Scientometric Analysis on Disaster Management Research Output during 2011-2020

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Abstract

This research study explore the scientometric application towards disaster management research publications between 2011 and 2020 that have been indexed in Scopus database. A total number of 13339 research publications are identified in disaster management research during the ten year study period. From the study it is identified that, maximum number of 2019(15.14%) research publications were contributed in the year 2020, and the highest number of 16284(12.14) citations are received in the year 2012. During the study period relative growth rate is 0.74 in the year 2012 and 0.16 in the year 2020. Top ranking author Shaw R contribute the maximum of 37 (15.29%) research publications. The Average degree of collaboration is 0.83, average collaborative co-efficient is 0.55, average collaborative index is 3.16 and average modified collaborative co-efficient is 3.10.

Keywords

RGR; Doubling Time; Co-Authorship Index; Degree of Collaboration; Disaster Management.

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Introduction

A disaster is a consequence of a sudden disastrous event which seriously disrupts the normal function of the society or the community to extent that it cannot subsist without outside help. A disaster is not just the occurrence of an event such as an earthquake, flood, conflict, health epidemic or an industrial accident; a disaster occurs if that event/process negatively impacts human populations. Disasters combine two elements: hazard, and the vulnerability of affected people. "A disaster occurs when a hazard exposes the vulnerability of individuals and communities in such a way that their lives are directly threatened or sufficient harm has been done to their community's economic and social structure to undermine their ability to survive. A disaster can be defined as any tragic event stemming from events such as earthquakes, floods, catastrophic accidents, fires, or explosions.[1]

Natural and man-made hazards include, for instance, droughts, desertification, floods, fires, earthquakes and dispersion of radioactive gases in the atmosphere. They have significant social, environmental and economic impacts. The Joint Research Center (JRC) carries out extensive work to continuously monitor the situation, assess risks and potential impacts, and forecast future events as accurately as possible in order to help prevent these phenomena from happening or to limit their impact. The JRC carries out research to support EU policies related to climate change, sustainable management of natural resources, water, food security, disaster risk reduction, and response and actions to prevent and fight forest fires.

The JRC provides the knowledge base that helps Europeancountries and international partners \respond to natural and man-made disasters. An important part of this work is the development of methods and tools to monitor the situation, assess risks and predict future developments. The JRC also carries out research on the seismic vulnerability of buildings, which is used to develop European standards for the construction sector, for example. It has also developed a web-based platform that provides instant alerts of disasters, as well as methods of automatically analyzing satellite images in order to assess damages.[2]

Scientometric Study

Scientometric is one of the truly interdisciplinary research fields to extend almost all scientific fields. In addition, many extensive bibliometric studies of important science fields appeared during the last two decades. At present, the connotation of bibliometric turns out to be the science of measurement relating to documents. The word measurement means the application of mathematical and statistical techniques to find out the growth of document, scattering, or literature in various types of documents, publication of documents by an author, impact of document, and so on. Cole and Eales (1917)[3] in their publication on the history of comparative anatomy, applied statistical methods for analyzing the literature are called it statistical analysis. The most important contribution was made by Hulme (1923)[4] when he published the book statistical bibliography, this term continued to be used for statistical measures till the end of the 1960s. Ranganathan (1948)[5] coined the term librametry to denote measurement of various library activities and services using mathematical and statistical techniques. Alan Prichard (1969)[6] coined the term bibliometric to denote the application of mathematical and statistical methods to books and other media, the process of written communication, and of the nature and course of a discipline. Van Raan (1997)[7] According to scientometric research is devoted to Quantitative studies of science and technology. So that this paper aims to analyze the contribution of wastewater management research publications are published in the Scopus database from 2010 to 2019.

