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Climate Change and Migration because of Urban Heat: Research trends through a bibliometric lens

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Abstract

Climate change and migration are deeply interconnected, with rising urban heat which is amplified by urban heat island (UHI) effects and is emerging as a significant but understudied driver of human mobility. This exerts significant pressure on city dwellers, with rising temperatures and unmitigated heat intensifying migration dynamics. While both climate-induced migration and urban heat have been separately studied, their intersection remains an overlooked area. When it comes to climate-induced migration, it is not just about numbers but it is a whole sage of rules, complexity of inter-country citizenships issues, physical pressure on the rehabilitated land and local pressure on GDP. Despite developments in technology, there is dearth of predictive holistic models. Needless to say, there is an issue around taxonomy too.

This article analysis using a bibliometric lens to chart the evolution of research exploring how urban heat drives human migration and maps research trends at the intersection of climate change, urban heat and human migration. We draw upon bibliometric literature on climate-induced mobility, urban- climate studies and heat- exposure inequities to identify emerging patterns and gaps. While heat-induced migration remains underrepresented in bibliometric mapping, our review underscores an urgent need for integrative, equity- informed and regionally grounded bibliometric inquiry into urban heat- driven migration.

A bibliometric review was conducted using key academic database of Scopus, spanning multiple decades. Keywords were used and 363 articles meeting the inclusion & exclusion criterion were selected. Analytical tools including co- word and cluster mapping (as seen in VOSviewer) were applied to track publication trends, research hotspots, geographic contributions and thematic linkages. Insights from broader climate migration and urban thermal environment studies were integrated to contextualize findings. The research shows the simultaneous growth of research on resilience, adaptability and gender issues besides the ones on climate-induced migration due to urban heat.

Keywords: Migration, Climate Change, refugees, bibliometric analysis, Urban Heat Island

1 Introduction

In recent years urban areas worldwide are experiencing rising temperatures due to the urban heat island (UHI) effect, a concept which describes the phenomenon that cities significantly experience warmer climate than their rural surroundings due to factors like heat-absorbing surfaces, reduced vegetation and anthropogenic heat sources. This warming increasingly interacts with broader climate change, exacerbating heat waves, energy demands and health risks for urban dwellers (Makvandi et al., 2023). Cities now experience drastic upticks in extreme heat exposure; one study recorded a 200% increase in urban extreme heat person- days between 1983 and 2016 (Freedman, 2021). Heat-related stress and deteriorating living conditions may compel internal migration, particularly from marginalized communities which bear disproportionate thermal burdens and most vulnerable to thermal exposure which creates a complex interplay between climate, urban heat and human movement. Yet this causal pathway remains underexplored in the scholarly literature. This problem is set to intensify further with the rural-urban migration, lessening of green spaces in the urban places, limited access to air-conditioning and high building density.

Identifying hidden spatial patterns to define sub-regions with similar behavior is a fundamental focus in statistical climatology, as it allows researchers to analyze and visualize areas experiencing similar climate phenomena, which aids in understanding impacts and risks. Recognition of these critical and vulnerable points are key to the successful research (Vignotto et al, 2021). Rapid urbanization contributes to greenhouse gas emissions and affect the local climates through the urban heat island effect (Pede, 2024). The green spaces in the urban landscapes have a great effect on the reduction of temperature which is required for improving the thermal wellbeing of the urban citizens. This is essential in the larger scheme of things around climate change (Purohit, 2024).

It is essential that the underplay between urban heat, migration and climate change is evaluated structurally. Thus, bibliometric analysis serves as a good measure for evaluating the linkages by synthesising together multiple researches over the years. It is essential to conduct quantitative analysis of the literature and research in the field to investigate the current research trends and future research trends using bibliometric analysis (Kang et al, 2022).

Simultaneously, climate- driven migration research is increasingly visible in bibliometric studies, showing a growing shift from themes of vulnerability and land degradation towards climate justice, sustainability and human rights (Milán-García et al., 2021). However, explicit bibliometric attention to urban heat as a catalyst for migration remains scarce.

Effective heat-health plans and guidelines are essential at city and community levels to manage the physiological and psychological impacts of heat, as they help identify at-risk groups, coordinate responses across agencies and promote targeted interventions to reduce heat exposure and illness. Developing these plans involves assessing local vulnerabilities, integrating emergency management principles (reduction, readiness, response, recovery), and implementing heat alert systems, public outreach, and healthcare capacity building. Some of the suggestive measures would be: Tracking and predicting heatwaves to trigger timely responses, scientific

mapping of heat hotspots and vulnerable populations for targeted support, mass public education, provision for supply of water, cooling spaces & medical resources et al (Manoli, 2019).
A bibliometric lens can illuminate this gap, offering insight into publication patterns, scholarly networks and thematic clusters at the nexus of climate, urban heat and migration. This review, therefore, seeks to map emerging trends across these domains, identify research gaps and inform future policy-relevant inquiry.

