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A Bibliometric Analysis Of Slums

Gecekondu Çalışmalarının Bibliyometrik Analizi

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Abstract: Studies written in the scientific world should be reviewed periodically. Such a review shows the general trend of studies in a particular field and allows focusing on the missing parts of the literature. Bibliographic studies are generally considered from two perspectives. In these studies, it is possible to focus on studies on a specific subject, as well as examining studies in a field or in an academic journal. In this study, a subject-based approach was adopted. The aim of this study is to review entire slum literature on the world from 1976 to 2021, and provide a comprehensive overview of the'slums' that have emerged and developed over the last century. The analysis is used dataset containing 6795 documents derived from the Web of Science database. The collected data was organized, and several analyses such as citation source networks, co-citation analysis, and lexical networks were conducted. ArcGIS 10.4.1. and VOSviewer packages programs are used for data analysis and visualization, respectively. Using the packages programs, the most productive countries, the most influential documents according to the citations, the top authors were identified and visualized. A lexical network analysis shows a strong relationship between "poverty" and "sanitation", two terms often used in the slum research. In the presented review on the slums, the United States, India, and the United Kingdom stand out "Habitat International", "Environment and Urbanization" and "Plos One" are the top three most influential journals in the slum study.

Structured Abstract: The United Nations reports that the overall number of people living in slums or informal settlements has risen over time, topping one billion in 2018. East and Southeast Asia (370 million), Sub-Saharan Africa (238 million), and Central and South Asia (238 million) have the most slum population (226 million) (Kalterina and Köszeghy, 2021). Another issue that the United Nations emphasizes on this issue is that the number of people living in slums will increase even more in the coming years. The fact that many people live in the slums and that more people will be living in slums in the future causes slums to be more popular topic in the scientific world. Thus, the topic and problems of the slums have been reviewed from various perspectives in the related literature (Woo & Jun, 2020). While some studies have examined the impact of slums on public health, others have discussed the social and psychological problems that slum dwellers suffer. Additionally, several studies have emphasized the slums' economy. However, there hasn't been a study published in the literature that uses the bibliometric mapping approach to analyze slum research.

In this work, bibliometric mapping methods were used to create an overview of slum researches, which is a quantitative examination of all information carriers using mathematical, statistical, and other measurement approaches. Bibliometric studies are generally concerned with scientific entities such as research themes, lexical networks, citation sources, scientific publications or authors, and their institutional linkages.

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Materials and methods

The papers evaluated in this research were solely gathered on the Web of Scinece (WoS) web interface during January 18-19, 2022, using the term'slum.' The publication search method comprised all indexes (SSCI, SCI-EXPANDED, ESCI, A&HCI, CPCI-S, BKCI-SSH, CPCI-SSH, BKCI-S). Articles, Proceedings Papers, Book Chapters, Review Articles, Early Access, and Books were refined till 2021, and 6795 documents of remaining were employed in the bibliometric article analysis.

The top ten journals' current impact factors were collected from their individual journal websites. Microsoft Excel was used to create the descriptive analyses, bar graphs, and line graphs. In addition, using the visualization program VOSviewer, version 1.6.15, maps of lexical, geographical, and citation resource networks were created. Van Eck and Waltman (2010) (www.vosviewer.com). ArcGIS was also used to show the countries publishing relevant to the issue.

Results

From 1976 to 2021, a total of 6795 documents on slums were published. With an average yearly growth rate of 23%, there are 151 publications published each year on average. Few studies on the slums were published before 1980, despite the fact that study on them began in 1976 with one article. In the 2000s, there was a noticeable growth. Studies on the slums have grown quickly, especially after 2005. 6021 investigations have been conducted since 2005, making up 89% of all research papers published in this area.

Researchers from disciplines including environmental studies, geography, regional urban planning, development studies, and urban studies conducted studies on the slums up to the 1980s, but no study was done in the area of public environmental Occupational Health. In the 1980s, a wide range of academic fields began to focus on slum studies. Slums were the subject of study for the academics from 24 different disciplines between 1981 and 1990. Prior to 1980, social scientists researched the slums; however, it wasn't until the 1980s that health sciences experts started researching this subject. The variety of study disciplines and the quantity of slum-related publications have both grown during the 1990s.

The top 10 nations with the most publications, as well as their percentages of all publications, have been found by analyzing the distribution of publications by country. The majority of documents were published in the United States, with 25% (1,429 papers), followed by India (23%, 1308 papers), and the United Kingdom (13%) (737 papers). The University of London in England produces the most research, followed by the African Population and Health Research Center in Kenya and the International Centre for Diarrheal Disease Research in Bangladesh. The most popular publications for "slum research" include Habitat International, Plos One, Environment and Urbanization, and others.

The three most important writers in slum research are Catherine Kyobutungi from the African Population & Health Research Centre in Kenya, Tahmeed Ahmed, and Rashidul Haque from the International Centre for Diarrhoeal Disease Research in Bangladesh. Urban slums, poverty, and housing are the three most important keywords that frequently arise in slum studies in terms of co-occurrence. Additionally, there is a strong correlation between the phrases "urban poor," "urbanization," "sanitation," "slum upgrading," and others with slums.