Literature Review

Dhanya and Raja (2017)[8] 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. Relative Growth Rate is 0.16 in the year 2016 and Doubling Time is 4.58 in the year 2016. Sudhakar and Thanuskodi (2018)[9] analyzed the scientometric analysis of Marine Pollution Bulletin Journal research publications from 2008 to 2017 with 5416 publications. Maximum numbers of 905(16.71%) publications are contributed in the year 2017. This study identified RGR has been decreased from 0.63 to 0.18 and the same time doubling time has been increased from 1.10 to 3.85. The degree of collaboration was 0.94, which clearly indicates its dominance of multiple author's contributions. Liu J. was the top ranked authors with 49 articles. Maximum numbers of 910 (12.06%) publications are contributed by United States. Kausalya and Jeyshankar (2019)[10] examine the Scientometric analysis on 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 contributes 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. Sweileh (2019)[11] analysis the health-related literature on natural disasters from 1900 to 2017 with 9073 documents and it was received 97,605 citations and average citation per paper was 10.8 citations, United States of America contributed maximum of 3127 (34.5%) publications. The Prehospital and Disaster Medicine journal published the most of 636(7.0%) publications. The Sichuan University and its affiliated hospital contributed to maximum of 384(7.0%) publications in the field.Dhawan et.al (2021)[12] analyzed the global cyber security research output (1998-2019) using Scopus database and to discover underlying trends and developments at the global, national, institutional, and individual level 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 relative citation index (1.47). International collaboration has been a major driver of growth in cyber security research. Ravichandran and Vivekanandhan (2021)[13] examine the Scientometric analysis of waste water management research publications during 2010-2019 from Scopus database. The study identified that 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, maximum of 19355 articles were contributed by joint authors and average degree of collaboration was 0.97. Maximum of 2102(10.58%) research publications are contributed in Bio resource technology, ministry of

education, china with 863(22.32%) research publication and China has contributed maximum of 5919(29.80%) research publications

Objectives

- To identify the year wise growth of publications with citations
- To analysis the relative growth rate and doubling time
- To determine the top 10 authors contribution
- To analysis the authorship pattern and degree of collaboration
- To analysis the collaborative coefficient and collaborative index
- To examine the co-authorship index and time series analysis
- To identify the document type of publications
- To identify the top 10 journals, institutions and countries contributions
- To examine the language wise growth and highly cited top 10 publications

Research Methodology

The disaster management research publications are identified using the Scopus multidisciplinary online database from 2011 to 2020 using the following search keyword: (TITLE-ABS-KEY ("Disaster Management") AND PUBYEAR > 2010 AND PUBYEAR < 2021) and the data was collected for this study is 14.07.2021. The collected data's were analyzed using Micro Soft Excel work sheet.

Data Analysis and Interpretations

Year Wise Growth of Publications

Table 1: Year Wise Growth of Publications and Citations

S.No	Year	No of Publications	%	No of Citations	%	Cited	%	CPP
1	2011	853	6.39	13909	10.60	671	6.63	20.73
2	2012	942	7.06	16284	12.41	768	7.59	21.20
3	2013	1120	8.40	16208	12.35	891	8.80	18.19
4	2014	1105	8.28	14682	11.19	860	8.50	17.07
5	2015	1181	8.85	13587	10.35	963	9.51	14.11
6	2016	1399	10.49	15999	12.19	1145	11.31	13.97
7	2017	1401	10.50	12921	9.84	1109	10.96	11.65
8	2018	1546	11.59	12590	9.59	1214	11.99	10.37
9	2019	1773	13.29	8662	6.60	1265	12.50	6.85
10	2020	2019	15.14	6421	4.89	1236	12.21	5.19
Total		**13339**	**100.00**	**131263**	**100.00**	**10122**	**100.00**	**Avg.=13.93**

Table 1 shows that year wise growth of disaster management research publications during the ten year study period between 2011 and 2020 with 13339research publications and 131263 citations. From the study, it is identified that, maximum of 2019(15.14%) research publications are contributed in the year 2020, followed by 1773(13.29%) publications in the year 2019, and 1546(11.59%) publications in the year 2018. The average research publications per year is 1334. During the ten year study it is identified that, total number of13339 publications are received 131263 citations. Out of that, maximum of 16284 citations are received by 942 publications in the year 2012. Followed by 16208 citations are received by 1120 publications in the year 2013. Maximum of citation per paper is 21.20citations in the year 2012, followed by CPP is 20.73 in the year 2011, CPP is 18.19 in the year 2013 and the average citation per paper is 13.93.

