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# A Bibliometric Analysis of Research Trends of Inter linkages between Disaster Management and Law

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## By

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## Abstract

*This study is the bibliometric analysis of research publications that focus on highlighting the inter linkages between disaster management and laws. The main objectives of the study are to determine the frequency of such publications and also to establish that inter linkages between disaster management and law have not received enough attention from the researchers. The data was collected from the Scopus database using VOSviewer software. Literatures written from 2000 to 2020 were perused. The study consisted of a total of 1649 documents which are classified into articles, letters, editorials conference papers, and reviews. Data collected is analyzed and presented using tables, charts, and graphs. The study revealed that not enough legal research is being conducted in connection with disaster management. This has also led to the under-development of the field of "disaster law". In the present pandemic crisis breeding several human disasters, it is also recommended that disaster-prone economies should fund and encourage such research.*

**Keywords** – Disaster laws, disaster management, bibliometric analysis, resilience, law

## I. Introduction

The term 'statistical bibliography' was coined by E. Wyndham Hulme in 1922, by which he meant the use of science and technology for counting documents. However, in 1969 Allen Pritchard (1969) said that the term 'statistical bibliography' is confusing and can be misunderstood as statistics or bibliography of statistics. He used the word 'bibliometrics' to define the art of applying mathematics and statistical methods to books and other means of communication (Pritchard 1969). So a bibliometric study can be understood as the evaluation and analysis of periodical literature for providing a complete picture of the existing

publications of any specific subject. Today bibliometric study is widely used to analyse and evaluate the research trend of any specific subject for a definite period of time with the help of bibliometric and citation indicators.

The present study attempts to examine the publication output on disaster management and laws from 2000 to 2020. It aims to establish that the research on disaster management has not received enough academic attention from the legal perspective. We analyse total 1375 documents with the help of graphical data representation and examines the documents from different perspectives like keywords analysis, type of documents, funding agencies, authorship affiliation, research domain, subject area, countries of publication, authorship and citation analysis.

## II. Statement of Problem

The rising frequency of disasters raises the concerns about the role of law in disaster management and disaster risk reduction. The role of law in prevention of disasters and protection of rights during disasters is largely an unexplored research area. Disasters whether man-made or natural, are largely dominated by research from the scientific perspective. However the paradigm shift from science to social science perspective on research on disasters is lately getting noticed. (Singh, 2018) A joint multi country report by The International Federation of Red Cross and Red Crescent Societies and United Nations Development Programme mention that laws and regulations play a pivotal role in building resilience of any community. They help in reducing the external risks and also in prevention of newer risks. Largely, laws can make communities safe. (IFRC & UNDP, 2015:5)

The Priority 2 of the Sendai Framework for Disaster Risk Reduction 2015-2030 is to *strengthen disaster risk governance to manage disaster risk*. Article 27(k) of the Framework states that disaster risk governance includes formulation of public policies for addressing issues of disaster risk reduction subject to national laws and legal systems. Also, because of the pre-existing vulnerabilities in societies, disasters also cause massive violation of human rights. The principles of rule of law and equity can play an effective role in protection of rights of people during and after disasters. However, usually disaster management laws end up only managing disasters and are oblivious to the potential of law in addressing disaster risk reduction and protection of rights of people. Also, there is growing need to establish a dedicated category of "disaster law" which can include laws like disaster management laws, environmental laws, common property resource management laws and their linkages with

various laws relating to human rights violations in the form of destitution or trafficking, etc which collectively aim at disaster risk reduction and management of disasters.

This paper endeavours to highlight the need of research on disaster management from the legal perspective and to map the research trends of disaster management and law by bibliometric analysis.

### III. Objectives of study

The key objectives of the study are as follows

- To study the pattern of articles distribution and citation by year
- To discover the affiliation of contributing authors by the country
- To map the most frequent keywords in documents relating to disaster laws and disaster management laws
- To determine the growth of publications and typology of documents
- To do the citation analysis of documents to establish the absence of law or inter-linkages of disaster management with law
- To analyse the research contribution by the countries on the basis their vulnerability to disasters.

### IV. Literature Review

Different bibliometric analyses were undertaken in the past spanning across different themes but peripherally touching upon law and policy.

**Demiroz and Haase (2019),** did a bibliometric analysis of resilience during emergency and disaster management. They found out that the concept of resilience gained attention of researchers only in 21$^{st}$ century and that too from 2008 onwards. The three primary clusters were observed during research such as environmental and ecological issues, emergency and disaster management, and public policy and administration. It was recommended that more research should be directed towards the development of knowledge of resilience. The paper also points out the challenges lies ahead of policymakers and researchers due to the growth and interdisciplinary nature of resilience studies.

