweileh (2019) analyzed the health-related literature on natural disasters from 1900 to 2017 with 9073 documents and it received 97,605 citations and the average citation per paper was 10.8 citations, the United States of America contributed a maximum of 3127 (34.5%) publications. The Prehospital and Disaster Medicine journal published the most 636(7.0%) publications. The Sichuan University and its affiliated hospital contributed to a maximum of 384(7.0%) publications in the field. Dhawan et.al (2021) analyzed the global cyber security research output (1998-2019) using the Scopus database to discover underlying trends and developments at the global, national, institutional, and individual levels using bibliometric indicators, the cyber security

research registered a 46.41% growth with an average citation impact of 5.05 citations per paper. Nearly 15% of the total papers were funded by external agencies. The top 10 countries alone accounted for the bulk (76.52%) of output in the subject. The United States leads this list with the highest publication productivity (43.75% of global output). Canada leads the world in terms of the relative citation index (1.47). International collaboration has been a major driver of growth in cybersecurity research.

Vivekanandhan et.al (2016) analyzed the pollution control research output from the SCOPUS database during the period of 1985-2014. They analyzed his study's growth of literature, number of citations, and bibliographic distribution. Further, they analyzed scientometric tools such as authorship pattern, Citation Index, Collaborative Coefficient, modified collaborative coefficient, and block year-wise publications. Maximum numbers of 13692 (25.43%) publications are contributed in the 6th block of 2010 – 2014 and block year-wise. The average degree of collaboration was 0.72.

Sudhakar and Thanuskodi (2018) analyzed the scientometric analysis of Marine Pollution Bulletin Journal research publications from 2008 to 2017 with 5416 publications. A maximum number of 905(16.71%) publications are contributed in the year 2017. This study identified RGR has decreased from 0.63 to 0.18 and at the same time doubling time has decreased from 1.10 to 3.85. The degree of collaboration was 0.94, which clearly indicates its dominance of multiple authors' contributions. Liu J. was the top-ranked author with 49 articles. A maximum number of 0(12.06%) publications are contributed by the United States.

Dhanya and Raja (2017) analyzed the Indian research output of industrial pollution indexed in the Web of Science database with 805 publications during 2007-2016 which received 9699citations. Kumar A and Kumar R are the most productive authors with 13 (1.6%)

publications. The most productive journal is Environmental Monitoring and Assessment with 103 (12.8%) publications and the maximum of articles are published in the year 2016 with 113(14%) publications. The relative Growth Rate is 0.16 in the year 2016 and Doubling Time is 4.58 in the year 2016.

Kausalya and Jeyshankar (2019) examine the Scientometric analysis of disaster management research output during 2009-2018 from the SCOPUS database with 10498 publications. The average year-wise distribution of articles in disaster management literature was 1049.8 publications and the year 2018 contributed the highest number of 13.3%. From the study, RGR for the year 2010 was 1.48 and 0.11 in the year 2018. The CAI exceeds the average number of publications during the year 2009- 2013 and 2015 for unique authored papers. The degree of collaboration value in the field of Topology literature is 0.81which is greater than 0.50; this demonstrates multiple authors 'predominance towards Disaster Management Literature. Straight-line equation findings predict the number of publications in 2023 as 2539 and for the year 2028 as 3284 which concludes an increasing pattern in the future growth of articles.

Ravichandran and Vivekanandhan (2021) examine the Scientometric analysis of wastewater management research publications during 2010-2019 from the Scopus database. The study identified that a maximum of 2842(14.31%) research publications with 19857 citations are contributed in the year 2019. Ngo, H.H. contributed a maximum of 101(0.51%) research publications, a maximum of 19355 articles were contributed by joint authors and the average degree of collaboration was 0.97. A maximum of 2102(10.58%) research publications are contributed in Bioresource technology, ministry of education, china with 863(22.32%) research publications and China has contributed the maximum of 5919(29.80%) research publications.

Ravichandran and Vivekanandhan (2021) analyzed the wireless sensor network research output in India during 2010-2019 from the SCOPUS database with 11775. This study identified that the maximum number of 2058(17.48%) publications are contributed in the year 2019 the and compound annual growth rate was 5.44. This study identified that the relative growth rate was decreasing trend and doubling time was increasing trend. The average degree of collaboration was 0.96 and CAI was decreasing trend for more than three authors from 1st block year (106.71) to 2nd block year (97.39).