Keywords: Urban studies, bibliometric analysis, slums, citation source networks, co-citation analysis, lexical network

Öz: Akademik çalışmalar belirli periyotlarda gözden geçirilmelidir. Böyle bir tutum, belirli bir alandaki çalışmaların genel eğilimini, güçlü, zayıf yönlerinin anlaşılmasına olanak sağlar ve literatürün eksik kısımlarına odaklanmayı sağlar. Bibliyometrik çalışmalar genellikle iki şekilde ele alınır. Bu çalışmalarda belirli bir konudaki çalışmalara odaklanılabileceği gibi bir alanda veya akademik bir dergide yapılan çalışmaları da incelemek mümkündür. Bu çalışmada konu bazlı bir yaklaşım benimsenmiştir. Web of Science veri tabanında gecekondular ile alakalı olan tüm çalışmalar derlenmiştir. 1976-2021 yılları arasında gecekondular ile alakalı 6795 çalışma incelenmiş ve çeşitli analizler yapılmıştır. Verilerin analiz ve görselleştirilmesinde ArcGIS 10.8.1 ve VOSviewer paket programları kullanılmıştır. Toplanan veriler düzenlenerek bilim dallarına göre çalışmaların dağılımı, atıf kaynak ağı, ortak atıf analizi ve anahtar kelimeri analiz edilmiştir. Buna göre, bir çalışmanın özensi olarak gecekondular ile alakalı çalışmaların 2000'li yıllardan sonra hızlı bir şekilde artış gösterdiği görülmektedir. Müstakil ya da genel olarak gecekonduları

kendisine çalışma alanı olarak seçen araştırmacılar, halk sağlığı, çevre çalışmaları, şehir çalışmaları, şehir ve bölgesel planlama, coğrafya gibi çeşitli disiplinlere mensuptur. Gecekonlar ile alakalı çalışmaların önemli bir kısmı Amerika Birleşik Devletleri ve gecekondulaşma oranlarının yüksek olduğu Hindistan gibi ülkelerin ön plana çıktığı görülmektedir. Sözlüksel ağ analizi, gecekondu araştırmalarında sıklıkla kullanılan iki terim olan "yoksulluk" ve "temizlik" arasında güçlü bir ilişki olduğunu göstermektedir.

Anahtar Kelimeler: Şehir çalışmaları, şehirleşme, biblometrik analiz, gecekondular, gecekondulaşma

Introduction

According to the United Nations, total number of people living in the slums or informal settlements has increased over time, surpassing 1 billion in 2018. The three regions with the most slum residents (226 million) are East and Southeast Asia (370 million), Sub-Saharan Africa (238 million), and Central and South Asia (238 million) (Kalterina and Köszeghy, 2021). Besides this slum concern, UN-Habitat estimates that 3 billion people will require adequate and affordable housing by 2030 (UN-Habitat, 2018). Because the number of people living in the slums is expected to rise, slum-related problems are likely to rise as well. The fact that many people live in the slums and that more people will be living in slums in the future causes slums to be more popular topic in the scientific world. Thus, the topic and problems of the slums have been reviewed from various perspectives in the related literature (Woo & Jun, 2020). Among these studies, While some studies have discussed effect of the slums on the public health (Alaazi & Aganah, 2020; Kien and et al., 2014; Vaid & Evans, 2017; Baumgart, and et al., 2011), others have debated the slum problem in terms of social (Obaitor and at al., 2021; Matous & Ozawa, 2010; Yeboah et al., 2021; Rains & Krishna, 2020; Yulu, 2021), and psychological (Ghosh & Mukhopadhyay, 2021; Subbaraman and et al.,2014) issues which people face in the slums. Further, some studies have focused on economics of the slums (Marx, and et al, 2013; Gandhi, 2012). However, there has been available no study in the literature, which analysis slum researches using the bibliometric mapping method.

In this study, an overview of slum researches was drawn using bibliometric mapping methods which is a quantitative analysis of all information carriers using mathematical, statistical and other measurement methods (Xu & Yu, 2019). Although there is no standard application procedure (Siyavuş and Aydın, 2021), bibliometric studies are typically concerned with scientific entities such as research themes, lexical networks, citation sources, scientific publications or authors, and their institutional connections. Based on the bibliometric analysis, the presented study proposes that academics could well understand slum models, and identify research gaps that would generate ideas to future research on the topic.

Moreover, the study has been carried out to achieve the following objectives:

To find out distribution statistics of contributions in diverse fields of science

To find out the year wise size of the contribution

To determine continent wise distribution of contributions in the journals

To identify the most prolific writer

To calculate citation count per article

To determine the most impactful articles published in the slum research literature

To detect keywords network model

To ascertain contributing authors affiliations

2. Materials and methods

The bibliometric research can be conducted using variety of data sources including Web of Science (WoS), Scopus, PubMed, DBLP, NLM's MEDLINE, and Google Scholar (D'Angel & van Eck, 2020; Biswas et al., 2021). The publications reviewed in this paper were only collected in the web interface of Web of Scinece (WoS) during January 18–19, 2022, with the term 'slum'. All indexes (SSCI, SCI-EXPANDED, ESCI, A&HCI, CPCI-S, BKCI-SSH, CPCI-SSH, BKCI-S) were included in the publication search process. Articles, Proceedings Papers, Book Chapters, Review Articles, Early Access, Books until 2021 were refined, and 6795 documents of remainder were used in the analysis of bibliometric article. It was ranked among the top ten countries, organizations, journals, and most influential authors, based on the overall number of publications.

The current impact factor of the top ten journals was obtained from the respective journal websites. The descriptive analysis, representation of bar graphs and line graphs were drawn *via* Microsoft Excel. Additionally, maps of lexical, geographical, and citation resource networks were generated using visualization software VOSviewer, version 1.6.15. (www.vosviewer.com van Eck & Waltman, 2010). Also, the nations publishing pertinent to the topic were visualized using ArcGIS.