**Waleed M. Sweileh (2018)** did bibliometric analysis study of climate change and health with a focus on infectious disease. They found out that research on interlink ages between the climate change, health is increasing. Moreover, the focus on infectious disease as result of climate change is also highlighted through research. They studied 4247 documents relating to health related literature and 1207 documents in infection related literature. It was found that after 2007 there is steep rise in the growth of publications. They recommended that international collaboration for such research should be encouraged, funded and supported by the nations. The focus of future research should be on the impact of climate change on psychosocial, behavioural, and technological advancements, policies, and health-system preparedness.

**Zhang, Q., Lu, Q., Zhong, D. et al. (2018)**, studied Chinese framework of policy to deal with disaster induced by natural hazards from 1949 to 2016 by quantitative bibliometric analysis of 5472 policy documents. They were able to identify four years of china's evolving disaster management system which emphasised on agriculture economic development, professional capacity building and government and disaster governance respectively. This article provides a quantitative foundation for understanding the complex policy reform in China's disaster management system, with a focus on governance capability, and may be used to explore possible transition paths in accordance with the Sendai Framework for Disaster Risk Reduction 2015–2030 and the Sustainable Development Goals.

**Ma R., Ho YS (2016)**, with the help of their bibliometric analysis of environmental law literature in both the fields of natural and social sciences, established that China is a central issue in research in both fields of natural science and social sciences. This reflects the growing trend of research in environmental law research in China and also raises concern about China's growing environmental laws issues.

**Ziabina and Pimonenko (2020),** discovered the connection between renewable energy sources and energy conservation with the aid of constructed bibliographic maps. The authors analysed 3 to 7 papers from Scopus database, published from 1999 to 2019. They used VOSviewer to further analysis the data collected from Scopus. They identified 6 clusters that combine 131 terms.

The literature review showed that there is not much research on disaster management and law directly. The trend of research in disaster management from health, climate change,

energy studies is lately catching up. The law also becomes an important aspect of such studies and there is an urgent need to recognise its role in making communities safer from disasters. There are not enough studies on the idea of fixing accountability of authorities in charge of disaster risk reduction and disaster management. We need more research to analyse and appreciate the relationship between disaster management and law.

## IV. Research Methodology

### IV.1.Source of information

The present study is conducted with the help of Scopus database. The Scopus database is developed by the Elsevier in the year 2004. Scopus is the peer-reviewed literature database such as scientific journals, conference proceedings and books. It has comprehensive literature in the fields of medicine, social science, arts and humanities and Science and technology. Scopus also has tools for analysis and visual representation of data. The Scopus database uses many metrics to analyse the data such as authors and their affiliation, document type, total no. of papers, total no. of citation, H-index.

### IV.2.Study Design

The bibliometric method is adopted for the study. The bibliometric analysis is done for the period of 2000 to 2020 i.e. 20 years. It is observed that since two decades the frequency of the natural disaster has increased. The disasters have affected people on an average of 99 million a year (The Guardian, 2016). Therefore the study is conducted to analyse whether the natural disaster has attracted any attention of researchers in the past 20 years.

### IV.3. Search Strategy

The keywords play a major role in fetching the results through database. Therefore, in the present study the researchers has used keywords and title word including few constrains to reduce false positive results for conducting the study. The keywords and title words are presented in Table 1. The keywords were accessed from previous published literature on disaster management laws. The limitations set during the study were about the source type and language. We have analysed articles published in English language only.

The search result showed total 1649 publications by using Scopus database. Further the search was restricted to 1375 English publication only. We selected all publications in the subject matter of disaster management laws. The VOSviewer analysis and Scopus analysis data were used for visualisation of maps.

## V. Presentation and Analysis of Data

Table 1 Research strategies and keywords used to retrieve document in the field of inter linkage of human trafficking and natural disaster

| Search method | Keywords | Constraints | Exclusion |
|---|---|---|---|
| Title words | Disaster management laws and disaster laws | None | -- |
| Limit | 1. Source language = English 2. Time interval = 2000 – 2020 | -- | -- |

## V.1. Growth of publication and typology of documents

Out of total 1375 documents there were five different types of document: Articles (47.7%), conference paper (25%), review (10.7%), book chapter (7.7%), book (3.3%), editorials (1.7%), Note (1.5%), Short Survey (1.2%), conference review (0.6%), letters (0.2%) and other (0.4%)[Table 2].