OBJECTIVES OF THE STUDY

- ❖ To identify and analyze the growth rate of world research in disaster management research output publications
- ❖ To analyze the author's, relative growth rate and doubling time research output publications
- ❖ To analyze the subject and authorship pattern of research output publications
- ❖ To identify the degree of collaboration and collaborative measure (CC, CI, MCC)
- ❖ To analyze the co-authorship index and time series research output publications
- ❖ To know the global research output of document-wise distribution of publications
- ❖ To assess the institution-wise and journals research concentration;
- ❖ To examine the country-wise distribution of publications;
- ❖ To analyze the Funding Agencies supported disaster management research
- ❖ To analyze highly cited papers of research publications

METHODOLOGY

The study retrieved and downloaded 10 years of publications data on the global output in Disaster management research output from the Scopus database covering the period of 2012-2021

The present study aims to analyze the research output of researchers in the field of Disaster management research output. The growth rates of output in terms of research productivity were analyzed during the study period. The authorship pattern and author productivity are examined to identify the pattern of research contribution in the field of Disaster management research output. (TITLE-ABS-KEY ("Disaster management") AND PUBYEAR > 2011 AND PUBYEAR < 2022 AND PUBYEAR > 2011 AND PUBYEAR < 2022) The data have been extracted and tabulated in the form of tables and figures and it is also analytical in nature strengthening the empirical validity due to the application of suitable statistical tools. The data was collected on 18.04.2022 and the micro soft excel format was downloaded.

ANALYSIS AND INTERPRETATION OF DATA

Citations per Publication (CPP)

CPP has been broadly used in the scientometric assessment to stabilize the variation in volumes of literature published by different institutions/countries etc., Bharvi and Khaiser (2016) and Sandhya (2016). From this study, CPP has been used to assess the impact of research publications for the years, countries, institutes, and authors for the below-mentioned formula,

$$CPP = \frac{\text{Total Citations of a Country or Institution}}{\text{Total of Publications}}$$

h-Index

Hirsch (2005) proposed the h-index is one of the alternatives to the standard bibliometric indicators for single scientists, it is defined in table 1. A scientist has index h if h of his or her Np papers have at least h citations each and other papers (Np – h) have ≤ citations each.

Ye (2009) found that the Glanzel-Schubert (2007) model was better than the Hirsch and Egghe-Rousseau (2006) model to estimate the *h*-index of countries and other units. Gupta and

Table 1: Various methods of *h*-index

Model	Equation	Description
Hirsch	$h = \sqrt{(C / a)}$	C = Total Citations; a = Constant
Egghe-Rousseau	$h = P^{1/\infty}$	P = Total Publications; a > 1 is Lotka's Exponential
Glanzel-Schubert	$h = c\,P^{1/3}\,(CPP)^{2/3}$	c is a Constant; P = Total Publications CPP = Citations Per Publications

Year-wise growth of Disaster management research publications

Table 2: Year-wise growth of Disaster management research publications

S.No	Year	Publications	%	Cum	%	Citations	%	h-Index	CPP	RCI
1	2012	945	6.37	945	1.34	18912	11.52	62	20.01	1.81
2	2013	1124	7.57	2069	2.94	18940	11.54	61	16.85	1.52
3	2014	1111	7.49	3180	4.52	17473	10.64	58	15.73	1.42
4	2015	1186	7.99	4366	6.21	16699	10.17	54	14.08	1.27
5	2016	1423	9.59	5789	8.23	20577	12.53	58	14.46	1.31
6	2017	1414	9.53	7203	10.24	17502	10.66	50	12.38	1.12
7	2018	1567	10.56	8770	12.47	18276	11.13	52	11.66	1.05
8	2019	1788	12.05	10558	15.02	15173	9.24	45	8.49	0.77
9	2020	2035	13.71	12593	17.91	15062	9.17	39	7.40	0.67
10	2021	2248	15.15	14841	21.11	5565	3.39	24	2.48	0.22
Total		**14841**	**100.00**	**70314**	**100.00**	**164179**	**100.00**			

Bala (2013) discussed the *h*-index in various activities of Epilepsy research in India. Differences among the various models of the *h*-index are given in table 1.

Relative Citation Index (RCI)

The relative citation index (RCI) was developed by the Institute of Scientific Information (now Thomson Reuters, USA) and examines the impact of different countries and institutions in the field of Pollution Control research publications. The scientific impact of leading countries was examined by using two relative indicators, namely citations per paper (CPP) and relative citations index (RCI). Citations per paper (CPP) is a relative indicator computed as the average number of citations per paper. It has been broadly used in bibliometric studies as it normalizes a large difference in the volumes of publications among the most productive countries, institutions, and authors.

To measure the both influence and visibility of the country research global - wise, the following formula has been used by Bharvi Dutt and Khaiser Nikam (2016)

$$RCI = \frac{A\ Country\ share\ of\ the\ World\ Citations}{A\ Country\ share\ of\ the\ World\ Publications}$$

RCI = 1 indicates that a country's citation rate is equal to the world citation rate

RCI > 1 indicates that a country's citation rate is greater than the world citation rate

RCI < 1 indicates that a country's citation rate is lower than the world citation rate

Table 2 shows the year-wise growth of Disaster management research publications during the 10-year study period between 2012 and 2021 with 14841 research publications and 164179 citations. From the study, it is identified that a maximum of 2248(15.15%) research publications

Top 10 Authors 'Contributions to Disaster management research publications

Table 3 : Top 10 Author's Contributions to Disaster management research publications