Relative Growth Rate of Publications

The relative growth of publications was analyzed by using the two parameter namely relative growth rate and Doubling time was originated by Mahapatra (1985)[14]. RGR is a measure to study the increases in number of articles in a period of time. It is calculated as

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

Where as

R (a) = RGR = the mean relative growth rate over the specific period of interval

W_1 = the logarithm of beginning number of publications/pages
W_2= the logarithm of 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.

Doubling Time

The doubling time is 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,

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

Relative Growth Rate and Doubling Time of Disaster Management Research Publications

Table 2: Relative Growth Rate and Doubling Time

S. No	Year	No of Publications	Cum.	W_1	W_2	RGR= (W_2-W_1)	Dt= (0.693/RGR)
1	2011	853	853		6.75		
2	2012	942	1795	6.75	7.49	0.74	0.93
3	2013	1120	2915	7.49	7.98	0.48	1.43
4	2014	1105	4020	7.98	8.30	0.32	2.16
5	2015	1181	5201	8.30	8.56	0.26	2.69
6	2016	1399	6600	8.56	8.79	0.24	2.91
7	2017	1401	8001	8.79	8.99	0.19	3.60
8	2018	1546	9547	8.99	9.16	0.18	3.92
9	2019	1773	11320	9.16	9.33	0.17	4.07
10	2020	2019	13339	9.33	9.50	0.16	4.22

The relative growth rate and the doubling time (Dt) was calculated and the results are presented in table 2. From the study it is identified that, the relative growth rate is 0.74 in the year 2012 and 0.16 in the year 2020. This study confirmed that relative growth rate is decreasing trend. At the same time doubling time is found that,0.93 in the year 2012 and 4.22 in the year 2020 and it is conformed that doubling time is increasing trend.

Top 10 Authors Contributions in Disaster Management Research Publications

Table 3: Top 10 Authors Contributions

S. No	Name of the Author	Name of the Country	No. of Publications	%	No of Citations	%	h-index
1	Shaw, R.	United States	37	15.29	405	8.84	13
2	Ha, K.M.	China	32	13.22	60	1.31	4
3	Shi, P.	India	26	10.74	516	11.27	11
4	Pradhan, B.	United Kingdom	24	9.92	1637	35.74	15
5	Li, N.	Australia	23	9.50	269	5.87	9
6	Gaillard, J.C.	Japan	22	9.09	668	14.59	11
7	Burkle, F.M.	Germany	21	8.68	299	6.53	11
8	Wilkinson, S.	Indonesia	21	8.68	335	7.31	11
9	Amaratunga, D.	Italy	19	7.85	202	4.41	9
10	Bessis, N.	Canada	17	7.02	189	4.13	7
Total			**242**	**100.00**	**4580**	**100.00**	

Table 3 identified the top ten author's contribution for the research publications in disaster management research from SCOPUS database. From the study it is identified that, maximum of 37(15.29%) research publications are contributed by Shaw, R. United

States, followed by Ha, K.M., Chinawith 32(13.22%) research publications, Shi, P., India with 26(10.74%) research publications. The highest number of 1637(35.74) citations are received by Pradhan, B, United Kingdom and lowest citations is 60 Ha, K.M, china. From this study it is identified that 242(100%) research publications are contributed by the top 10 authors from the ten different countries.

Authorship Pattern vs Year in Disaster Management Research Publications

Table 4: Authorship Pattern

Year		Authorship Pattern					
	1	2	3	4	5	>5	Total
2011	196	232	171	108	78	68	853
2012	202	227	200	141	84	88	942
2013	241	282	246	157	78	116	1120
2014	213	269	236	164	101	122	1105
2015	248	275	248	166	98	146	1181
2016	237	339	308	235	131	149	1399
2017	231	341	291	205	160	173	1401
2018	216	356	339	281	136	218	1546
2019	220	404	438	270	181	260	1773
2020	198	451	437	385	235	313	2019
Total	**2202**	**3176**	**2914**	**2112**	**1282**	**1653**	**13339**
%	16.51	23.81	21.85	15.83	9.61	12.39	100.00

Table 4 identified that year wise authorship pattern in the field of disaster management research during the ten year study period. From the study, it is identified that, out of 13339 research publications, 2202 research publications are contributed by single authors and remaining 11137 research publications are multi author's contributions. From the multi authors publications, maximum of 3176 research publications are contributed by two authors, followed by 2914 publications are contributed by three authors,2112 publications are four authors, 1282 publications are five authors and 1653 publications are more than five authors.