The retrieved number of documents has been fluctuating during the study time (Figure 1). The publication was at peak between 2020 but the decline was observed after 2021.
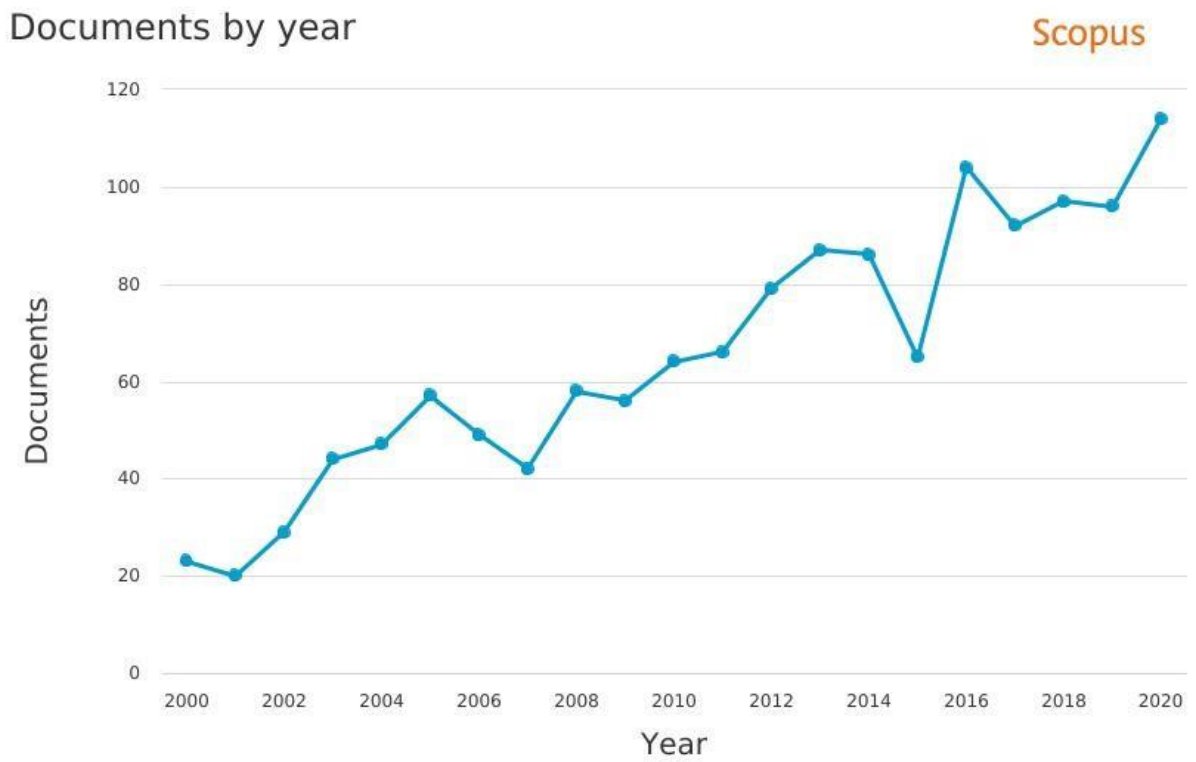
**Table 2 -Document type and No. of Documents**

| Document Type | No. of Documents | Percentage |
|---|---|---|
| Article | 656 | 47.7% |
| Conference Paper | 344 | 25% |

| | | |
|---|---|---|
| Review | 147 | 10.7% |
| Book Chapter | 106 | 7.7% |
| Book | 45 | 3.3% |
| Editorial | 23 | 1.7% |
| Note | 21 | 1.5% |
| Short Survey | 16 | 1.2% |
| Conference Review | 8 | 0.6% |
| Letter | 3 | 0.2% |
| Other | 6 | 0.4% |
| **Total** | **1375** | **100**% |