S.No	Authors	Country	Publications	%	Citations	%	h-Index	CPP	RCI
1	Shaw, R.	United States	43	16.17	595	9.74	16	13.84	0.60
2	Ha, K.M.	China	36	13.53	79	1.29	5	2.19	0.10
3	Shi, P.	India	28	10.53	718	11.76	13	25.64	1.12
4	Pradhan, B.	United Kingdom	27	10.15	2065	33.82	20	76.48	3.33
5	Burkle, F.M.	Australia	25	9.40	404	6.62	14	16.16	0.70
6	Gaillard, J.C.	Japan	23	8.65	823	13.48	12	35.78	1.56
7	Li, N.	Germany	23	8.65	339	5.55	10	14.74	0.64
8	Imamura, F.	Indonesia	21	7.89	566	9.27	9	26.95	1.17
9	Amaratunga, D.	Italy	20	7.52	271	4.44	11	13.55	0.59
10	Chan, E.Y.Y.	Canada	20	7.52	246	4.03	8	12.30	0.54
	Total		**266**	**100.00**	**6106**	**100.00**			

are contributed in the year 2021, followed by 2035(13.71%) publications in the year 2020, and 1788(12.05%) publications in the year 2019. The average research publication per year is 1484.1.

During the 10 - year study, it is identified that a total number of 14841 publications received 164179 citations. Out of that maximum of 20577(12.53%) citations received 1423(9.59%) publications in the year 2016. Followed by 1894011.54%) citations received 5231124 (7.57%) publications in the year 2013. The maximum citation per paper is 20.01 in the year 2012 and h- index is 62, followed by CPP is 16.85 in the year 2013, the h-index is 61, and by CPP is 15.73 in the year 2014 and the h-index is 58. The average citation per paper is 12.35. The maximum RCI is 1.81 in the year 2012 and the minimum RCI is 1.52 in the year 2013.

Table 3 identified the top 10 author contributions for the research publications on Disaster management research from the Scopus database. From the study, it is identified that a maximum of 43(16.17%) research publications are contributed by Shaw, R., the United States, followed by Ha, K.M., China with 36(13.53%) research publications, Shi, P., India with 28(10.53%) research publications. The highest citations of were 2065(33.82%) Pradhan, B. In

the United Kingdom and the lowest number of citations is 79(1.29%) Ha, K.M., China. The highest CPP is 76.48, the h-index is 20 and RCI is 3.33. The lowest CPP is 2.19, the H-index is 05 and RCI is 0.10. From this study, it is identified that 266(100%) research publications are contributed by the top 10 authors from 10 different countries.

Relative Growth Rate of Publications
The relative growth of publications was analyzed by using the two parameters namely relative growth rate and doubling time originated by Mahapatra (1985) RGR is a measure to study the increases in the number of articles over a period of time. It is calculated as

$$R(a) = \frac{(W2 - W1)}{(T2 - T1)}$$

Whereas

R (a) = RGR = the mean relative growth rate over the specific period of interval
W_1 = the logarithm of the beginning number of publications/pages
W_2= the logarithm of the ending number of publications/pages after a specific period of interval
$T_2 - T_1$ = the unit difference between the beginning time and the ending time.

Relative Growth Rate and Doubling Time of Disaster management research publications

Table 4: Relative Growth Rate and Doubling Time of Disaster management research publications

S.No	Year	Publications	Cumulative	W1	W2	RGR	Dt
1	2012	945	109		4.69		
2	2013	1124	2069	4.69	7.63	2.94	0.24
3	2014	1111	3180	7.63	8.06	0.43	1.62
4	2015	1186	4366	8.06	8.38	0.32	2.20
5	2016	1423	5789	8.38	8.66	0.28	2.47
6	2017	1414	7203	8.66	8.88	0.22	3.18
7	2018	1567	8770	8.88	9.08	0.20	3.54
8	2019	1788	10558	9.08	9.26	0.19	3.75
9	2020	2035	12593	9.26	9.44	0.18	3.95
10	2021	2248	14841	9.44	9.61	0.16	4.24
Total		**14841**					

Doubling Time

The doubling time is the time taken for the doubling of the number of records actually published within a stipulated period. The doubling time is calculated from the relative growth rate and the natural logarithm number is used, the difference has a value of 0.693. Thus the corresponding doubling time can be calculated by the following formula,

$$Dt = \frac{0.693}{R(a)}$$

The relative growth rate and the doubling time (Dt) were calculated and the results are presented in table 4. From the study, it is identified that the relative growth rate is 2.94 in the year 2012 and 0.16 in the year 2021. This study confirmed that the relative growth rate is decreasing trend. At the same time doubling time was found that 0.24 in the year 2012 and 4.24 in the year 2021 and it is confirmed that doubling time is an increasing trend.

Table 5 identified the top ten subject contributions for the research publications of Disaster management research from the Scopus database. From the study, it is identified that a maximum of 4635(43.37%) research publications are contributed by Earth and Planetary Sciences, followed by Computer Science with 3135(29.34%) research publications, Business, Management, and Accounting with 943(8.82%) research publications. The lowest subject is Dentistry with 6(0.05%). Research publications.