Degree of Collaboration in Disaster Management Research Publications

Table 5: Degree of Collaboration

Year	Single Author Publications	Multi Author Publications	Total Publications	Degree of Collaboration DC = Nm/(Ns+Nm)
2011	196	657	853	0.77
2012	202	740	942	0.79
2013	241	879	1120	0.78
2014	213	892	1105	0.81
2015	248	933	1181	0.79
2016	237	1162	1399	0.83
2017	231	1170	1401	0.84
2018	216	1330	1546	0.86
2019	220	1553	1773	0.88
2020	198	1821	2019	0.90
Total	**2202**	**11137**	**13339**	**0.83**

Degree of collaboration is relationship between single author and multi author contributions. The degree of collaboration is calculated by the Subramanian (1983)[15] formula, and used by Vivekanandhan (2016)[16],

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

Where DC = Degree of Collaboration
N_m = Number of Multi authored publications
N_s = Number of single authored publications
In the present study, Nm = 11137, Ns= 2202
So that the degree of collaboration is =11137/ (2202+11137) = 0.83

Table 5 shows that the degree of collaboration in disaster management research publications for the ten year studies period. From this study it is identified that, degree of collaboration is between 0.77 in the year 2011 and 0.90 in the year 2020. The average degree of collaboration is 0.83. From this study it is identified that, majority of the disaster management research publications are contributed by collaborative authors.

Collaborative of 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)[17]

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

Whereas,
Fj = Number of publications with j author papers
N = Total number of the research publications and
k = the greatest number of authors/ paper in the given field

Collaboration Index (CI)

The simple indicator are presently employed in the publications to the collaboration index among the co-authors, which is to be understand nearly as the mean number of authors per paper are suggested by Ajiferuke, et al.(1988) [23]

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

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)[18]
Which is given below:
Where,

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

j = the number 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 articles

Collaborative Measures of Disaster Management Research Publications

Table 6:CC, CI and MCC

Year	Authorship Pattern						CC	CI	MCC
	1	2	3	4	5	>5			
2011	196	232	171	108	78	68	0.50	2.82	2.82
2012	202	227	200	141	84	88	0.52	2.94	2.94
2013	241	282	246	157	78	116	0.52	2.91	2.91
2014	213	269	236	164	101	122	0.54	3.03	3.04
2015	248	275	248	166	98	146	0.53	3.02	3.03
2016	237	339	308	235	131	149	0.56	3.09	3.10
2017	231	341	291	205	160	173	0.56	3.17	3.17
2018	216	356	339	281	136	218	0.59	3.27	3.27
2019	220	404	438	270	181	260	0.60	3.32	3.32
2020	198	451	437	385	235	313	0.62	3.47	3.47
Total	**2202**	**3176**	**2914**	**2112**	**1282**	**1653**			

It is observed from table 6, the collaborative coefficient is calculated and presented during the ten year study period for disaster management research publications. It is observed from the table-6 highest collaboration coefficient is 0.62 in the year 2020 and lowest CC is 0.50 in the year 2011. Collaboration index is observe from the table-6,maximum of collaboration Index is 3.47 in the year 2020 and minimum of 2.82 in the year 2011. Modified collaboration coefficient observed from the table 6,maximum of 3.47 in the year 2020 and minimum of 2.82 in the year 2011

Co-Authorship Index

Co- Authorship Index (CAI) is obtained by calculating proportionately the publications by single, two and multi authored papers (Garg & Padhi, 1999).[19]

$$CAI = \frac{N_{ij}/N_{io}}{N_{oj}/N_{oo}} X100$$

Where,
Nij = Number of papers having authors in block i
Nio = Total output of block i
Noj = Number of papers having j authors for all blocks.
Noo = Total number of papers for all authors and all blocks

CAI=100 indicates that a countries co-authorships effort for a particular type of Authorship correspondents to the world average.
CAI>100 reflects 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 into block years. For this study, the authors have been classified into two blocks (ie.2011-2015 and 2016-2020) vs.single, two, three authors and more than three authors.