**Figure1 -Growth of publication and typology of documents**

**Source: visited scopus.com/ on 9rd April 2021**



Documents by year — Scopus

**V.2. Mapping the most frequent keywords and typology of trafficking and disasters**

The keywords selection is very important as it is directly relates to the results and finding. The most common keywords that were visualised are in figure 2. The minimum no. of occurrence of keywords was 5. The total 784 items i.e. keywords were part of

threshold. The map showed 784 items in form of 6 clusters comprising of cluster (1) with 384 items, cluster (2) with 196 items, cluster (3) with 117 items, cluster (4) with 83 items and cluster (5) and (6) with 2 items each. Figure 2 shows the most common keywords retrieved from the documents. The keywords "disaster management", "disaster", "law", "law enforcement", "legal aspects" and "human" occurred many times. Table no. 3 shows the occurrence of the keywords, it can seen that terms like "law", "legislation" and "law enforcement" feature in top 20 keywords. The term "law" occurred 154 times whereas the term law enforcement has occurred 156 times and law and legislation has occurred 198 times. This clearly establishes that there is upcoming trend to recognise and to do research on disaster management and law.
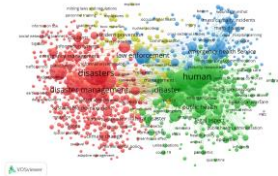
**Table 3 Keywords and occurrence**

| Selected | Keyword | Occurrences | Total link strength |
|:---:|---|---:|---:|
| ☑ | human | 335 | 5938 |
| ☑ | humans | 290 | 5211 |
| ☑ | disaster planning | 229 | 4125 |
| ☑ | article | 229 | 4084 |
| ☑ | disasters | 363 | 3763 |
| ☑ | organization and management | 197 | 3508 |
| ☑ | united states | 188 | 3273 |
| ☑ | disaster | 196 | 3009 |
| ☑ | law | 154 | 2758 |
| ☑ | risk management | 215 | 2363 |
| ☑ | law enforcement | 156 | 2186 |
| ☑ | disaster management | 242 | 2081 |
| ☑ | risk assessment | 157 | 2050 |
| ☑ | laws and legislation | 198 | 1929 |
| ☑ | priority journal | 98 | 1861 |
| ☑ | public health | 96 | 1782 |
| ☑ | emergency health service | 91 | 1710 |
| ☑ | government | 88 | 1666 |
| ☑ | disaster prevention | 191 | 1629 |
| ☑ | review | 82 | 1523 |

**Figure 2 Mapping the most frequent keywords and typology of trafficking and disasters**
**Source: visited scopus.com/ on 9thApril 2021**



## V.3. Research Domain

The total 371 documents i.e. 26.98% of the documents were retrieved from the field of social sciences. The chemical engineering field contributed about 27 documents i.e. 1.1% of documents, whereas chemistry field contributed 07 documents i.e. 0.3%. The documents retrieved from earth and planet science is 231 documents i.e. 9.8%. Whereas the documents retrieved in the field of Biochemistry, Genetics and Molecular Biology is 17 documents i.e. 0.7% and Business, Management and Accounting is 84 documents i.e.3.6%. The Computer science has contributed 155 documents i.e. 6.6%. The 85 documents i.e. 3.6 % of documents retrieved from the field of agricultural and biological science. The 53 document i.e. 2.2% were retrieved from the field of Decision science. The 689 documents i.e. 71% were retrieved from the other field (Figure 3). It can be said that dedicated subject domain of "law/legal" is still not observed. However, since the keyword analysis shows recurrence of words like law enforcement and legal aspects we can presume that in the others category which accounts for 71% of the documents, research publications are touching upon the legal aspect of the problem.
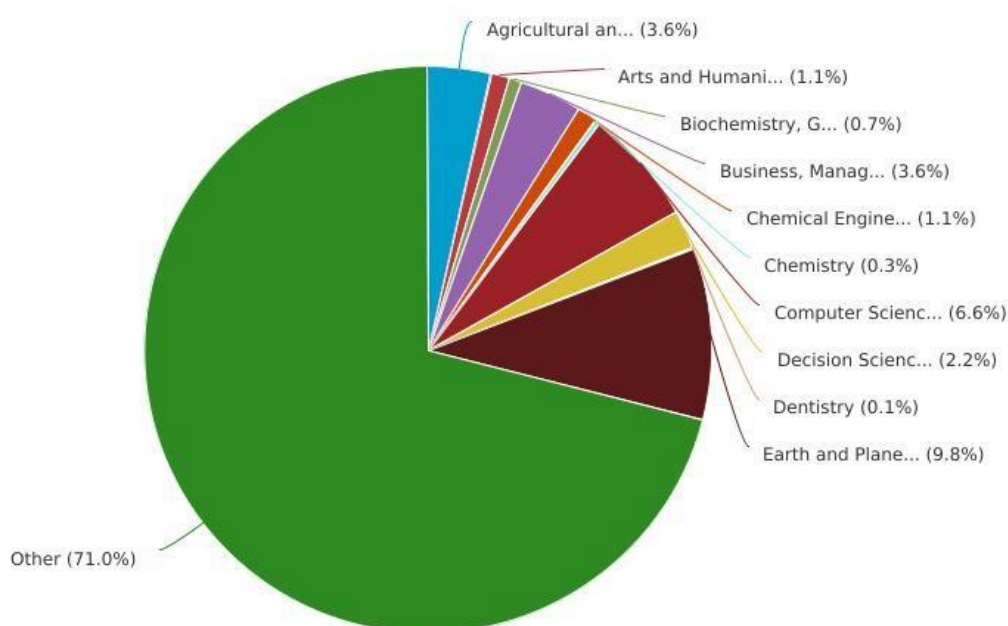
**Table 3 Subject Area and Number of Documents**