Table 6 identified the year-wise authorship pattern in the field of Disaster management research during the 10- year study period. From the study, it is identified that, out of 14841 research publications, 2246 research publications are contributed by single authors, and the remaining 12595 research publications are multi-author contributions. Of the multi-author publications, a maximum of 3415 research publications are contributed by two authors, followed by 3307 publications contributed by three authors and 2420 publications are four authors. And 1457 publications are contributed by five authors. During the 10- year study period, more than five authors contributed to 1996 publications.

The degree of collaboration is the relationship between single-author and multi-author contributions. The degree of collaboration is calculated by the Subramanian (1983) formula and used by Ravichandran (2021) Sivasamy (2020).

Subject wise of Disaster management research publications

Table 5: Subject wise of Disaster management research publications

S.No	Subject area	No. of articles	%
1	Agricultural and Biological Sciences	552	5.17
2	Arts and Humanities	312	2.92
3	Biochemistry, Genetics, and Molecular Biology	205	1.92
4	Business, Management, and Accounting	943	8.82
5	Chemical Engineering	104	0.97
6	Chemistry	83	0.78
7	Computer Science	3135	29.34
8	Decision Sciences	711	6.65
9	Dentistry	6	0.06
10	Earth and Planetary Sciences	4635	43.37
	Total	**10686**	**100.00**

Authorship Pattern in Disaster Management Research Publications

Table 6: Authorship Pattern in Disaster Management Research Publications

Years	Authorship pattern						
	1	**2**	**3**	**4**	**5**	**>5**	**Total**
2012	204	227	201	141	85	88	946
2013	242	281	248	158	78	117	1124
2014	213	272	237	163	102	124	1111
2015	249	278	250	166	97	146	1186
2016	243	344	317	236	132	151	1423
2017	234	345	294	205	162	174	1414
2018	221	363	346	283	136	218	1567
2019	210	404	438	280	187	269	1788
2020	199	446	444	393	235	318	2035
2021	231	455	532	395	243	391	2247
Total	**2246**	**3415**	**3307**	**2420**	**1457**	**1996**	**14841**

$$DC = \frac{Nm}{(Nm + Ns)}$$

Where DC = Degree of Collaboration
N_m = Number of Multi- authored publications
N_s = Number of single-authored publications
In the present study, Nm = 12595, Ns= 2246
So that the degree of collaboration is =12595/ (2246+2246) = 0.85
Table 7 shows the degree of collaboration in Disaster management research publications for the 10- year studies period. From this study, it is identified that the degree of collaboration is between 0.78 in the year 2012 and 0.90 in the year 2021. The average degree of collaboration is 0.85. From this study, it is identified that the majority of Disaster management research publications are contributed by collaborative authors.

Degree of Collaboration in Disaster Management Research Publications

Table 7: Degree of Collaboration in Disaster Management Research Publications

Years	Single author publications	Multi authors publications	Total authors publications	Degree of collaborations DC = Nm/(Nm+Ns)
2012	204	742	946	0.78
2013	242	882	1124	0.78
2014	213	898	1111	0.81
2015	249	937	1186	0.79
2016	243	1180	1423	0.83
2017	234	1180	1414	0.83
2018	221	1346	1567	0.86
2019	210	1578	1788	0.88
2020	199	1836	2035	0.90
2021	231	2016	2247	0.90
Total	**2246**	**12595**	**14841**	

Collaborative Co-efficient (CC)

The pattern of co-authorship collaboration among the authors can be measured with the following formula suggested by Ajiferuke, et al. (1988)

$$CC = 1 - \left[\sum_{j=0}^{k} \left(\frac{1}{j} \right) \times Fj/N \right]$$

Whereas,

Fj = Number of publications with j author papers

N = Total number of research publications and

k = the greatest number of authors/papers in the given field

Collaboration Index (CI)

The simple indicator is presently employed in the publications to the collaboration index among the co-authors, which is to be understood nearly as the mean number of authors per paper are suggested by Ajiferuke, et al.(1988)

$$CI = \frac{\sum_{j=1}^{k} jfj}{N}$$

Here, J-The number of co-authored papers appearing in a discipline

N - The total number of publications in the field over the same time period of interval and

k - The highest number of authors per paper in a same-time field.

Modified Collaboration Coefficient

The modified collaboration coefficient (MCC) counted by the formula which is suggested by Savanur and Srikanth, (2010)

Which is given below:

Where,

$$MCC = \frac{N}{N-1} \left[1 - \frac{\sum_{j=1}^{k} jfj}{N} \right]$$

j = the number of authors in an article i.e. 1, 2, 3......