3. Results

3.1.Distribution of publications by years

The total of 6795 documents was published on the slums from 1976 to 2021. The annual average number of publications is 151, with an average annual growth rate of 23%. Although research on the slums started in 1976 with one article, few articles were published on the slums before 1980. The 1990s were more productive than the 1980s. While the number of articles published from 1976 to 1989 was 112, the number of articles published from 1991 to 2005 was 755, and it onstitutes to 11% of the research publications in this field. A significant increase occurred in the 2000s. Especially since 2005, studies on the slums have been increasing rapidly (Fig. 1.) The number of studies since 2005 is 6021, and it constitutes 89% of the research publications in this field (Table 1)

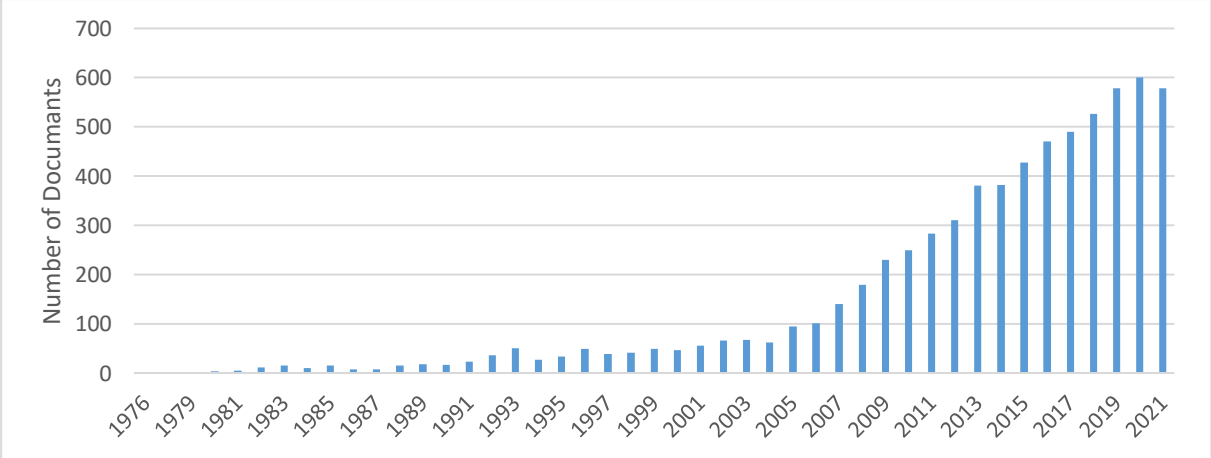


Fig. 1. The Number of Papers Related to Slums in WoS Database.

3.2. Interpretation of categorization

Table 1 shows the uppermost 25 subject categories. The three most common categories were public environmental occupational health (accounting for 11.4% of the 1101 papers), urban studies (700 papers; 7.3%), environmental studies (548 papers; 5.7%). Until the 1980s, studies on the slums were carried out by researchers from the fields such as environmental studies, geography,

regional urban planning, development studies, and urban studies, and no studies have been conducted in the field of Public Environmental Occupational Health. The studies on the slums were started to be handled by many different disciplines in the 1980s. From 1981 to 1990, the researchers from twenty-four different disciplines chose slums as a field of study. While social scientists studied the slums before 1980, the researchers from the health sciences began studying in this topic in the 1980s. Since the 1990s, there has been an increase in both the number of publications on the slums and the diversity of research fields.

Table 1: Research areas' distribution and temporal variation (the top 25)

Web of Science Categories	Total Articles	%	Articles				
			1976-1980	1981–1990	1991–2000	2001–2010	2011–2021
Public Environmental Occupational Health	1178	17.3	Null	14	89	217	858
Urban Studies	816	12.0	1	19	36	172	588
Environmental Studies	618	9.1	2	13	19	130	454
Environmental Sciences	450	6.6	Null	6	16	76	352
Regional Urban Planning	408	6.0	1	26	32	79	270
Geography	379	5.6	1	6	9	59	304
Medicine General Internal	333	4.9	Null	6	29	54	245
Development Studies	324	4.8	1	12	11	63	237
Tropical Medicine	241	3.5	Null	10	42	57	132
Infectious Diseases	229	3.4	Null	2	17	61	149
Economics	220	3.2	Null	5	6	43	166
Pediatrics	204	3.0	Null	3	36	68	97
Water Resources	182	2.7	Null	Null	9	26	147
Multidisciplinary Sciences	171	2.5	Null	2	7	14	148
Nutrition Dietetics	171	2.5	Null	6	25	48	92
Social Sciences Interdisciplinary	170	2.5	Null	4	5	29	132
History	162	2.4	Null	4	3	44	111
Immunology	153	2.3	Null	5	28	42	78
Architecture	144	2.1	1	1	4	37	101
Green Sustainable Science Technology	135	2.0	Null	Null	1	2	132
Education Educational Research	134	2.0	Null	Null	1	18	115
Sociology	134	2.0	Null	3	6	21	104
Area Studies	132	1.9	Null	1	6	22	103
Political Science	115	1.7	Null	13	10	18	74
Medicine Research Experimental	111	1.6	Null	7	7	20	77

Note: NULL means that there is no such research area in specific time period

Source: WoS datasets, 2022.

3.3.Distribution of publications by Country

The distribution of publications by country was studied, and the top ten countries with the most publications, as well as their percentages of total publications, have been identified. Table 2 lists the top ten countries for the slum researches, as well as the various features of publications,

such as TP, TC, and TC/TP. It also distributes the number of publications produced by the top 10 countries across time. The United States published the most documents, 25 percent (1429 papers), followed by India with 23 percent (1308 papers) and the United Kingdom with 13 percent (737 papers). These countries started publishing on the subject in 1977, 1981, and 1977, respectively. However, the majority of their articles on the subject, 77 percent (1099 papers), 77 percent (1001 papers), and 83 percent (612 papers), have been for the recent five years (2011–2021). Between 2001 and 2010, the United States published 6% (280 papers) of all publications, while India and the United Kingdom each contributed 6% (271 papers) and 5% (150 papers), respectively. Brazil began publishing in 1983 and is now rated fourth having published 7% (458 papers) of all texts published by the top ten countries. Kenya, which began releasing documents in 1992, was ranked fifth by publishing 7% (395 papers). Bangladesh, Netherlands, Australia, Canada, and South Africa ranked seventh, eighth, ninth, and tenth in terms of document production, with 4 percent (373 papers), 4 percent (245 papers), 4 percent (239 papers), 4 percent (219 papers), and 4 percent (209 papers), respectively, after entering the field in 1985, 1983, 1988, 1989, and 1991.