| Subject Area | No. of Documents | Percentage |
| --- | --- | --- |
| Agricultural and Biological Sciences | 85 | 3.6% |
| Arts and Humanities | 25 | 1.1% |
| Biochemistry, Genetics and Molecular Biology | 17 | 0.7% |
| Business, Management and Accounting | 84 | 3.6% |
| Chemical Engineering | 27 | 1.1% |
| Chemistry | 7 | 0.3% |
| Computer Science | 155 | 6.6% |
| Decision Sciences | 53 | 2.2% |
| Dentistry | 2 | 0.1% |
| Earth and Planetary Sciences | 231 | 9.8% |
| Others | 689 | 71% |
| **Total** | **1375** | **100%** |

**Figure 3 Documents by subject's area**

**Sources: visited scopus.com/ on 9thApril 2021**



Documents by subject area

Scopus

Agricultural an... (3.6%)
Arts and Humani... (1.1%)
Biochemistry, G... (0.7%)
Business, Manag... (3.6%)
Chemical Engine... (1.1%)
Chemistry (0.3%)
Computer Scienc... (6.6%)
Decision Scienc... (2.2%)
Dentistry (0.1%)
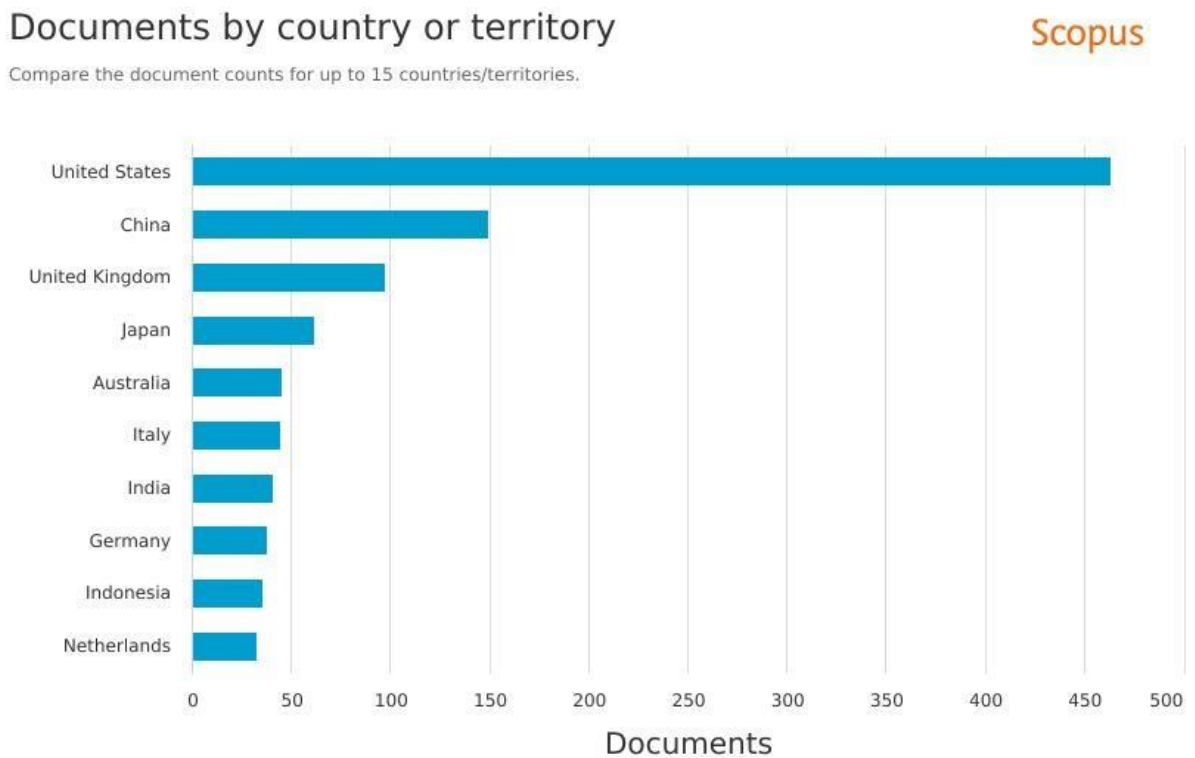Earth and Plane... (9.8%)
Other (71.0%)