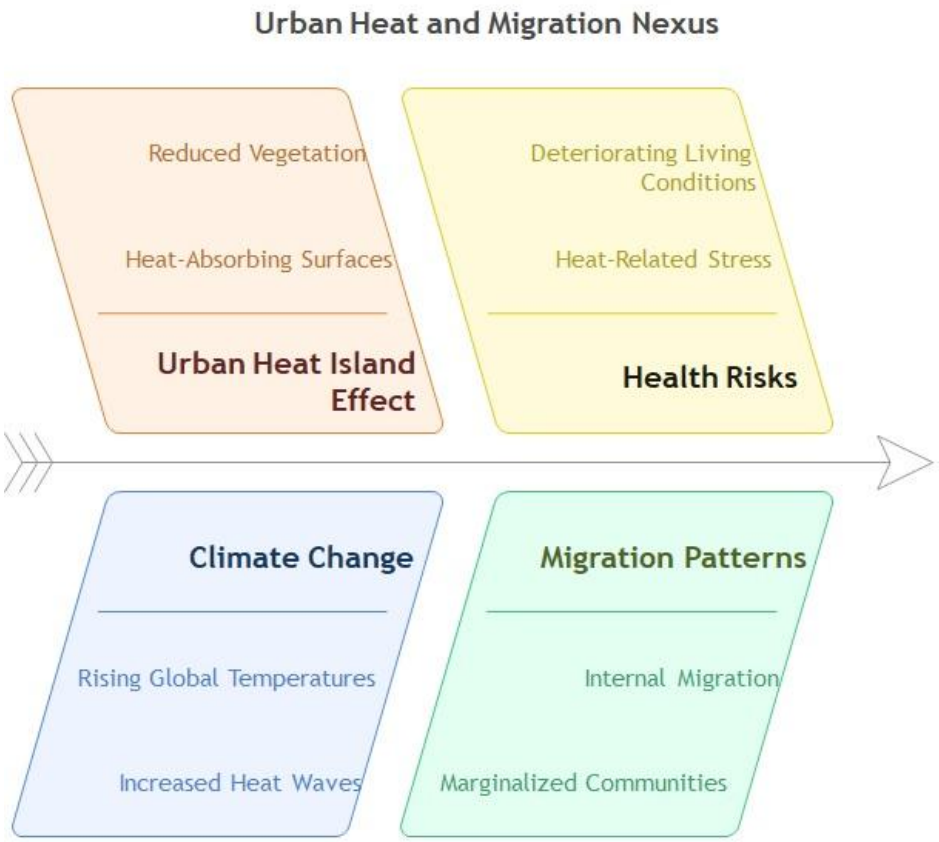

Fig 1: Urban heat and Migration nexus
Source: Compiled by authors

1.1 Research Questions

The authors chose to address the following Research Questions (RQ)
RQ1: What has been the pattern of research publications in the research area of "Climatic Refugees because of urban heat" over the years?
RQ2: In what ways have countries, institutions and authors helped with research in this space?

RQ3: Which journals and articles in the Climatic Refugees field have the most significant citations?
RQ4: Based on citations, which of these research works is the most widely cited in the Climatic Refugees space?

2 Developments in the area of climatic refugees (Literature Review)

2.1 Migration as an Adaptation Strategy

People migrate to escape the adverse effects of environmental changes, seeking better living conditions and livelihood opportunities (Nawrotzki et al., 2015). In the context of urban heat and climate change, migration is frequently seen as an adaptation tactic. People move in search of better living conditions and employment possibilities in order to avoid the negative consequences of environmental change. A number of factors, including social, economic and environmental causes, have an impact on this migration. For instance, individuals may be drawn to urban areas from rural areas by the perception of better possibilities in less heat-stressed places, while they may be pushed there by decreasing agricultural yield brought on by drought or excessive heat.

There is a marked shift in the discourse around climate-induced migration from a focus on "climate refugees" and security threats to a more nuanced discussion of human security, resilience and adaptation. The mentioned shift is visible across policies by planners, research work and discussions in multilateral forums (Bettini, 2014).