During the last 10 years, from 2011 to 2021, their percentage shares of total publications have increased. Furthermore, studies on the slums have been conducted in a number of other nations (130 papers). The intensity of studies by countries was investigated between 1976 and 2021 (Fig. 2.).

Table 2: The Top Ten Countries and The Number of Publications Throughout Time

Country	TP	%	TC	TC/TP	1971 - 1980	1981 – 1990	1991–2000	2001 – 2010	2011 – 2021	First Publication Year
Usa	1429	26	34325	24	4	16	89	280	1099	1977
Indıa	1308	23	17386	13	Null	30	74	271	1001	1981
United Kingdom	737	13	15729	21	1	12	39	150	612	1977
Brazıl	468	7	8036	17	Null	8	36	109	333	1983
Kenya	407	7	8866	22	Null	Null	12	58	378	1992
Bangladesh	373	4	7778	21	Null	3	33	80	310	1985
Netherlands	245	4	5346	22	Null	3	7	36	234	1983
Australia	239	4	3426	14	Null	1	11	42	214	1988
Canada	219	4	3612	16	Null	1	11	47	181	1989
South Afrıca	209	4	3256	16	Null	Null	4	18	213	1991

Note: NULL means that there is no such research area in specific time period

Source: WoS datasets, 2022. Note: TP = Total publications; TC = Total citations.

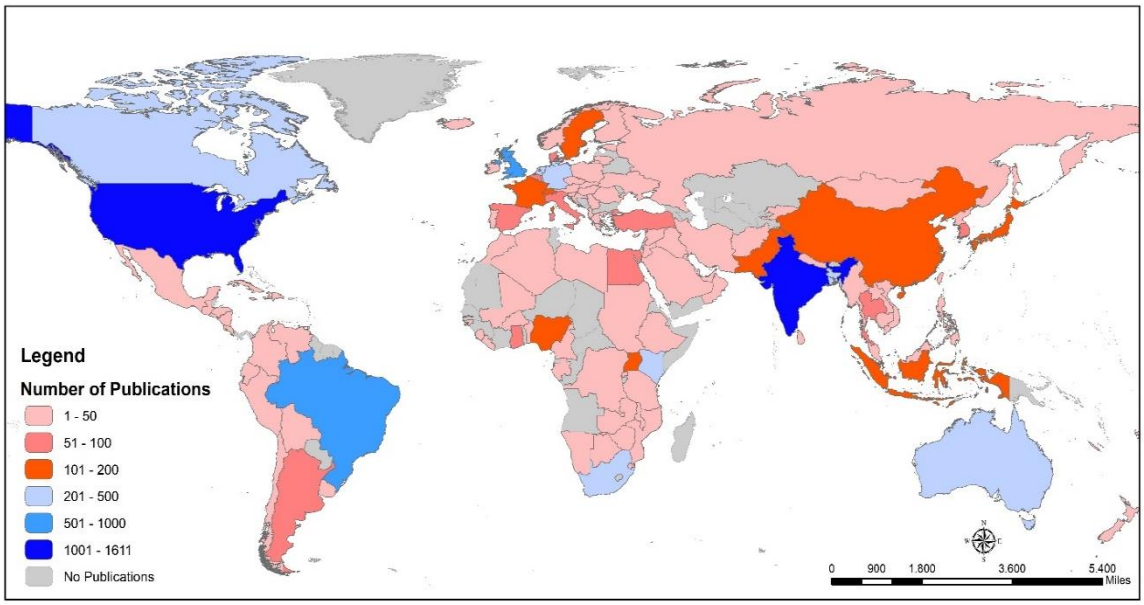


Fig. 2. The All Publishing Countries Across The World.

3. 4. Distribution of Publications by Organization

Table 3 shows the top ten institutions that produced the most slum-related documents, illustrating various TP, TC, and TC/TP indicators. It also displays that the number of publications made by the top ten organizations throughout various time periods. University of London in England came in top, followed by the African Population and Health Research Center in Kenya. International Centre for Diarrheal Disease Research from Bangladesh ranked third. These organizations began publishing in the field of the slums in 1981, 1986, and 2003, respectively, and accounted for 19% (293), 13% (210), and 13% (204) of the top ten institutions. University of California System and Johns Hopkins Universty in the USA, Indian Council of Medical Research (ICMR) in India, London School of Hygiene & Tropical Medicine and the University College London in England have been close to them, which began to contribute to the field from 1997, 1986, 1982,1992, and 1988, respectively, sharing 10% (158), 9% (138), 8% (138), 7% (114), and 7% (111) of publications on the topic, respectively. The remaining top 10 institutions are Oswaldo Cruz Foundation from Brazil and Harvard University from the United States. They began publishing in 1988 and 1991, publishing 7% (102), 6% (100) of the documents, respectively.

Table 3: Top Ten Organizations and The Number of Publications Over Time

Organisations	Country	P	%	C	H-Indeks	1981–1990	1991–2000	2001–2010	2011–2021	First Publication Year
University of London	England	293	18,7	6907	42	3	19	51	220	1981
International Centre for Diarrheal Disease Research	Bangladesh	210	13,4	5388	40	2	19	34	155	1986
The African Population and Health Research Center	Kenya	204	13,0	5198	38			26	178	2003
University of California System	USA	158	10,1	5504	33		3	38	117	1997
Johns Hopkins Universty	USA	138	8,8	4214	36	1	21	49	67	1986
The Indian Council of Medical Research (ICMR)	India	138	8,8	3174	30	5	4	41	88	1982
London School of Hygiene & Tropical Medicine	England	114	7,3	2845	31		11	20	93	1992
University College London	England	111	7,1	2518	26	1	4	23	83	1988
Oswaldo Cruz Foundation	Brazil	102	6,5	3748	29	2	2	25	73	1988
Harvard Universty	USA	100	6,4	2192	27		10	15	75	1991

Source: WoS datasets, 2021. Note: TP = Total publications; TC = Total citations.