### V.4. Top 10 active countries

Authors from various countries have contributed in publishing the retrieved documents. The top 10 active countries contributed in publishing documents. The United States ranked first in number of published documents. The other top ten countries that have published documents are United States, China, United Kingdom, Japan, Australia, Italy, India, Germany, Indonesia and Netherlands. The graphical representation of the same is in figure 4.

**Figure 4 Top 10 active countries**

**Source: visited scopus.com/ on 9th April 2021**



### V.5 Disaster risk analysis

Investing in disaster risk reduction for resilience is the basic aim of Sendai framework to achieve the sustainable development goals (UNISDR, 2017). This clearly establishes that investment in research and development is one of the keys to disaster risk reduction and making communities resilience. Also, the countries which are highly vulnerable to disaster risk are contributing less towards the research and development and vice versa.

Thus it is the need of the hour that research is promoted and funded by the states of the most vulnerable countries.

**Table 4 – World risk report –**

| Rank | Name of the Countries | Risk index |
|------|----------------------|------------|
| 1 | Vanuatu | 49.74 |
| 2 | Tonga | 29.72 |
| 3 | Dominica | 28.47 |
| 4 | Antigua and Barbuda | 27.44 |
| 5 | Solomon Islands | 24.25 |
| 6 | Guyana | 22.73 |
| 7 | Brunei Darussalam | 22.3 |
| 8 | Papua New Guinea | 21.12 |
| 9 | Philippines | 20.96 |
| 10 | Guatemala | 20.09 |

(Source – worldriskreport.org/#data on 9th April 2021)

**V.6 Authorship and Affiliation analysis**

The top 10 authors were identified who have contributed in the research. The documents retrieved show that maximum 08 documents were contributed by Burkle FM and Hodge JG contributed 07 documents, whereas rest of them have written minimum 3 documents each (Figure 5).

The affiliation of top 10 institutions is identified. The Centre for Disease Control and Prevention, USA has the highest associated documents i.e. 17 followed by the Harvard University, USA with 16 documents and University of Tokyo ranks third with 13 documents (Figure 6).