Climate change and urban heat has been a researched area but over a period of time, the urban heating is gaining prominence among all other factors. Infact the cities have high chances of vulnerability. (Khelifa, 2024). Urban climate governance and development of theoretical models around the same has been the areas of focus by researchers in the area of urban heat migration (Kang et al, 2022).

2.2 Bibliometric Trends in Climate Change & Migration

A bibliometric review of publications from 1999 to 2019 reveals a steady upward trajectory in climate-migration literature, with U.S., U.K., Germany and China leading research output. Focus has shifted from early themes such as “vulnerability,” “refugees,” and “land degradation” towards international migration, climate justice, disaster risk reduction and human rights (Milán-García et al., 2021). Another review underscores that environmental migration discussions display heterogeneity—environmental shocks drive migration variably, influenced by geography, economy and socioeconomic contexts (Cipollina et al., 2021).

The topic of immigration and environmental degradation have been active since 1981. However, search research started around 2000 (Anuar, A et al, 2021).

2.3 Bibliometric Insights in Urban-Climate and UHI Research

A bibliometric analysis (1990–2021) of climate-city studies identify three phases—initial (1990–2006), transition (2007–2014) and rapid growth (2015–2021)—with emergent topics such as city, vulnerability, management, adaptation and governance (Hasanah & Wu, 2023). Another study on climate-cities research highlights six clusters: Climate Change & Urbanization, Urban Climate

Adaptation, Urban UHI Effect, Greenhouse Emissions, Water and Urban Energy Systems (Sun et al., 2022). Further, bibliometric mapping in adaptation/mitigation literature shows "urban" clusters tied to governance, sustainability, carbon and heat stress (Einecker & Kirby, 2020).
These findings indicate that research on UHI and urban adaptation is well represented in bibliometric fields but without explicit linkage to migration studies.

There is a distinct need of studying the needs of the under-privileged groups in the urban areas if we have to study justifiably the cross-linking of urbanization and migration. This is equally important from the point of evaluating resilience in the context of urban migration (Baidya & Saha, 2024).

2.4 Urban Heat, Inequity and Potential Migration Drivers

Studies document the growing scale of urban heat exposure which not only raises mortality risk, especially among vulnerable populations, but also stresses urban systems and life quality. Urban heat inequity reflects social and racial disparities, with underprivileged groups disproportionately exposed to high temperatures due to limited vegetation and legacy land-use effects. In this context, emerging scholarship in green infrastructure shows widely varying cooling capacities, with Global South cities experiencing roughly half the cooling benefits of green spaces compared to the Global North (Li et al., 2023).

While these conditions likely influence internal migration or relocation for thermal safety, this segment remains largely uncharted in bibliometric territory.
Heat vulnerability quotient needs to be prepared using suitable metrics to evaluate the effect of heat for causing migrations. Population sensitivity and socioeconomic adaptive capacity must eb the guardians of this measurement (Qian Y and Liu, T, 2025).

2.5 Intersecting Themes: Heat Exposure, Inequity & Mobility

The concept of urban heat inequity illustrates how low-income and marginalized communities frequently bear higher heat exposure, due to factors like substandard housing and limited green infrastructure. These disparities tie directly to migration decisions.
A 2023 empirical study in the U.S. showed the emergence of "urban heat traps"; areas where residents living in hot neighborhoods mostly circulate among other similarly heat-exposed zones—highlighting the social-spatial risk of heat exposure (Huang & Mostafavi, 2023).
There is evidence of difference in vulnerability and resilience among males and females. Male-headed households generally have low vulnerability and high resilience. Female-headed households are divided into two main groups: those with low vulnerability and low resilience, and those with low vulnerability and high resilience. For both men and women, when vulnerability is higher, resilience also tends to be higher. (Belcore et al, 2020).

3 Methodology & Data

Scopus, published by Elsevier, is a comprehensive database that indexes abstracts and provides links to full-text publications, including journals, books and conference papers (Guz & Rushchitsky, 2009).

VOSviewer is a widely used bibliometric software tool that visualizes bibliometric networks such as co-authorship, co-citation and term co-occurrence, helping to identify influential authors and research trends more accurately than traditional methods (Van Eck & Waltman, 2009). Select keywords were used to select the right research topics.
The field of bibliometrics, originally called "statistical bibliography" evolved through the mid-20th century, with the term "bibliometrics" first used by Allan Pritchard in 1968. Bibliometrics applies quantitative methods to analyze and map written scientific communication, revealing the structure and dissemination of knowledge (Broadus, 1987; Nicholas & Ritchie, 1978; Sengupta, 1990).