3.5.Distribution of publications by journals

Examining the publications that published studies on the slums and their impact factors provided us with further insight on the subject. By completing this analysis, it was possible to determine which periodicals covered and were interested in the subject.

Table 4 shows the top ten journals, the number of slum-related documents published, their citations and impact factor. The highest and least number of documents published in the ten most significant journals were 110 and 47, respectively. The findings have suggested that Habtat Internatonal was the most influential slum journal. The journal had 15 percent (110) share of publications on the issue among the ten most prominent journals, and the published papers' mean citations were about 20. It is followed by Plos One (3.2) and Envıronment and Urbanızatıon (3.2). Their shares on slum research are 15% (106) and 13% (93), and average citations are 22 and 31, respectively. The following top sources on slum documents are the Bmc Publc Health and the Indian Journal of Community Health, which produced 87 (12%) and 69 (10%) documents on the

topic slums, respectively, with mean citations of 22 and 1. These are followed by the high-impact journals Cities, Journal of Urban Health-Bulletn of The New York Academy of Medicine, American Journal of Tropical Medicine and Hygiene, Urban Studes, Socal Scence & Medcne, with a share of 62 (9%), 57 (8%), 50 (7%), 50 (7%), 50 (7%), and 47 (7%) documents, with average citations of around 13, 31, 29, 19, 27, respectively.

Table 4: Top Ten Journals (documents ≥ 47).

Rank	Sources	TP	Percentage	TC	TC/ TP	Impact factor 2021
1	Habitat International	110	15,0	2147	20	5.369
2	Plos One	106	14,9	2373	22	3.240
3	Environment And Urbanization	93	13,0	2882	31	3.200
4	Bmc Public Health	87	12,2	1932	22	3.295
5	Indian Journal Of Community Health	69	9,7	70	1	0.240
6	Cities	62	8,7	812	13	5.835
7	Journal Of Urban Health Bulletin Of The New York Academy Of Medicine	57	8,0	1781	31	3.671
8	American Journal Of Tropical Medicine And Hygiene	50	7,0	1441	29	2.345
9	Urban Studies	50	7,0	945	19	4.663
10	Social Science Medicine	47	6,6	1260	27	4.634

Source: WoS datasets, 2021.

Note: TP = Total publications; TC = Total citations.

Figure 3 depicts cumulative frequency line of slum-related articles from the top 10 journals (listed in Table 4). This graph indicates that the number of articles and the most influential journal, Habitat International, climbed consistently from 2000 to 2020. Plos One, the second most popular journal, on the other hand, began publishing on slum in 1980 and continuously expanded the quantity of articles till 2019. It is followed by the journal Environment and Urbanization, beginning in 1995 and whose publications are concentrated between Between 2000 and 2018, the number of publications shifted dramatically. BMC Public Health began publishing on slums in 2018, and the number of publications increased gradually after 2011. Cities began to publish on slum from 1998 and Its publications rose rapidly in 2018. The remaining top journals of the ten, Journal of Urban Health-Bulletin of the New York Academy of Medicine, American Journal of Tropical Medicine and Hygiene, Urban Studies, Social Science & Medicine, which are the most recent journals, began publication of slum research from 2001, 1992, 1982 and 1991, respectively.

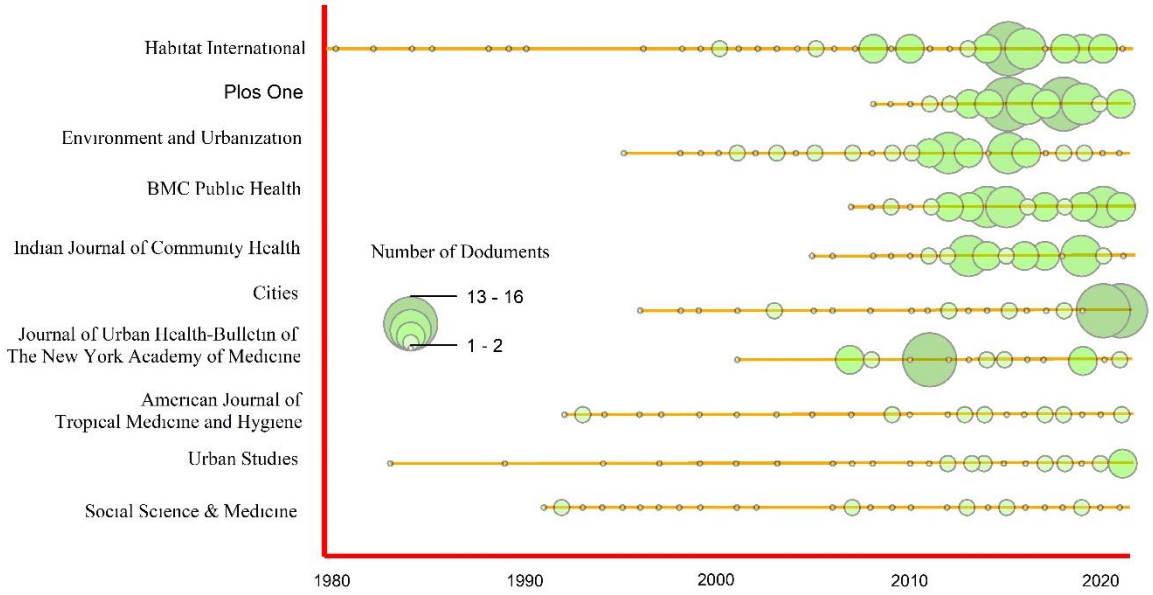


Fig. 3. The Top 10 Journals' Cumulative Frequency Of Publication.

3.6 Citation Source Networks

In order to analyze citation source networks, twenty of 2745 sources were examined. The minimum number of documents and citations for a source is accepted as 30 and 0, respectively.