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

Table 7: Co- Authorship Index (CAI)

Block Years	Single Authors	CAI	Two Authors	CAI	Three Authors	CAI	>3 Authors	CAI	Total
2011-2015	1100	128.12	1285	103.77	1101	96.90	1715	87.15	5201
2016-2020	1102	82.03	1891	97.59	1813	101.98	3332	108.21	8138
Total	2202		3176		2914		5047		13339

Table 7 shows that Co-Authorship Index values for disaster management research publications by block year period for the selected ten year study period. From the study it is identified that CAI for single, 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. iemore than three authors from 1st block year (87.15) to 2nd block year (108.21).

Time Series Analysis of Disaster Management Research Publications

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)[20] Ravichandran (2020)[21]

Table 8: Time Series Analysis

S.No	Year	Count(Y)	X	X^2	XY
1	2011	853	-5	25	-4265
2	2012	942	-4	16	-3412
3	2013	1120	-3	9	-2826
4	2014	1105	-2	4	-2240
5	2015	1181	-1	1	-1105
6	2016	1399	1	1	1399
7	2017	1401	2	4	2802
8	2018	1546	3	9	4638
9	2019	1773	4	16	7092
10	2020	2019	5	25	10095
	Total	**13339**		**110**	**12178**

Table 8 shows that, time series analysis formula has been predicted for disaster management research publications for the year 2025 and 2030

Straight Line Equation is $Y = a + bx$

Here,
$\sum Y = 13339$, $\sum X^2 = 110$, $\sum XY = 12178$
$a = \sum Y/N = 13339/10 = 1333.9 = 1334$
$b = \sum XY/\sum X^2 = 12178/110 = 110.7 = 111$

Estimated publications in the year 2025 is when X=2025-2015=10

$Y = a + bx$
$= 1334 + (111*10) = 1334+1110 = 2444$

Estimated literature in 2030 is when X=2030-2015=15

$Y = a + b x$
$= 1334 + (111*15) = 1334+1665 = 2999$

The estimated growth based on the time series analysis statistical application will be expected in the disaster management research publications in the year 2025 is around or equal to 2444 publications and the year 2030 is around or equal to 2999 publications. So that, time serious analysis conformed that the publications on disaster management research is increasing trend.

Document Types of Disaster Management Research Publications

Table 9: Document Type of Disaster Management Research Publications

S.No	Document Type	No of Publications	%	Cum.	%
1	Article	8791	65.90	8791	65.90
2	Conference Paper	2966	22.24	11757	88.14
3	Review	627	4.70	12384	92.84
4	Book Chapter	550	4.12	12934	96.96
5	Conference Review	138	1.03	13072	98.00
6	Book	119	0.89	13191	98.89
7	Editorial	56	0.42	13247	99.31
8	Short Survey	38	0.28	13285	99.60
9	Note	35	0.26	13320	99.86
10	Letter	11	0.08	13331	99.94
11	Erratum	4	0.03	13335	99.97
12	Retracted	2	0.01	13337	99.99
13	Data Paper	1	0.01	13338	99.99
14	Undefined	1	0.01	13339	100.00
Total		**13339**	**100.00**		

Document types are identified during the ten year study period on disaster management research publications are shows from table 9. From the study it is identified that, maximum of 8791(65.90%) research publications are contributed by article, followed 2966(22.24%) research publication are conference paper and third placed in review with 627(4.70%) research publications. This study confirmed that more than 65% of research publications are contributed by article. The remaining nearby 35% of research publications are identified in the other form of documents.