Fj = the number of j-authored articles

N = the total number of articles published in a year, and

A = the total number of authors per article

It is observed from table 8, the collaborative coefficient is calculated and presented during the 10- year study period for Disaster management research publications. It is observed from the table-10 highest collaboration co-efficient is 0.62 in the year 2020, and 2020 and the lowest CC is 0.52 in the year 2012, and 2013 and the average CC is 0.57. The collaboration index observed in table 8 the maximum collaboration Index is 3.51 in the year 2021, a minimum of 2.91 in the year 2013, and an average CI is 3.18. The Modified collaboration coefficient observed in table 8 is a maximum of 3.51 in the year 2021, a minimum of 2.91 in the year 2013, and an average MCC is 3.18.

Collaboration Index and Collaborative Co-efficient of Disaster management research

Table 8 : Collaboration Index and Collaborative Co-efficient of Disaster management research

Years	Authorship pattern									
	1	2	3	4	5	>5	CC	CI	MCC	Total
2012	204	227	201	141	85	88	0.52	2.94	2.94	946
2013	242	281	248	158	78	117	0.52	2.91	2.91	1124
2014	213	272	237	163	102	124	0.54	3.04	3.04	1111
2015	249	278	250	166	97	146	0.53	3.02	3.02	1186
2016	243	344	317	236	132	151	0.56	3.09	3.09	1423
2017	234	345	294	205	162	174	0.56	3.17	3.17	1414
2018	221	363	346	283	136	218	0.58	3.26	3.26	1567
2019	210	404	438	280	187	269	0.60	3.36	3.36	1788
2020	199	446	444	393	235	318	0.62	3.48	3.48	2035
2021	231	455	532	395	243	391	0.62	3.51	3.51	2247
Total	2246	3415	3307	2420	1457	1996				14841

Co-Authorship Index

Co-authorship Index (CAI) is obtained by calculating proportionately the publications by single, two, and multi-authored papers Garg & Padhi, (1999).

$$CAI = \frac{N_{ij}/N_{io}}{N_{oj}/N_{oo}} X 100$$

Where,

N_{ij} = Number of papers having authors in block i

N_{io} = Total output of block i

N_{oj} = Number of papers having j authors for all blocks.

N_{oo} = Total number of papers for all authors and all blocks

CAI=100 indicates that a country's co-authorship effort for a particular type of authorship correspondents to the world average.

CAI>100 reflects a higher-than-average co-authorship effort and

CAI<100 shows lower than average Co-authorship effort for a given type of authorship pattern.

For calculating the co-authorship index for authors, years have been replaced with block years. For this study, the authors have been classified into two blocks (ie.2012-2016 and 2017-2021) Vs**.** Single, Two, Three authors, and More than three authors.

Table 9 shows that Co-Authorship Index values are calculated by block year period for Disaster management research publications for the selected 10- year study period. From the study, it is identified that CAI for a single author and two authorship contributions are decreasing trend from 1st block year to 2nd block year. At the same time, CAI is increasing trend for three and more than three authors from 1st block year (86.59) to 2nd year block year (108.58).

Time Series Analysis

Time series analysis reveals the estimated growth values are identified based on previous data. A straight–line equation is adapted to measure the future values based on previous data. Time series analysis used by Jeyshankar and Ramesh babu (2013), Ravichandran (2020)

Table 10 shows that the time series analysis formula has been predicted for Disaster management research publications for the years 2025 and 2030

The straight Line Equation is

$$Y = a + bx$$

Here,

$\sum Y = 14841, \sum X^2 = 110, \sum XY = 12943$

$a = \sum Y/N = 14841/10 = 1484.1 = 1484$

Co- Authorship Index (CAI) in Disaster Management Research Publications

Table 9: Co- Authorship Index (CAI) in Disaster Management Research Publications

5 year Block	Single author	CAI	Two authors	CAI	Three authors	CAI	More than three authors	CAI	Total
2012-2016	1151	131.36	1402	105.23	1253	97.12	1984	86.59	5790
2017-2021	1095	79.94	2013	96.65	2054	101.84	3889	108.58	9051
Total	**2246**		**3415**		**3307**		**5873**		**14841**

Time Series Analysis of Disaster Management Research Publications.

Table 10: Time Series Analysis of Disaster Management Research Publications

S.No	Year	Count (Y)	X	X^2	XY
1	2012	945	-5	25	-4725
2	2013	1124	-4	16	-4496
3	2014	1111	-3	9	-3333
4	2015	1186	-2	4	-2372
5	2016	1423	-1	1	-1423
6	2017	1414	1	1	1414
7	2018	1567	2	4	3134
8	2019	1788	3	9	5364
9	2020	2035	4	16	8140
10	2021	2248	5	25	11240
	Total	**14841**		**110**	**12943**

$b = \sum XY / \sum X^2 = 12943/10 = 1294.3 = 1294$

The estimated publications in the year 2025 are when X=2025-2015=10

$Y = a + bx$

$= 1484 + (1294*10) = 1484+12940 = 14,424$

The estimated literature in 2030 is when X=2030-2015=15

$Y = a + bx$

$= 1484 + (1294*15) = 1484+19410 = 20,894$

The estimated growth based on a time series analysis statistical application will be expected in the Disaster management research publications in the year 2025 is around equal to 14,424 and in the year 2030 is around equal to 20,894. So that time serious analysis confirmed that the publications on Disaster management research are increasing trend.