The early contributions to slum research were made by Habitat International, Plos One, Envirnomental and Urbanization, as shown in the temporal network in Fig. 4. They were followed by BMC Public Health, Indian Journal of Community Health, Cities, Journal of Urban Health-Bulletin of the New York Academy of Medicine, American Journal of Tropical Medicine and Hygiene, Urban Studies, Social Science & Medicine. While the journal such as Habitat International, Envirnomental and Urbanization, Social Science & Medicine about the slums intensified from the beginning of 2010, the journal such as Plos One, Cities, Sustainability intensified after 2015.

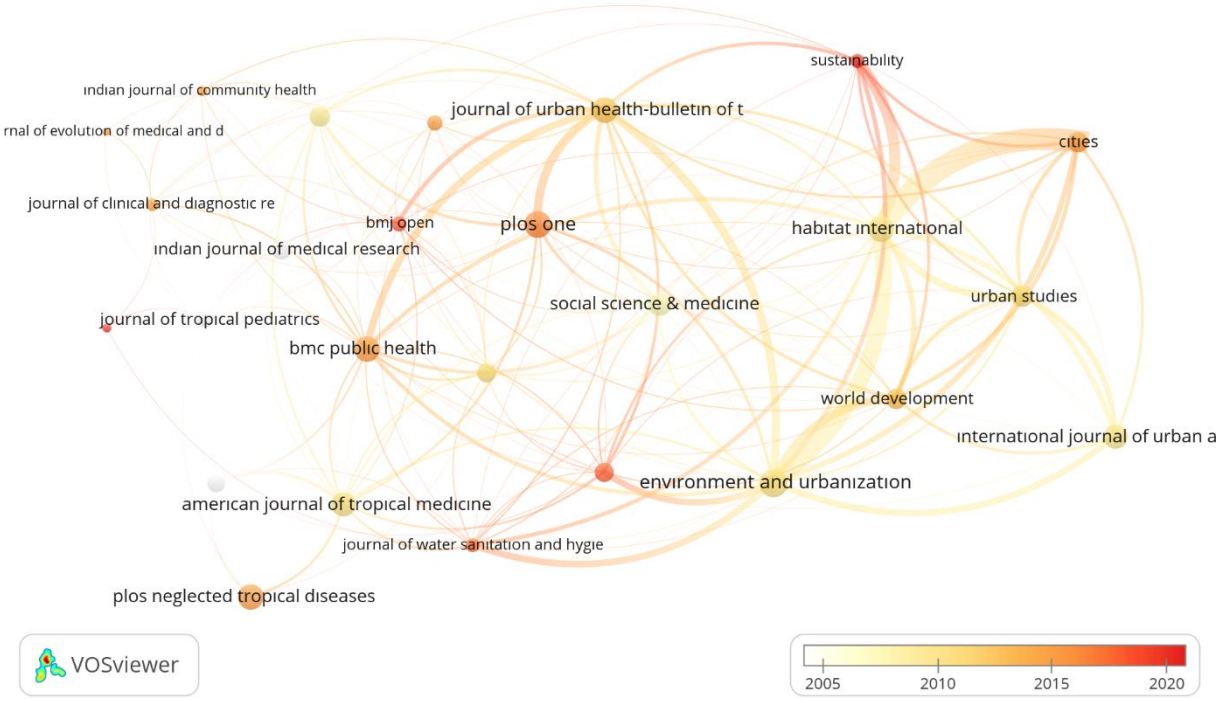


Fig. 4. Citation Source Network Colored By Year (2010–2021) Depending On The Number Of Publications.

Source: WoS datasets, 2021.

3.7. Authors

Catherine Kyobutungi of International Centre for Diarrhoeal Disease Research in Bangladesh, according to the statistics, has led to field with 54 publications and an average citation count of 23.6 (Table 6). With 51 articles and an average citation count of roughly 24.3, Tahmeed Ahmed of African Population and Health Research Centre in Kenya is the field's top author. Rashidul Haque is the third most important author on the issue, with 49 papers published and an average citation of 43.5. Albert I. Ko from Yale Universty is the fourth-ranked author, with 46 publications and an average of 56.4 citations. Gagandeep Kang from Dayanand Medical College & Hospital (DMCH) Ludhiana is ranked fifth with 41 publications and a mean citation count of 23.7. Federico Costa from Centro de Pesquisas Gonçalo Moniz. Fundação Oswaldo Cruz is the sixth most influential author, with 40 documents published on the subject and a citation rate of 38.7. Susmita Das from International Centre for Diarrhoeal Disease Research (ICDDR) is the seventh most influential author, with 38 documents published on the subject and a citation rate of 13.4. William A. Petri and Dipika Sur are ranked ninth and tenth, respectively, with thirty-five publications and a mean citation count of 53.7 and 32.2. These findings include both single-authored and multi-authored documents.

Table 6: Top Ten Authors

Name of the authors	TP	TC	TC/ TP
Catherine Kyobutungi	54	1277	23.65
Tahmeed Ahmed	51	1238	24.27
Rashidul Haque	49	2152	43.92
Albert I. Ko	46	2593	56.37
Gagandeep Kang	41	971	23.68
Federico Costa	40	1548	38.7
Mitermayer G. Reis	39	1761	45.15
Susmita Das	38	507	13.34
William A. Petri,	35	1879	53.69
Dipika Sur	35	1127	32.20

Source: WoS datasets. 2021.

Note: TP = Total publications; TC = Total citations.

3. 8. Co-citation analysis

The authors' co-citation analysis is a scientific bibliometric analysis technique to determine structure of a research field, identifying trends, to explain citation status of two different publications within the same publication, and to reveal co-citation frequency matrix between authors. (Braam, Moed, H & Van Raan, 1991; Nerur, Rasheed, and Natarajan 2008; Siyavuş & Aydın, 2021). This analysis also suggests that publications with a high number of citations are perceived as relevant by field researchers.