**Figure 5 Top 10 Authorship analyses and their affiliation analysis in Scopus database**

**Source: visited scopus.com/on 9th April 2021**



Documents by author
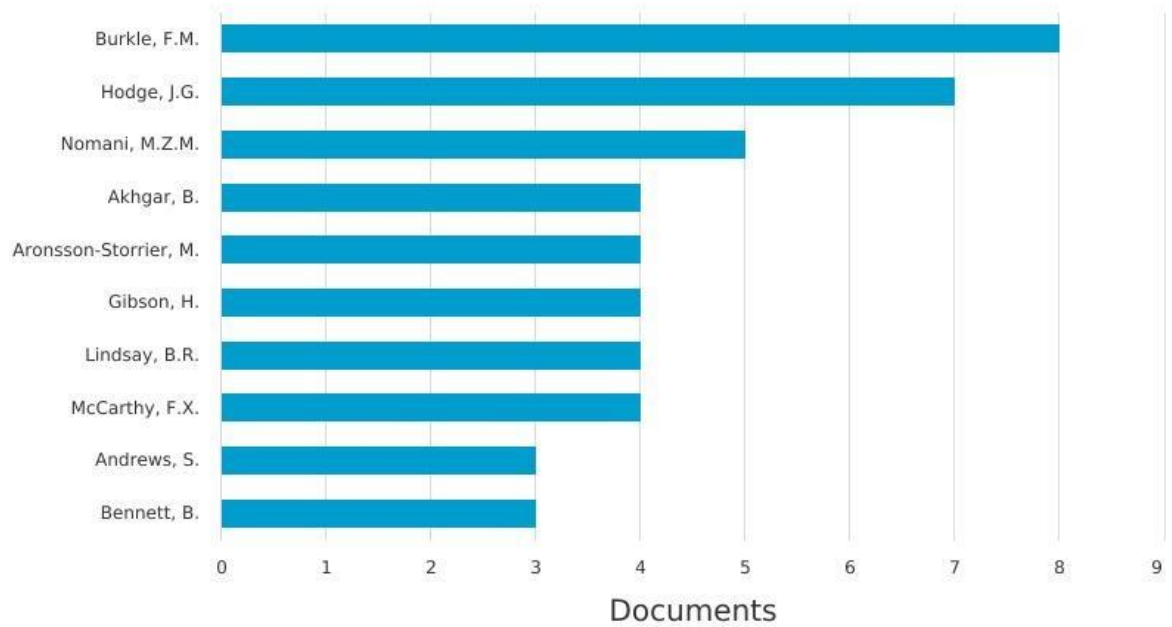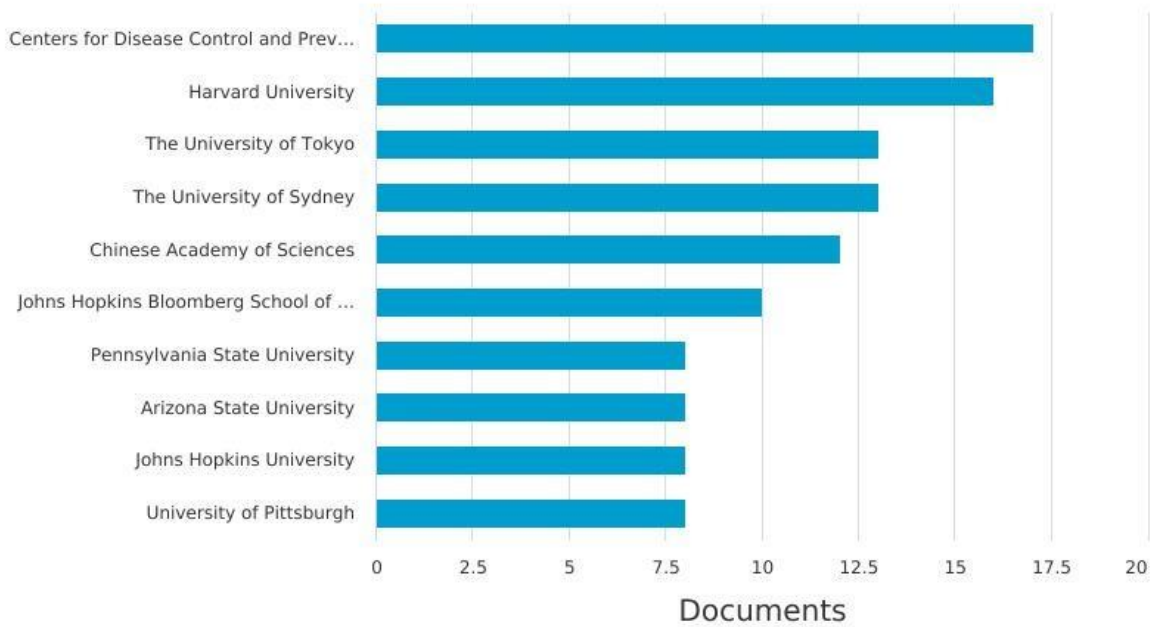
Compare the document counts for up to 15 authors.