Top 10 Journals Contributions in Disaster Management Research Publications

Table 10: Top 10 Journals Contributions

S. No	Name of the Journals	No of Publications	%	No of Citations	%
1	Natural Hazards	644	26.92	12075	46.60
2	Journal of Natural Disasters	294	12.29	727	2.81
3	Disasters	241	10.08	3458	13.34
4	International Journal of Disaster Risk Reduction	231	9.66	3147	12.14
5	Sustainability Switzerland	207	8.65	1251	4.83
6	Disaster Advances	206	8.61	295	1.14
7	International Journal of Environmental Research And Public Health	167	6.98	1499	5.78
8	International Archives of the Photogrammetry Remote Sensing and Spatial Information Sciences ISPRS Archives	140	5.85	347	1.34
9	Natural Hazards and Earth System Sciences	134	5.60	2281	8.80

10	International Journal of Disaster Resilience in the Built Environment	128	5.35	833	3.21
Total		**2392**	**100.00**	**25913**	**100.00**

Table 10 shows that top10 journals contributions in the field of disaster management research. From the study it is identified that, maximum of 644(26.92%) research publications are contributed by natural hazards, followed by journal of natural disasters with 294(12.29%) research publications, third placed is disasters with 241(10.08%) research publications. During the ten year study period the highest number of 12075(46.60%) citations are received by natural hazards and the lowest citations of 295(1.145) disaster advances. During the ten year study period top 10 journals are contributed by 2392 research publications.

Top 10 Institution Contributions in Disaster Management Research Publications

Table 11: Top 10 Institutions Contributions

S. No	Name of the Institution	No of Publications	%	No of Citations	%
1	Chinese Academy of Sciences	227	18.67	2444	14.73
2	Ministry of Education, China	187	15.38	2261	13.62
3	Beijing Normal University	147	12.09	1787	10.77
4	Kyoto University	110	9.05	910	5.48
5	The University of Tokyo	110	9.05	1234	7.44
6	China Earthquake Administration	103	8.47	518	3.12
7	University of Melbourne	92	7.57	1340	8.07
8	University College London	84	6.91	2590	15.61
9	Texas A&M University	79	6.50	2362	14.23
10	Tohoku University	77	6.33	1149	6.92
	Total	1216	100.00	16595	100.00

During the 10 years study period, top 10 institutions contributions are identified from the table 11. From the study, maximum of 227(18.67%) publications are contributed by Chinese academy of sciences, followed by ministry of education, china contributed with 187(15.38%) research publications, Beijing normal university contributed with 147(12.09%) research publications. During the ten year study period, highest number of 2590(15.61) citations are received by University college London and lowest citations of 518(3.12%) by China earthquake administration. The top 10 institutions are contributed by 1216 research publications.

Top Ten Countries Contributions in Disaster Management Research Publications

Table 12: Country wise Contributions

S. No	Country	No of Publications	%	No of Citations	%
1	United States	2536	23.91	38843	30.93
2	China	1930	18.19	16652	13.26
3	India	1263	11.91	7838	6.24
4	United Kingdom	1044	9.84	17032	13.56
5	Australia	939	8.85	12938	10.30
6	Japan	914	8.62	7734	6.16

7	Germany	676	6.37	9713	7.73
8	Indonesia	475	4.48	1658	1.32
9	Italy	434	4.09	7250	5.77
10	Canada	397	3.74	5931	4.72
Total		**10608**	**100.00**	**125589**	**100.00**

The table 12 shows that, top 10 countries research publications for disaster management research during the study period of 2011-2020. From this study it is identified that, the maximum of 2536(23.91%) research publications are contributed by United States, followed by China with 1930(18.19%) research publications, India is third place with 1263(11.91%) research publications. During the ten year study period, highest number of 38843(30.93%) citations are received by United States and lowest number of 1658(1.32%)citations by Indonesia from the top ten countries contributions. Top 10 countries are contributed 10608research publications and 125589 citations.

Language wise Contributions in Disaster Management Research Publications

Table 13: Language wise Contributions

S.No	Language	No of Publications	%
1	English	12522	99.83
2	French	5	0.04
3	Spanish	4	0.03
4	Russian	3	0.02
5	Japanese	2	0.02
6	Turkish	2	0.02
7	Arabic	1	0.01
8	Croatian	1	0.01
9	Portuguese	1	0.01
10	Slovenian	1	0.01
11	Undefined	1	0.01
	Total	**12543**	**100.00**

Table 13 shows that, language wise research publications in the field of disaster management research during the ten year study period. From the study it is identified from the table 13, maximum of 12522(99.83%) research publications are English language, followed by 5(0.043%) research publications are French, 4(0.03%) research publications are Spanish. This study confirmed that most of the researchers are used in English language.