The total of 182 920 citations were received by the authors of 6795 publications. The co-citation analysis determined the authors' citation intensity in the same publication, as well as distributions of these densities. The study was carried out with citation threshold of 130 as the minimum. There were 24 authors who met this criterion and four clusters in the overall structure among 182 920 authors (Fig. 5). The size of clusters was determined by the amount of citations they received.

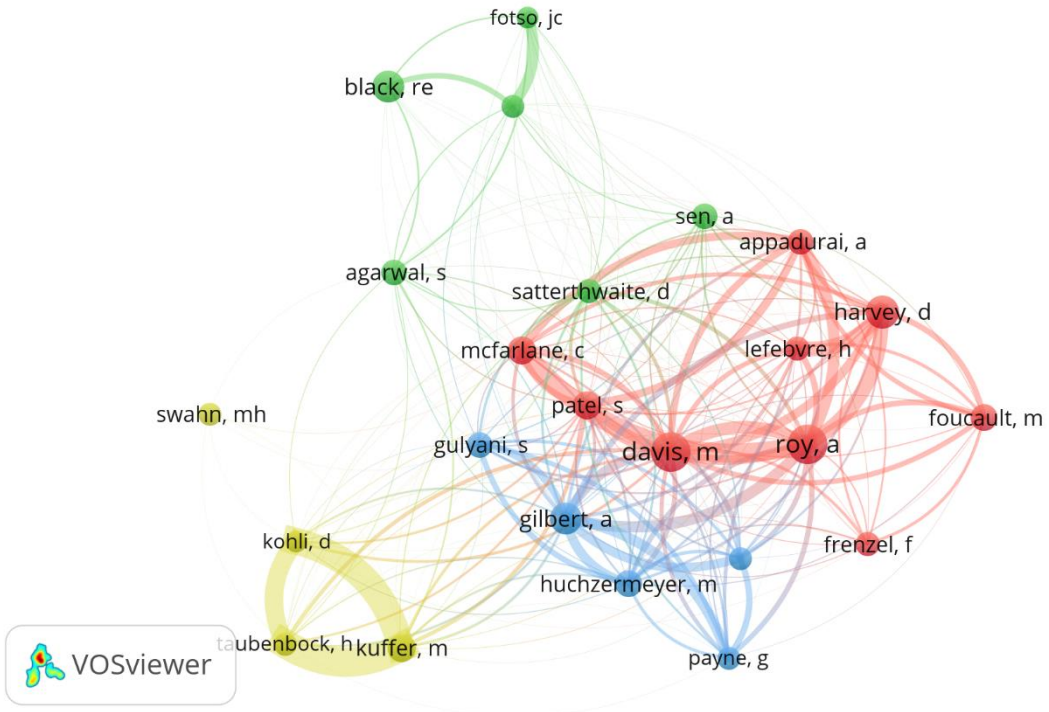


Fig. 5. Co-Citation (Author) Network.

In the most prominent red cluster, 9 researchers with 2008 citations can be found. Ananya Roy, an international development and global urbanism specialist, ranked first with 348 citations. Roy, followed by Mike Davis, known investigations of power and social class, as among the most-cited authors in the red cluster with 354 citations, While David Harvey, who known as urban theorist, was among the most-cited authors in red cluster with 263 citations. Colin McFarlane, a geographer among the outhers in red cluster, researched on the experience and politics of the city. Sheela Patel, who focused on urban urban poverty, was with 194 citations. While Arjun Appadurai who focused on public Addministration, public policy, cultural Anthropology, was with 169 citations. Other writers in the red cluster include Lefebvre, who received 154 citations, Foucault, who received 176, Frenzel, who received 155. The authors in the red cluster were mostly interested in urban studies in general.

A total of 5 publications of seven authors in the blue cluster on the map were cited 861 times. Authors in the blue cluster were A. Gilbert (240), M. Huchzermeyer (185), S. Gulyani (162), J.F.C. Turner (138), G. Payne (136). They carried out their studies in public administration, urban politics, geography, urban/rural sociology, public health, public policy, Infrastructure, service, delivery, urban poverty social psychology, social movements, housing, urban development. Therefore, it was understood that this cluster mainly represented geography, urban/rural sociology, and urban politics. When the cluster's proximity and connection numbers were studied, it was discovered that the blue cluster and the red cluster have a close link.

Six researchers can be seen in the green cluster with 1008 citations. Robert E Black (252) researched prevention of childhood mortality and diseases, especially diarrheal diseases in low- and middle-income countries; S Siddharth Agarwal (163) focused on public health, community empowerment, urban health; Amartya Sen (161) focussed on welfare economics, social choice theory, and development economics; David Satterthwaite (157) focused on poverty reduction and environmental problems in urban areas, climate change adaptation; E.W. Kimani-Murage (144)

focusssed on maternal and child health and nutrition among vulnerable populations in sub-Saharan Africa; Jean Christophe Fotso (131) who focussed on family planning; sexual and reproductive health and rights, newborn and child health, nutrition and food security, and human resources for health. The green cluster's authors were largely concerned with public health in general.

The authors in the yellow cluster, including another five authors, with 608 citations received. M. Kuffer (196), had a high number of citations and carried out studies in geoinformatics, remote sensing. Kuffer followed by M.H. Swahn (143), who focussed on pertain to health risk behaviors among adolescents and young adults, primarily focusing on the structural drivers of alcohol, violence and HIV/AIDS. Apart from that, the authors, named H. Taubenbock (138), D. Kohli (131), made multiple publications on remote sensing, geoinformatics (GIS), geography, earth observation.

3.9. Lexical network

The keywords from 6795 slum-related publications were used to form a lexical network. In the keyword co-occurrence analysis, 40 out of 11,547 keywords meet the threshold which the minimum number of repetitions for a term is 43. The keyword network is divided into five groups, as illustrated in Figure 6, each containing a list of keywords covering the various slum aspects and factors of the cluster.