Scopus

**Figure 6 Top 10 Institution affiliation analyses in Scopus database**

**Source: visited scopus.com/on 9<sup>th</sup> April 2021**



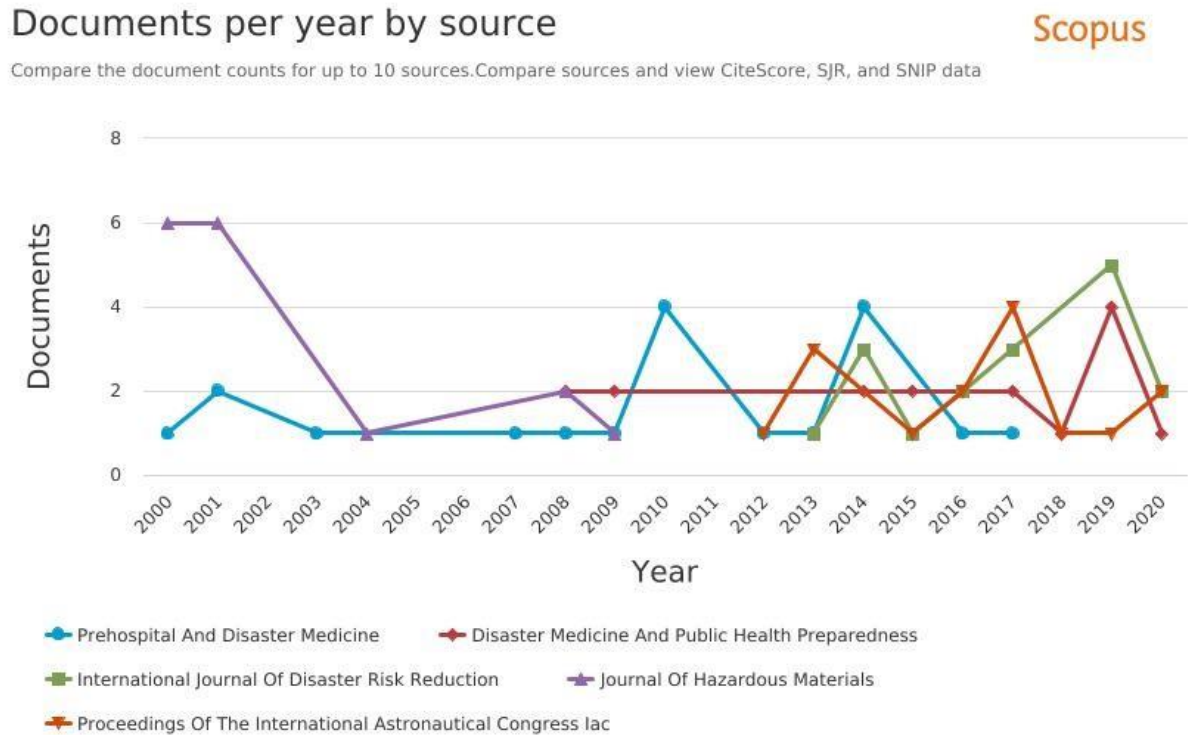## V.7 Source for publishing documents

The documents retrieved where published various sources. The most active journal is Pre-hospital and Disaster Medicine. The top 05 journal sources where identified which is shown in the figure no. 7.

**Documents per year by source**

Compare the document counts for up to 10 sources.Compare sources and view CiteScore, SJR, and SNIP data

Scopus

Legend:
- Prehospital And Disaster Medicine
- Disaster Medicine And Public Health Preparedness
- International Journal Of Disaster Risk Reduction
- Journal Of Hazardous Materials
- Proceedings Of The International Astronautical Congress Iac

## V.8 Citation analysis

The retrieved document is 1397. The minimum 5 citation per document was selected and only 474 documents meet the threshold but only 10 documents were connected to each other. There are 03 clusters consisting cluster (1) of 4items, cluster (2) of 3 items and cluster (3) of 3 items (Figure 7)

**Figure 7 Citation analysis**

**Source: visited scopus.com/ on9thApril 2021**



## Discussion and Conclusion

The present study was conducted for analysis of the research trends in the area of disaster management and laws. The keyword analysis proved that keywords "law", "laws and legislation" and "law enforcement" feature in top 20 keywords. Also, in the subject domain analysis, 71% of the documents fall in the "others" category which can be understood as inclusive of the legal studies also. It can be said that authors are publishing on disaster laws, human rights and disaster, violence and disaster, disaster management and technology and climate change. A strong linkage is seen between the keywords such as disaster management, disaster, law enforcement, humans and policy. The total link strength of these keywords with other keywords is also strong. A link is a connection or relation between two items. The strength of a link indicates the number of publications in which two terms occur together. The link strength of "law", "law enforcement" and "laws legislation" is 2758, 2186 and 1929 respectively. The connection between the authors was also seen through the citation of work. It was observed that the top 10 contributing authors have received fair amount of citation. It was identified that connection between the authors and institution is also strong.

A lot of research work is done on the development of technology to improve disaster management. The study showed inadequate research is done in disaster prone countries.

It is also observed that there is no international collaboration for the research in disaster management laws.

It can be concluded that there is growing acceptance of importance and role of law in addressing disaster risk reduction and protection of rights of people. However, the research on disaster management purely from the legal perspective is still not being conducted. International organisations like The International Federation of Red Cross and Red Crescent Societies are recognising the relevance and urgency to give priority to "disaster law" in their different publications and programmes. It is only through pure legal research on disaster management and resilience that a special category of "disaster law" can be recognised both in national and international law. Our analysis establishes complete absence of this category in recent research.

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