Document types identified during the 10- year study period on Disaster management research publications are shown in table 11. From the study, it is identified that a maximum of 9984(67.27%) research publications are contributed by articles, followed by 3094(20.85%) research publications are Conference Paper and third placed in the review with 728(4.91%) research publications. The lowest document type of data paper 1(0.01%) research publications. This study confirmed that more than 67.27% of research publications are contributed by articles. The remaining nearby 32.73% of research publications are identified in the other form documents.

Table 12 shows the top 10 journals' contributions to the field of Disaster management research. From the study, it is identified that a maximum of 721(25.81%) research publications are

Document Types of Disaster Management Research Publications

Table 11: Document Type of Disaster Management Research Publications

S.No	Document Type	No. of articles	%	Cumulative	%
1	Article	9984	67.27	9984	5.89
2	Conference Paper	3094	20.85	13078	7.72
3	Review	728	4.91	13806	8.15
4	Book Chapter	624	4.20	14430	8.52
5	Conference Review	136	0.92	14566	8.60
6	Book	121	0.82	14687	8.67
7	Editorial	63	0.42	14750	8.71
8	Note	37	0.25	14787	8.73
9	Short Survey	30	0.20	14817	8.75
10	Letter	16	0.11	14833	8.76
11	Erratum	7	0.05	14840	8.76
12	Data Paper	1	0.01	14841	8.76
	Total	**14841**	**100.00**	**169419**	**100.00**

Journal's Contributions to Disaster Management Research Publications

Top 12: Journal's Contributions to Disaster Management Research Publications

S.No	Journal	No. of articles	%	Citations	%	h-Index	CPP	RCI
1	Natural Hazards	721	25.81	14441	43.06	54	20.03	1.67
2	Sustainability Switzerland	301	10.77	2257	6.73	21	7.50	0.62
3	International Journal Of Disaster Risk Reduction	296	10.59	4791	14.29	37	16.19	1.35
4	Journal Of Natural Disasters	267	9.56	705	2.10	10	2.64	0.22
5	International Journal Of Environmental Research And Public Health	246	8.80	2477	7.39	24	10.07	0.84
6	Disasters	235	8.41	3524	10.51	30	15.00	1.25
7	Disaster Advances	219	7.84	319	0.95	8	1.46	0.12
8	Top Conference Series Earth And Environmental Science	188	6.73	295	0.88	8	1.57	0.13
9	International Journal Of Disaster Risk Science	166	5.94	1814	5.41	21	10.93	0.91
10	Natural Hazards And Earth System Sciences	155	5.55	2914	8.69	28	18.80	1.57
	Total	**2794**	**100.00**	**33537**	**100.00**			

Top 10 Institution Contributions to Disaster Management Research Publications

Table 13: Top 10 Institutions Contributions to Disaster Management Research Publications

S.No	institutions	Publications	%	Citations	%	h-Index	CPP	RCI
1	Chinese Academy of Sciences	265	19.33	3420	17.60	31	12.91	0.91
2	Ministry of Education China	200	14.59	2868	14.76	28	14.34	1.01
3	Beijing Normal University	158	11.52	2386	12.28	26	15.10	1.07
4	The University of Tokyo	133	9.70	1717	8.84	21	12.91	0.91
5	Kyoto University	122	8.90	1228	6.32	19	10.07	0.71
6	China Earthquake Administration	103	7.51	996	5.13	17	9.67	0.68
7	University of Chinese Academy of Sciences	102	7.44	1796	9.24	23	17.61	1.24
8	University of Melbourne	101	7.37	485	2.50	12	4.80	0.34
9	University College London	96	7.00	3234	16.64	25	33.69	2.38
10	Tohoku University	91	6.64	1300	6.69	19	14.29	1.01
Total		**1371**	**100.00**	**19430**	**100.00**			

contributed by the Natural Hazards, followed by Sustainability Switzerland with 301(10.77%) research publications, third-placed in the International Journal of Disaster Risk Reduction with 296(10.59%) research publications. During 10- the year study period the highest number of citations was 14441(43.06%) from the Natural Hazards, the CPP is 20.03, the H-Index is 54 and RCI is 1.67. The Lowest citations of 295(0.88) Top Conference Series Earth And Environmental Science, the CPP is 1.57, the H-Index is 8 and the RCI is 0.13 During the 10- year study period the top 10 journals contributed by 2794(100. %) research publications.

During the 10-year study period, the top 10 institutions' contributions are identified in table 13, from the study the maximum of 265(19.333%) contributions to be Chinese Academy of Sciences, followed by the Ministry of Education China contributed 200(14.59%) research publications, and Beijing Normal University contributed with 158 (11.52%) research publications.