3.1 Need for the study

We found few papers on the bibliometric analysis of climatic refugees. However, there are limited papers on climatic migration because of urban heat. There are very few papers on bibliometric analysis of this topic. Among all the reasons for requirement of climatic migration, urban Hence, there is a growing number of research papers and publications; thus, the necessity of synthesis of them.

Future researchers (new to this area and wanting to improve further) can take the help of this paper to find the best journals, articles and authors. It can help them immensely. Authors and researchers specializing in structured literature review formats can take note of the cited articles. Besides, researchers may plan to link this topic with other disciplines like economics, innovation, governance, legalities, et al.

3.2 Dataset

For the work, the Scopus database was searched on 30-Jun-2025. The steps involved in choosing the set of articles for review are as follows

		Include	*Exclude*	*Net*
Step 1	Scopus search using the following keywords: ((climat* change induced migration) OR (environment* change induced migration) OR (climat* migrant*) OR (environment* AND migrant*) OR (climat* refugee*) OR (environment* refugee*) OR (global warming induced migration)(AND ((urban heat effect*) OR (urban heat) OR (urban temperature*) OR (urban heat island*) OR (urban warming) OR (urban climate) OR (urban micro climate) OR (urban microclimate) OR (urban micro-climate) OR (urban heat risk) OR (city temperature) OR (city microclimate) OR (city micro climate) OR (city micro-climate) OR (urban thermal environment) OR	606		606

	(metropolitan thermal effect*) OR (urban heat stress))			
Step 2	Filter & limit "Document type" to "Article", "Book" and "Book Chapter"	502		502
Step 3	Filter & limit to "Final" in "Publication Stage"	493		493
Step 4	Filter & limit to "English" in "Language"	462		462
Step 5	Filter & limit to subject areas being "Social Sciences", "Environmental Science", "Economics, Econometrics & Finance", "Energy" and "Business, Management & Accounting"	378		378
Step 6	Filter and exclude articles with the following keywords: Covid-19 (5), Khulna (Bangladesh) (6)	378	11	367
Step 7	Filter and manually exclude article(s) with missing authors	367	3	364
Step 8	Filter and manually exclude article(s) with missing / improper abstracts	364	2	362

The copy of the exact query is as follows: ((TITLE-ABS-KEY(((climat* change induced migration) OR (environment* change induced migration) OR (climat* migrant*) OR (environment* AND migrant*) OR (climat* refugee*) OR (environment* refugee*) OR (global warming induced migration))) AND TITLE-ABS-KEY(((urban heat effect*) OR (urban heat) OR (urban temperature*) OR (urban heat island*) OR (urban warming) OR (urban climate) OR (urban micro climate) OR (urban microclimate) OR (urban micro-climate) OR (urban heat risk) OR (city temperature) OR (city microclimate) OR (city micro climate) OR (city micro-climate) or (urban thermal environment) or (metropolitan thermal effect*) or (urban heat stress)))) AND (LIMIT-TO (DOCTYPE,"ar") OR LIMIT-TO (DOCTYPE,"ch") OR LIMIT-TO (DOCTYPE,"bk")) AND (LIMIT-TO

(PUBSTAGE,"final")) AND (LIMIT-TO (LANGUAGE,"English")) AND (LIMIT-TO (SUBJAREA,"ENVI") OR LIMIT-TO (SUBJAREA,"SOCI") OR LIMIT-TO (SUBJAREA,"ECON") OR LIMIT-TO (SUBJAREA,"BUSI") OR LIMIT-TO (SUBJAREA,"ENER")) AND (EXCLUDE (EXACTKEYWORD,"Covid-19") OR EXCLUDE (EXACTKEYWORD,"Khulna [bangladesh]")))

All the analysis in this paper would be basis these 362 research items. A small analysis of the concerned documents are as follows

Description	*Data*	*Description*	*Data*
Total Research documents	362	**Per Document Avg. Citation**	21.24
Articles	280	**# countries with publications**	74
Books	19	**Author Keywords**	1209
Book Chapters	63	**Index Keywords**	1788
Citations	7690	**Authors**	1096

Table 1: Summary of document types covered for the bibliometric analysis
Source: Collated by authors basis data from Scopus