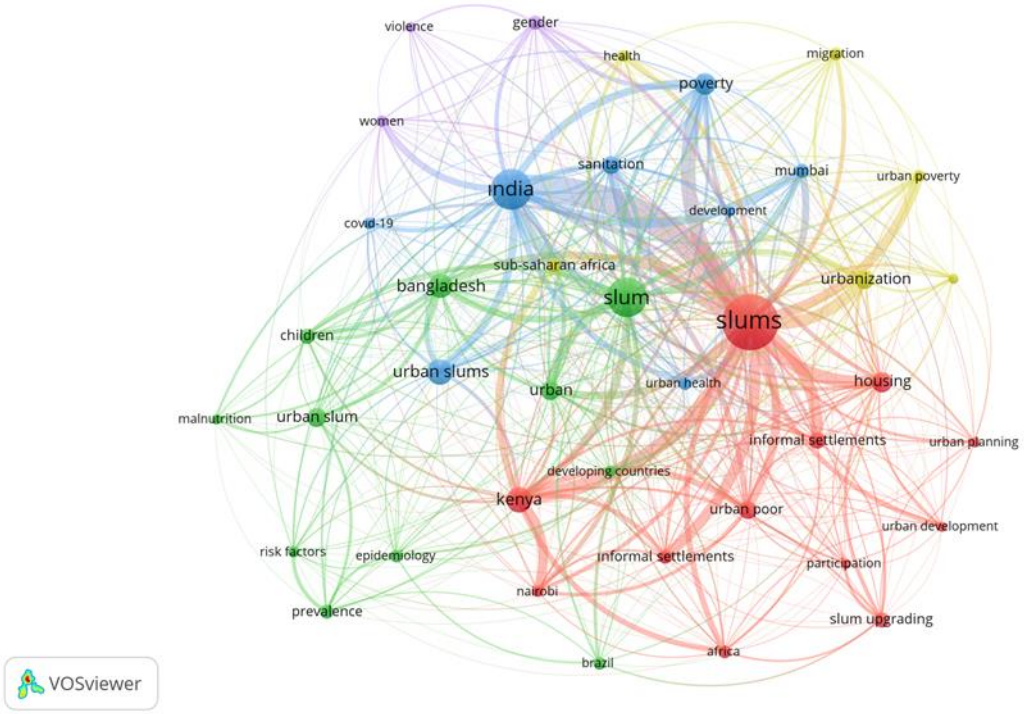


Fig. 6. The Co-occurrence of The Author's Keywords.

These clusters are denoted by various colors:

- Red: Terminologies that are important indications of slum, such as housing, informal setlements, Kenya, Nairobi, slum upgrading, urban development, participation, and urban planning.
- Green: Keywords associated with urban slums, such as children, prevalence of risk factors, and epidemiology.

- Blue: Keywords that represent such as sanitation, covid-19, urban health, poverty.
- Yellow: Terminologies such as povery, urbanisation, migration
- Purple: Terms connected to subjective slum issues such as violence, gender, and women.

The network of keyword co-occurrence in the field is depicted in Fig. 6. The network visualization depicts the processes of the keyword nodes' interconnections or connections. The line thickness shows the frequency of keyword co-occurrence, and a larger node in the lexical network implies a higher frequency of the term occurring. The presence of two keywords in the same document is implied by the relationship between two lexical network nodes (Biswas et al., 2021).

Slums have the strongest connection strength of all keywords, as shown in Fig. 6, and are highly linked to poverty, urban, housing, urban poor, sanitation, and other terms. The intensity of the networks between the keywords suggests that these ideas are inextricably linked.

Table 7 contains a list of 20 commonly occurring keywords with a minimum of 69 occurrences. Urban slums, poverty, and urban are the top three most commonly appearing phrases in slums-related research, as seen in Table 7. The lexical resources on slum studies are difficult to categorize. Physical elements such as location, urban, housing, informal settlements, and non-physical attributes such as poverty, urban poor, and so on are all considered in slum studies. However, sociodemographic aspects such as sanitation and gender are also important slum terminology. Furthermore, slum studies are extensively tied to some regions, like India, Bangladesh, Kenya, Mumbai, and Sub-Saharan Africa.

Table 7: The Most Frequently Used Keywords in The Slum-Related Papers

No.	Keywords	Freq.	No.	Keywords	Freq.
1	Slums	577	11	Urban Slum	113
2	India	344	12	Urbanization	109
3	Slum	328	13	Urban Poor	103
4	Kenya	172	14	Sanitation	102
5	Urban Slums	172	15	Children	80
6	Informal Settlements	169	16	Slum Upgrading	80
7	Bangladesh	155	17	Gender	73
8	Poverty	140	18	Sub-Sahra Africa	72
9	Housing	119	19	Prevalence	70
10	Urban	118	20	Mumbai	69

Source: WoS datasets, 2021.

4. Conclusion

This study, which uses bibliometric research methodologies, evaluated studies related to slums. Between 1976 and 2021, a total of 6795 publications on slums were published in 226 different sources. On average, 147 documents are published in various sources each year, with a growth rate of approximately 23%. The amount and range of studies on slums has expanded, particularly during the 2000s. The countries with the most publications on slums are the USA, India and the UK. The most productive research institution is the University of London in England, followed by the International Centre for Diarrheal Disease Research in Bangladesh and the African Population and Health Research Center in Kenya. The most common sources in ‘slum research’ are Habıtat Internatıonal, Plos One and Envıronment and Urbanızatıonal.

Catherine Kyobutungi from African Population & Health Research Centre in Kenya, and Tahmeed Ahmed and Rashidul Haque from International Centre for Diarrhoeal Disease Research

in Bangladesh are the three most influential authors in slum research. In terms of co-occurrence, the terms 'Urban Slums,' 'Poverty,' and 'housing' are the three most essential keywords that commonly appear in slum studies. Aside from that, slums have a high co-occurrence association with terms like "urban poor," "urbanization," "sanitation," "slum upgrading," and so on.

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