The highest number of citations was 3420(17.60%) from the Chinese Academy of Sciences, and the CPP is 12.91. the H- Index is 31, and RCI is 0.91. The lowest citations of 485(2.50%) from the University of Melbourne, the CPP is 4.80, H-Index is 12 and RCI is 0.30. During 10- the year study period Top 10 institutions contributed 1371(100%) research publications.

Table 14 shows the top 10 countries' research publications for Disaster management research during the study period from 2012-2021. From this study, it is identified that a maximum of 2774(23.23%) research publications are contributed by the United States, followed by China with 2187(18.32%) research publications, and third place is India with 1512(12.66%) research publications. During ten year study period the highest number of citations was 46798(29.80%) in the United States, the CPP is 16.87, the H-index is 89 and RCI is 1.28. The lowest citations of were 2224(1.42%) in Indonesia. The CPP is 3.55, the H-index is 23 and RCI is 0.0.27. The top 10

Top 10- countries' Contributions to Disaster Management Research Publications

Table 14: Country-wise Contributions to Disaster Management Research Publications

S.No	Country	No. of articles	%	Citations	%	h- Index	CPP	RCI
1	United States	2774	23.23	46798	29.80	89	16.87	1.28
2	China	2187	18.32	22481	14.32	58	10.28	0.78
3	India	1512	12.66	10884	6.93	41	7.20	0.55
4	United Kingdom	1134	9.50	19809	12.61	59	17.47	1.33
5	Australia	1026	8.59	17008	10.83	55	16.58	1.26
6	Japan	1025	8.58	10180	6.48	42	9.93	0.76
7	Germany	732	6.13	11394	7.26	49	15.57	1.18
8	Indonesia	627	5.25	2224	1.42	23	3.55	0.27
9	Italy	483	4.05	9074	5.78	44	18.79	1.43
10	Canada	440	3.69	7190	4.58	39	16.34	1.24
Total		**11940**	**100.00**	**157042**	**100.00**			

Top 10- Funding agency's Contributions to Disaster Management Research Publications

Table 15: Top 10 Funding agency's Contributions to Disaster Management Research Publications

S.No	Funding Agency	No. of articles	%
1	National Natural Science Foundation of China	784	29.74
2	National Science Foundation	438	16.62
3	European Commission	250	9.48
4	Japan Society for the Promotion of Science	235	8.92
5	National Key Research and Development Program of China	222	8.42
6	Ministry of Education, Culture, Sports, Science, and Technology	205	7.78
7	Seventh Framework Programme	135	5.12
8	Ministry of Science and Technology of the People's Republic of China	130	4.93
9	Fundamental Research Funds for the Central Universities	124	4.70
10	Ministry of Education of the People's Republic of China	113	4.29
Total		**2636**	**100.00**

countries contributed 11940 (100%) research publications.

Table 15 shows the top 10 funding agencies' research publications for Disaster management research during the study period from 2012-2021. From this study, it is identified that a maximum of 784(29.74%) research publications are contributed by the National Natural Science Foundation of China, followed by the National Science Foundation with 438 (16.62%) research publications and third place is the European Commission with 250(9.48%) research publications. The lowest funding agency 113 (4.29%) research published in the Ministry of Education of the People's Republic of China. The top 10 funding agencies contributed 2636 (100%) research publications. Table 16 shows the top 10 keyword research publications for Disaster management research during the study period from 2012-2021.

Top 10- Keyword Contributions to Disaster Management Research Publications

Table 16: Top 10 Keyword Contributions to Disaster Management Research Publications

S.No	Keyword	No. of articles	%
1	Disaster Management	10679	35.40
2	Disasters	5239	17.37
3	Disaster Prevention	4386	14.54
4	Risk Assessment	2209	7.32
5	Disaster	1573	5.21
6	Human	1489	4.94
7	China	1249	4.14
8	Humans	1130	3.75
9	Natural Disaster	1127	3.74
10	Decision Making	1086	3.60
Total		**30167**	**100.00**

From this study, it is identified that a maximum of 10679(35.40%) research publications are contributed by the Disaster Management, followed by Disasters with 5239(17.37%) research publications, and third place is Disaster Prevention with 4386(14.54%) research publications. The top 10 keywords contributed 30167(100%) research publications.

Table 17 the highly cited top 10 Disaster management research publications during the selected 10- year study period. From the study, it is identified that a maximum of 768 citations are received for the publication of Lindell, M.K., and Perry, R.W. (2012) The Protective Action Decision Model: Theoretical Modifications and Additional Evidence, Risk Analysis, 32(4):616-632. Followed by 688 citations by Smith, A.C., et.al (2020) Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19), Journal of Telemedicine and Telecare, 26(5):309-313.and 576 Corominas, J., et.al (2014) Recommendations for the quantitative analysis of landslide risk, Bulletin of Engineering Geology and the Environment, 73(2): 209-263. The top 10 highly cited publications are covered by 07 articles and 03 reviews.