4 Analysis and interpretations based on data from Scopus and VosViewer

4.1 Publications trends

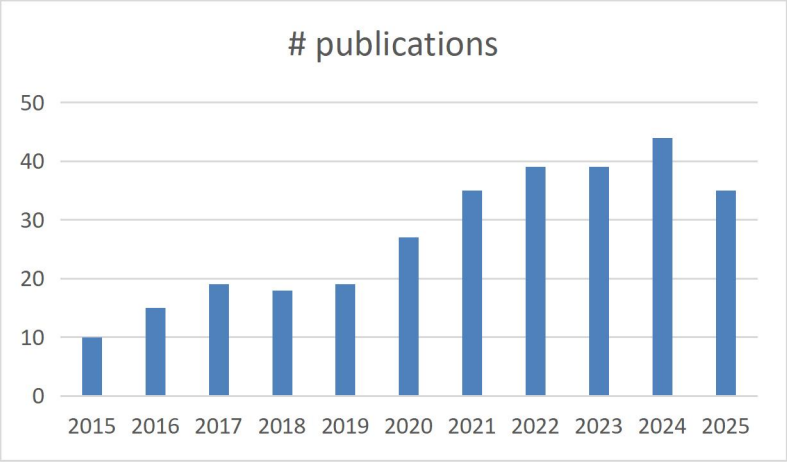

Fig 2: Publication over the years
Source: Compiled by authors based on data from Scopus

We are able to see a distinct trend from 2018 onwards. The dip that is seen in 2025 is because of the incomplete years itself.

4.2 Basis article publications

The details of journals with the maximum published articles on Climatic Refugees are as follows

Journal Name	*# articles / research work*	*ISSN*	*Publisher*
Sustainability (Switzerland)	7	2071-1050	Multidisciplinary Digital Publishing Institute (MDPI)
Science of the Total Environment	6	0048-9697	Elsevier B.V.
Climate and Development	5	1756-5529	Taylor and Francis
Cities	4	0264-2751	Elsevier B.V.
Global Environmental Change	4	0959-3780	Elsevier B.V.
Habitat International	4	0197-3975	Elsevier B.V.
International Journal of Disaster Risk Reduction	4	2212-4209	Elsevier B.V.
Journal of Environmental Management	4	0301-4797	Academic Press
Population, Space and Place	4	1544-8444	John Wiley and Sons Ltd
Environmental Research Letters	4	1748-9326	Institute of Physics Publishing

Table 2: Best journals in terms of articles published on Climatic Refugees
Source: Authors basis data from Scopus

While Sustainability (Switzerland) has the largest number of articles, Elsevier B.V. seems to have the largest number of productive journals (basis # research work). We do have 9 more journals with the article counts being 3 in each of them.

4.3 Publication basis countries

Country	*# publications*
United States	91
United Kingdom	42
China	32
Australia	31

India	29
Germany	26
Canada	18
Bangladesh	14
Netherlands	12
South Africa	12

Table 3: Country-wise publications
Source: Authors basis data from Scopus

The United States, United Kingdom and China lead the publications.

4.4 Basis journal citations

Journal Name	***# citations***	***ISSN***	***Publisher***
Global Environmental Change	366	0959-3780	Elsevier Ltd
Environment and Urbanization	219	0956-2478	Sage Publications
Environmental Science and Policy	187	1462-9011	Elsevier Ltd
Cities	179	0264-2751	Elsevier Ltd
Science of the Total Environment	176	0048-9697	Elsevier Ltd
China Journal	175	1324-9347	Australian National University
Environmental Research Letters	154	1748-9326	Institute of Physics Publishing
Journal of Housing and the Built Environment	141	1566-4910	Springer Netherlands
Journal of Cleaner Production	138	0959-6526	Elsevier Ltd
Landscape and Urban Planning	136	0169-2046	Elsevier Ltd

Table 4: Best journals in terms of citations on articles on Climatic refugees
Source: Authors basis data from Scopus

Besides the ones mentioned above, we have 9 more journals with citations of over 100. From Table 2 and Table 4, it comes out that the following journals are good: Global Environmental Change, Cities, Science of the Total Environment and Environmental Research Letters. This is basis the fact that they have the large number of articles as well as citations.