Highly cited top 10 in Disaster Management Research Publications

Table 14: Highly cited top 10 Publications

S. No	Description of the Publication	No of Citations	Document Type
1	Lindell, M.K., et.al (2012) The Protective Action Decision Model: Theoretical Modifications and Additional Evidence, Risk Analysis, 32(4): 616-632.	593	Article
2	Caunhye, A.M., et.al (2012) Optimization models in emergency logistics: A literature review, Socio-Economic Planning Sciences, 46(1):4-13.	486	Review
3	Corominas, J., (2014) Recommendations for the quantitative analysis of landslide risk, Bulletin of Engineering Geology and the Environment, 73(2): 209-263.	472	Article
4	Alexander, D.E. (2013) Resilience and disaster risk reduction: An etymological journey, Natural Hazards and Earth System Sciences, 13(11):2707-2716.	426	Article
5	Smith, A.C., et.al (2020 elehealth for global emergencies: Implications for coronavirus disease 2019 (COVID-19), Journal of Telemedicine and Telecare, 26(5): 309-313.	400	Article
6	Birkmann, J., et.al (2013) Framing vulnerability, risk and societal responses: The MOVE framework, Natural Hazards, 67(2): 193-211.	400	Article
7	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.	398	Review
8	Devkota, K.C.,et.al(2013) Landslide susceptibility mapping using certainty factor, index of entropy and logistic regression models in GIS and their comparison at	372	Article

	Mugling-Narayanghat road section in Nepal , Natural Hazards, 65(1): 135-165.		
9	Erdelj, M., et.al (2017) Help from the Sky: Leveraging UAVs for Disaster Management, IEEE Pervasive Computing, 16(1): 24-32.	366	Review
10	Cutter, S.L. et.al (2014) The geographies of community disaster resilience, Global Environmental Change, 29, 65-77.	359	Article

The table 14 shows that highly cited top 10 disaster management research publications during the selected 10 year study period. From the study it is identified that, maximum of 593 citations are received for the publication of Lindell, M.K., et.al (2012) theprotective action decision model: theoretical modifications and additional evidence, risk analysis, 32(4): 616-632. Followed by 486 citations by Caunhye, A.M., et.al (2012) Optimization models in emergency logistics: A literature review, Socio-economic planning sciences, 46(1):4-13., and 472 citations by Corominas, J., (2014) Recommendations for the quantitative analysis of landslide risk, Bulletin of engineering geology and the environment, 73(2): 209-263. Top 10 highly cited publications are contributed by 07 articles and 03 review.

Major Finding

- During the ten-year study period total number of 13339 research publications are identified in disaster management research and maximum of 2019(15.14%) research publications are contributed in the year 2020 and the highest citations of 16284(12.14) in the year 2012.

- During the study, the relative growth rate is 0.74 in the year 2012 and 0.16 in the year 2020. This study confirmed that the relative growth rate is decreasing trend. At the same time, doubling time found that 0.93 in the year 2012 and 3.62 in the year 2020, and it is confirmed that doubling time is increasing trend. Maximum of 37 (15.29%) research publications are contributed by Shaw. R. United States.

- This study identified average degree of collaboration is 0.83, average collaborative co-efficient is 0.55, and average collaborative index is 3.16 and modified collaborative co-efficient is 3.10. This study identified that, CAI for single 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 to 2nd block year.

- The study of time series analysis will be expect in the disaster management research publications in the year 2025 is around are equal to 2444 publications and the year 2030 is around are equal to 2999 publications. This study identified that the maximum of 8791(65.90%) research publications are contributed by article.

- Maximum of 644(26.943%) research publications in the natural hazards, maximum of 227(18.67%) contributions from the Chinese academy of sciences. The United States has maximum of 2536(23.91%) research publications. English language has contributed a maximum of 12522 (99.83%) research publications.

- During the study period, the maximum of 593 citations are received for the publication of Lindell, M.K., et al. (2012) the protective action decision model: Theoretical modifications and additional evidence, risk analysis, 32(4): 616-632 and document of articles.

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