International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume 7 Issue 22 (September 2025) PP. 16-33
DOI 10.35631/IJIREV.722002

INTERNATIONAL JOURNAL OF INNOVATION AND INDUSTRIAL REVOLUTION (IJIREV)
www.ijirev.com

FROM TECHNICAL SOLUTIONS TO IMPLEMENTATION: A BIBLIOMETRIC REVIEW OF BEHAVIORAL BARRIERS IN URBAN CLIMATE ADAPTATION

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Article Info:

Article history:
Received date: 30.06.2025
Revised date: 21.07.2025
Accepted date: 14.08.2025
Published date: 01.09.2025

To cite this document:

Omar, S. R., Abd Rahman, N. H., Mustaffa, N. E., & Azizul, M. F. (2025). From Technical Solutions to Implementation: A Bibliometric Review of Behavioral Barriers in Urban Climate Adaptation. *International Journal of Innovation and Industrial Revolution, 7* (22), 16-33.

DOI: 10.35631/IJIREV.722002

Abstract:

Cities are on the front lines of climate breakdown, but knowing what to do is not enough if people do not act. Meanwhile, engineering and nature-based strategies have been widely proposed. However, urban adaptation often stalls due to behavioral and institutional barriers that are harder to detect but equally critical. This study employs bibliometric analysis to trace the evolution of urban climate adaptation research from 2015 to 2025, with a specific focus on these non-technical impediments. A total of 820 peer-reviewed journal articles were retrieved from the Scopus database based on a title search containing "urban," "climate," and "adaptation." Data were refined using OpenRefine and visualized through VOSviewer to map keyword co-occurrences, country-level trends, and collaborative networks. Results reveal a sharp rise in scholarly output, peaking in 2024, with a noticeable shift in thematic focus from infrastructure-based solutions to topics such as governance, justice, and institutional readiness. Frequently cited keywords include "vulnerability," "governance," and "behavioral barriers," while leading contributions emerged from the United States, the United Kingdom, and Germany. However, collaboration from Global South countries remains limited, despite an increase in publication activity. The findings highlight that many adaptations strategies falter not due to flawed design, but because of psychological resistance, ideological beliefs, or governance complexity. This paper underscores the importance of integrating behavioral science into climate policy and urban planning. By identifying where academic attention has concentrated and where critical gaps remain, the study contributes to the development of more inclusive

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and implementable climate resilience strategies. It calls for interdisciplinary approaches that move beyond technical fixes to fully engage with the human dimensions shaping urban climate action.

Keywords:

Urban Climate Adaptation, Behavioral Barriers, Policy Framework, Risk Assessment, Adaptive Management

Introduction

From heatwaves to rising seas, cities are at the forefront of climate change impacts. Despite understanding the necessary actions, many urban adaptation efforts struggle to gain momentum. The dense concentration of people, infrastructure, and ecosystem services in cities heightens their vulnerability to climate-related risks, making effective adaptation strategies essential. However, numerous behavioral barriers hinder the implementation of these measures. Understanding these barriers is crucial for developing strategies that can overcome them and facilitate efficient adaptation planning and implementation.

Behavioral barriers play a crucial role in shaping the outcomes of urban adaptation strategies. These obstacles often arise from a combination of cultural, psychological, and institutional factors that can slow down or disrupt progress. On an individual level, resistance to change and limited awareness are common challenges that hinder meaningful action (Ekstrom & Moser, 2014). The willingness of private actors to engage in public-oriented adaptation is shaped by social patterns and identities related to socioeconomic status and historical relationships with public institutions (Eakin et al., 2024). Institutional barriers, including regulatory frameworks and governance issues, frequently obstruct progress (Lehmann et al., 2015). Cultural factors, like resistance to relocation due to cultural identity, can also act as barriers, maintaining social and economic stability but hindering adaptation efforts (Oliver-Smith, 2019). Understanding these behavioral barriers enables policymakers and urban planners to design strategies that are more effective, sustainable, and contextually responsive. As such, addressing behavioral barriers is essential to strengthening urban resilience in the face of climate change.

Urban adaptation nowadays is not just a technical challenge but also a behavioral one, where the actions and decisions of individuals, communities, and institutions play a crucial role. Behavioral barriers, including limited cognition, ideological worldviews, and perceived risks of change, can significantly impede necessary adaptation measures (Gifford, 2011). Addressing these barriers ensures timely and effective adaptation to the changing climate. These barriers often arise from misalignment between technical planning and community-level perceptions or expectations (Cea & Costabile, 2022; Cruz et al., 2023).

Recent research highlights the multifaceted nature of barriers to urban climate adaptation, categorizing them into structural and psychological barriers. Structural barriers involve infrastructure, governance, and resource constraints, while psychological barriers include limited awareness, ideological resistance, and risk perception (Gifford, 2011; Lehmann et al., 2015). These barriers are often interrelated and vary in severity across different urban contexts (Boehnke et al., 2023; Lehmann et al., 2015). Governance complexity is a dominant behavioural barrier (Mumtaz, 2024; Kempenaar et al., 2024; Fereshtehpour & Najafi, 2025).

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Understanding these barriers is crucial for developing effective strategies to enhance urban resilience and sustainability.