4.5 Basis Article Citations

Title	*Authors*	*Cited by*	*Year*	*Journal Name*	*ISSN*
Climatic factors as determinants of international migration	Beine M.; Parsons C.	274	2015	Scandinavian Journal of Economics	0347-0520
Exploring the dynamics of migration to mega-delta cities in Asia and Africa: Contemporary drivers and future scenarios	Seto K.C.	183	2011	Global Environmental Change	0959-3780
The 'last resort'? Population movement in response to climate-related hazards in Bangladesh	Penning-Rowsell E.C.; Sultana P.; Thompson P.M.	183	2013	Environmental Science and Policy	1462-9011
Xinjiang in the nineties	Becquelin N.	175	2000	China Journal	1324-9347
Isotopic evidence for age-related immigration to imperial Rome	Prowse T.L.; Schwarcz H.P.; Garnsey P.; Knyf M.; Macchiarelli R.; Bondioli L.	158	2007	American Journal of Physical Anthropology	1096-8644
Sub-Saharan African urbanisation and global environmental change	Parnell S.; Walawege R.	153	2011	Global Environmental Change	0959-3780
The association between neighbourhoods and educational achievement, a systematic review and meta-analysis	Nieuwenhuis J.; Hooimeijer P.	141	2016	Journal of Housing and the Built Environment	1566-4910
Recognition in urban climate justice: marginality and exclusion of migrants in Indian cities	Chu E.; Michael K.	140	2019	Environment and Urbanization	0956-2478
Theorising mobility justice; [Teorizando sobre "mobilidades justas"]	Sheller M.	134	2018	Tempo Social	0103-2070
Social Policy, COVID-19 and Impoverished Migrants: Challenges and Prospects in Locked Down India	Sengupta S.; Jha M.K.	126	2020	International Journal of Community and Social Development	2516-6026

Table 5: Best articles in terms of citations on articles on Climatic Refugees
Source: Authors basis data from Scopus

Top 10 research works have been choosen. It may be noted here that there are 6 articles which also have individual citations of more than 100. "Climatic factors as determinants of international migration" is the only article to have citations of more than 200.

4.6 Basis Productive Co-Authors

The details with respect to the best productive authors are as follows

Authors	***# Articles***
Porst, Luise ; Sakdapolrak, Patrick	2

Table 6: Productive authors basis number of articles on Climatic Refugees
Source: Authors basis data from Scopus

These are the only co-authors who have multiple research articles.

4.7 Basis Productive Authors

The details of paper publications basis authors are as follows

Author Name	***Count***
Adger W.N.	2
Ahsan R.	2
Birk T.	2
Dabaieh M.	2
Ekoh S.S.	2
Islam M.R.	2
Li J.	2
Lobo M.	2
Mattioli G.	2
Nawrotzki R.J.	2
Porst L.	2
Song J.	2
Suckall N.	2
Tousi E.	2
Tubi A.	2
Van Praag L.	2

Table 7: Productive authors' basis number of articles on Climatic Refugees
Source: Authors basis data from Scopus

We have 16 authors who have atleast 2 different articles.

4.8 Country coupled bibliometric analysis

We used the minimum number of documents for a country as 5 and arrived at 29 countries. The screenshot of Vosviewer result is appended below.

Countries	***Documents***	***Citations***	***Total link strength***	***Citations per document***
United States	91	2457	4897	27.0
United Kingdom	42	1438	4433	34.2
Australia	31	608	2911	19.6
Germany	26	442	2760	17.0
Bangladesh	14	143	2427	10.2
China	32	496	1880	15.5
Netherlands	12	326	1748	27.2
Canada	18	481	1624	26.7
Austria	10	275	1581	27.5
Switzerland	8	270	1252	33.8

Table 8: Country couple data basis total link strength
Source: Vosviewer results basis data from Scopus

The United States has absolutely highest number of documents as well as citations. However, when it comes to quality (citations / article), United Kingdom and Switzerland score the highest.

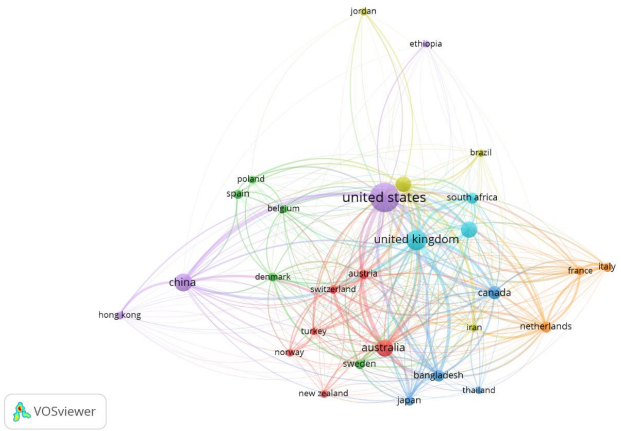

Fig 3: Country couple data basis total link strength
Source: Vosviewer basis data from Scopus

4.9 Co-occurrence of author keywords

We used the minimum number of co-occurrence of author keywords as 5 and we arrived at 30 keywords out of 1209, which meet the threshold. The screenshot of Vosviewer result is appended below.