FINDINGS AND CONCLUSION

The year-wise growth of Disaster management research publications during the 10- year study period between 2012 and 2021 with 14841 research publications and 164179 citations. From the study, it is identified that a maximum of 2248(15.15%) research publications are contributed in the year 2021, followed by 2035(13.71%) publications in the year 2020, and 1788(12.05%) publications in the year 2019. The average research publication per year is 1484.1.

During the authors a maximum of 43(16.17%) research publications are contributed by Shaw, R., the United States, followed by Ha, K.M., China with 36(13.53%) research publications, Shi, P., India with 28(10.53%) research publications.

The relative growth rate is 2.94 in the year 2012 and 0.16 in the year 2021. This study confirmed that the relative growth rate is decreasing trend. At the same time doubling time was found that 0.24 in the year 2012 and 4.24 in the year 2021 and it is confirmed that doubling time is an increasing trend.

During the subjects a maximum of 4635(43.37%) research publications are contributed by Earth and Planetary Sciences, the authorship pattern with 2246 research

Highly Cited paper top 10 Disaster Management Research Publications

Table 17: Highly Cited paper top 10 Disaster Management Research Publications

S.N	Titles of highly cited papers	Citations	Document Type
1	Lindell, M.K., and Perry R.W. (2012) The Protective Action Decision Model: Theoretical Modifications and Additional Evidence, Risk Analysis, 32(4):616-632.	748	Article
2	Smith, A.C., et.al (2020) Telehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19), Journal of Telemedicine and Telecare, 26(5):309-313.	688	Article
3	Corominas, J., et.al (2014) Recommendations for the quantitative analysis of landslide risk, Bulletin of Engineering Geology and the Environment, 73(2): 209-263.	576	Article
4	Caunhye, A.M., Nie, X., and Pokharel, S. (2012) Optimization models in emergency logistics: A literature review, Socio-Economic Planning Sciences, 46(1):4-13.	552	Review
5	Mouradian, C., et.al (2018) A Comprehensive Survey on Fog Computing: State-of-the-Art and Research Challenges, IEEE Communications Surveys and Tutorials, 20(1): 416-464.	519	Review
6	Alexander, D.E. (2013) Resilience and disaster risk reduction: An etymological journey, Natural Hazards and Earth System Sciences, 13(11):2707-2716.	514	Article
7	Flanagan, B.E., et.al (2020) A Social Vulnerability Index for Disaster Management, Journal of Homeland Security and Emergency Management, 8(1), article No: 3.	501	Article
8	Erdelj, M., et.al (2017) Help from the Sky: Leveraging UAVs for Disaster Management, IEEE Pervasive Computing, 16(1):24-32.	490	Review
9	Birkmann, J., et.al (2013) Framing vulnerability, risk, and societal responses: The MOVE framework, Natural Hazards, 67(2):193-211.	471	Article
10	Cutter, S.L., et.al (2014) The geographies of community disaster resilience, Global Environmental Change, 29, 65-77.	457	Article

publications are contributed by single authors, and the degree of collaboration is between 0.78 in the year 2012 and 0.90 in the year 2021. The average degree of collaboration is 0.85.

The highest collaboration co-efficient is 0.62 in the year 2020, and 2020 and the lowest CC is 0.52 in the year 2012, and 2013 and the average CC is 0.57. The collaboration index observed in the maximum collaboration Index is 3.51 in the year

2021, a minimum of 2.91 in the year 2013, and an average MCC is 3.18.

The CAI for a single author and two authorship contributions is decreasing trend from 1st block year to 2nd block year. At the same time, CAI is increasing trend for three and more than three authors from 1st block year (86.59) to 2nd year block year (108.58).

The time series analysis statistical application will be expected in the Disaster management research publications in the year 2025 is around equal to 14,424 and in the year 2030 is around equal to 20,894. So that time serious analysis confirmed that the publications on Disaster management research are increasing trend.

During document type a maximum of 9984(67.27%) research publications are contributed by articles, followed by 3094(20.85%) research publications are Conference Paper and third placed in the review with 728(4.91%) research publications.

During the journals a maximum of 721(25.81%) research publications are contributed by the Natural Hazards, followed by Sustainability Switzerland with 301(10.77%) research publications, third-placed in the International Journal of Disaster Risk Reduction with 296(10.59%) research publications.

During the Institutions the maximum of 265(19.333%) contributions to be Chinese Academy of Sciences, followed by the Ministry of Education China contributed 200(14.59%) research publications, Beijing Normal University contributed 158(11.52%) research publications

During the country that a maximum of 2774(23.23%) research publications are contributed by the United States, followed by China with 2187(18.32%) research publications, and third place is India with 1512(12.66%) research publications.

During the funding agency a maximum of 784(29.74%) research publications are contributed by the National Natural Science Foundation of China, and the keyword a maximum of 10679(35.40%) research publications are contributed by the Disaster Management,

During the highly cited papers 768 citations are received for the publication of Lindell, M.K., and Perry, R.W. (2012) The Protective Action Decision Model: Theoretical Modifications and Additional Evidence, Risk Analysis, 32(4):616-632.

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