Keyword	***Occurrences***	***Total link strength***
climate change	98	140
migration	57	91
vulnerability	21	42
adaptation	14	33
urbanization	18	30
resilience	11	23
urbanisation	10	22
bangladesh	12	21
india	9	19
displacement	8	18

Table 9: Author keywords basis total strength
Source: Vosviewer results basis data from Scopus

Bangladesh and India come in probably because of articles written with these countries in background. It is clear that research is happening on vulnerability, adaptation and resilience under the broad research under climate change migration. Since "climate change", "migration", "urbanization" and "urbanisation" have come in, it clearly shows that the selection of papers of the authors is on the right track.

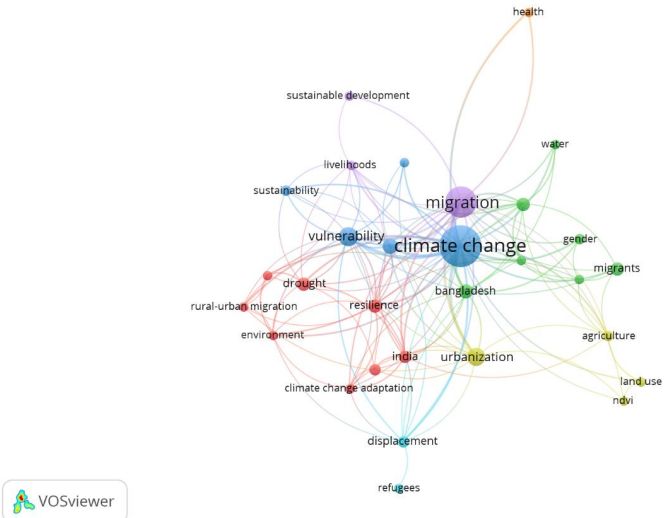

Fig 4: Author keywords basis total strength
Source: Vosviewer basis data from Scopus

"Climate change" is the largest visible author keyword which is evinced from the data too.

4.10 Co-occurrence of index keywords

We used the minimum number of co-occurrence of index keywords as 5 and we arrived at 100 keywords out of 1788, which meet the threshold. The screenshot of Vosviewer result is appended below.

Keyword	***Occurrences***	***Total link strength***
climate change	95	526
article	32	318
migration	37	245
urban area	30	223
urbanization	33	214
human	21	211
population migration	24	199
humans	12	148
united states	21	142
rural-urban migration	25	141

Table 10: Index keywords basis total strength
Source: Vosviewer results basis data from Scopus

Index keywords generated are similar to that of authors keywords. "united states" is a new entry probably because of the large number of research work being done by the country. "rural-urban migration" has come in probably because that also finds mention alongside "migration because of urban heat" in books, journals and book series.

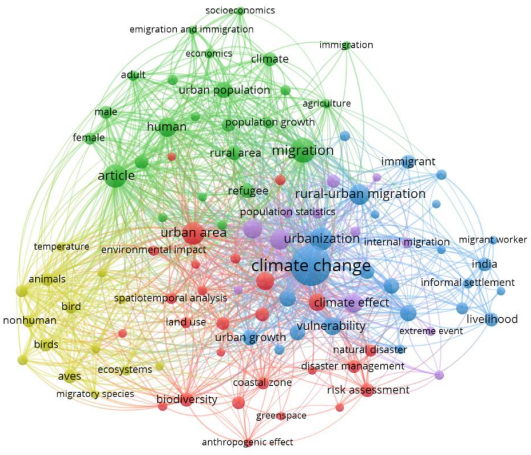

Fig 5: Index keywords basis total strength
Source: Vosviewer basis data from Scopus

No doubt, the number and variety of index keywords are larger than authors keywords.

4.11 Co-authorship Countries Analysis

With a minimum criterion of 5 documents per country, we arrive at 29 countries out of a total of 74 countries.

Countries	***Documents***	***Citations***	***Total link strength***
United Kingdom	42	1438	41
United States	91	2457	37
Australia	31	608	25
Germany	26	442	25
Bnagladesh	14	143	18
China	32	496	18
Canada	18	481	17
Switzerland	8	270	15
Netherlands	12	326	13
France	8	249	12

Table 11: Country wise co-authorship analysis
Source: Vosviewer results basis data from Scopus

United Kingdom, the United States and Australia have the highest strength.

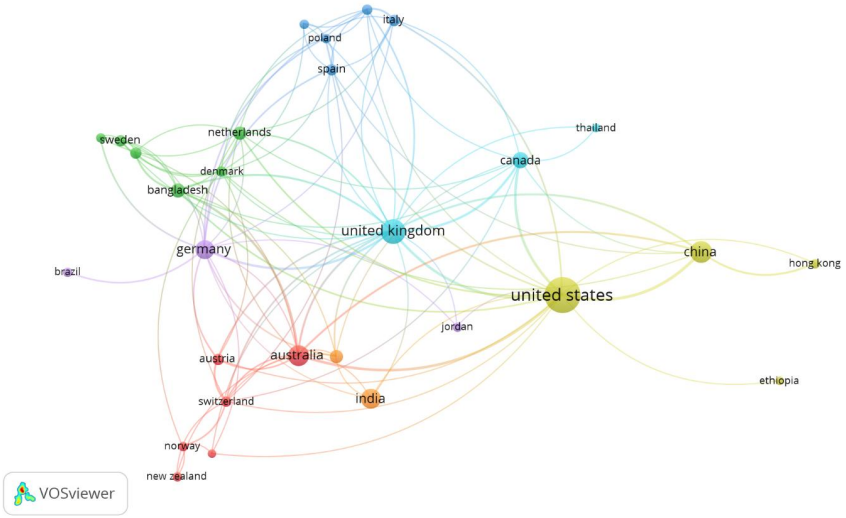

Fig 6: Co-authorship-countries analysis
Source: Vosviewer basis data from Scopus

4.12 Funding

166 research works have been funded. The large funding agencies are as follows:

Funding Agency	***# projects***
Bundesministerium für Bildung und Forschung, BMBF, Germany	3
World Bank Group, WBG	2

Table 12: Top funding agencies
Source: Authors basis data from Scopus

161 agencies have funded 1 research work. It is commendable to see large amount of research funding happening.

5 Limitations of the Research

There are few limitations of the study namely
a The database has been taken from Scopus. There could be good papers or research works which are present in other databases like Web of Science and Dimensions. There could be papers which are published in journals or books beyond the domains of the databases.
b The selected papers and research works have been taken from the lot of English articles. There could be good articles in the non-English group.
c The keywords have been carefully chosen basis discussion, feedback from other researches and researchers. However, there could be some omissions which might result in missing out of important and relevant studies.

6 Future directions

There is a need for inter-disciplinary study encompassing economics, psychology, econometrics, law and political science for any creation of a successful & sustainable framework for climate change migrations. With increased urbanization, there may be creation of urban hotspots which may have detrimental effects in future emerging as porous places for failed planning. Technology both mathematical (on computation) and physical (satellite monitoring & drone usage) will be essential cornerstones of any policy on climate change.
Most of the countries affected are small countries (islands) or least-developed countries. Because of the presence of indigenous tribes in most of the lands, there may be a possibility of a wealth of local knowledge. Thus, it may be wise to pick up that bucket of knowledge too with respect to solutions.
We could also go for socially diverse evaluations like the lenses of gender, age and disabilities in future research while tackling climate-induced migrations.

7 Contribution of authors

Dr Anitha: Writing - review & editing
Dr Kalyani Final review
Dr Sukhamaya Swain: Scopus searches and VosViewer analysis, writing – original draft
Dr Siddhartha Bhattacharya: Conceptualization, critical evaluation

8 Conclusion

Climate change and migration are increasingly intertwined, particularly due to the exacerbating effects of urban heat. Urbanization, combined with climate change, intensifies the urban heat island (UHI) effect, making cities significantly warmer than surrounding rural areas. This phenomenon drives migration, as people seek more habitable environments. However there has been a gap in linking urban heat and climatic refugees. Hence the authors have conducted the bibliometric analysis on this area. The analysis has highlighted that though research papers are published since 2015, in the recent years more papers are publishing highlighting the increased attention on this area.

The top five countries based on number of articles are United States, United Kingdom, China, Australia and India. There are only two authors who have produced multiple co-authored papers. This trend needs to improve as with more collaborations and co-authoring, best ideas can emerge and help the society at large.

In the area of research funding, 166 research works have been funded. Bundesministerium für Bildung und Forschung (3 projects) and World Bank Group (2 projects) are the major funding agencies. It is good to see large number of research works getting funded. This bibliometric analysis has used articles in English language for analysis; upcoming studies can consider articles from other languages for analysis. Similarly, articles which are published and available beyond the scope of data base can also be considered in upcoming analysis.
Managing the combined challenges of climate change, urban heat, and migration requires a multifaceted approach. Conducting inter disciplinary studies and creating a sustainable frame work is the need of the hour. It is also important to document the wealth of knowledge with tribes of small islands.

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