A significant development is the recognition of the importance of the institutional context in shaping adaptation outcomes. Institutional barriers, including challenges in mainstreaming adaptation into governance structures and a lack of multi-level coordination, are critical obstacles (Ekstrom & Moser, 2014; Lehmann et al., 2015). The role of local governments and their capacity to integrate climate adaptation into urban planning is a focal point of recent studies (Boehnke et al., 2023; Hughes, 2020). Understanding these dynamics is essential for developing effective strategies that address both current and future climate challenges.

Another growing area of research focuses on "soft" adaptation strategies that prioritize organizational and behavioral dimensions over purely structural solutions. These approaches stress the importance of flexibility, reversibility, and scalability, particularly in contexts where the impacts of climate change remain uncertain (Bernardini, 2024). One such approach involves integrating climate data into the daily management of urban services, often referred to as urban adaptation services, which aims to strengthen cities' overall capacity to respond (Bernardini, 2024). At the same time, empirical studies increasingly point to the need for addressing social vulnerability and equity concerns in adaptation planning. The so-called adaptation deficit—the gap between perceived and actual adaptive capacity—is frequently widened by unequal access to resources and support systems (Ekstrom & Moser, 2014; Hughes, 2015). Adaptation efforts are also shaped by the unique cultural and geographic characteristics of each place, underlining the need for context-sensitive policies (Armah et al., 2015). Public trust (Cea & Costabile, 2022; Romero-Muñoz et al., 2024) and the credibility of institutions (Larson et al., 2015; Whittaker & Jespersen, 2022) continue to emerge as critical factors in the success of climate adaptation initiatives.

In conclusion, studying behavioral barriers in urban climate adaptation is crucial for developing effective strategies to enhance urban resilience. Evidence underscores the importance of considering behavioral responses and institutional factors alongside technical solutions to address urban adaptation intricacies (Thorn et al., 2015; Winchell et al., 2022). The complexity of these barriers encompasses both structural and psychological dimensions. Consequently, all these recent developments highlight the importance of institutional context, the potential of soft adaptation strategies, and the need to address equity and social vulnerability. By understanding and addressing these barriers, policymakers and urban planners can better facilitate adaptation measures, ensuring urban areas are better equipped to face climate change challenges.

Research Questions

There are five points that will be discussed in this study based on the following Research Questions (RQ).

RQ 1: What are the research trends in Urban Climate Adaptation studies according to the year of publication?
RQ 2: What are the most cited articles?
RQ 3: Documents by country trend?
RQ 4: What are the popular keywords related to the study, and have they evolved/changed during the last ten years?

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RQ 5: What are the country-level co-authorship and collaboration patterns?

Methodology

This study employed a bibliometric analysis to explore global scholarly trends on behavioral barriers in urban climate adaptation. Bibliometric methods allow for a systematic and quantitative examination of scientific literature, enabling the identification of key themes, influential contributors, and collaboration patterns within a research domain (Ortega et al., 2024; Lim et al., 2024; Öztürkvet al., 2024; Gherheș et al., 2025). Using Elsevier's Scopus database, we retrieved relevant publications spanning the period from 2015 to 2025 based on a refined keyword search string. The final dataset comprised 820 documents after applying predefined inclusion and exclusion criteria (Table 2). Details of the database and search query are provided in Table 1.

Table 1: Database Source and Keyword Search Strategy Used in the Scopus Bibliometric Extraction

Database	Search String
Scopus	TITLE (urban OR city AND climate AND adaptation) AND PUBYEAR > 2014 AND PUBYEAR < 2026.

Data Search Strategy

The search process began by querying the Scopus database with the search string as mentioned in Table 1. This query yielded 853 results. Documents were then screened based on specific criteria (Table 2). Only English-language publications were retained, while document types such as Short Surveys and Notes were excluded. After applying these filters, the final dataset comprised 820 documents deemed suitable for bibliometric analysis.

Table 2: Inclusion and Exclusion Criteria for Document Selection

Criterion	Inclusion	Exclusion
Language	English	Non-English
Time Frame	2015 – 2025	< 2015
Document Type	All Document Types Included, Excluding Short Surveys and Notes	Short Survey, Notes

Data Analysis

Bibliometric metadata such as titles, authors, affiliations, keywords, citations, and abstracts were exported from Scopus in plain text format. These data were analyzed using VOSviewer (version 1.6.19) to construct visual networks of co-authorship, keyword co-occurrence, and country-level collaboration. VOSviewer is particularly suitable for science mapping due to its clustering and normalization algorithms, which help reveal structural and thematic relationships within large bibliometric datasets (van Eck & Waltman, 2010; Lim et al., 2024). The bibliometric approach employed in this study was structured around the recommended design principles for robust bibliometric research: clear problem definition, systematic data collection, performance analysis, and science mapping (Zupic & Čater, 2015; Donthu et al., 2021; Öztürk et al., 2024). This ensured both methodological transparency and analytical rigor.

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Findings

Figure 1 shows a conceptual map created by Scopus AI, revealing the complex thematic clusters in urban climate adaptation research. This map highlights three main clusters from the literature: Risk Assessment, Policy Framework, and Behavioural Barriers. Each cluster branches into essential subtopics. According to the figure, it is informed that Mitigation Strategies and Climate Risk Management fall under Risk Assessment, while Policy Diffusion and Adaptive Management are part of the Policy Framework. Moreover, the Behavioral Barriers pathway is particularly noteworthy, as it links to Ethics, Environmental Justice, and Decision-Making. These connections emphasize the multifaceted nature of behavioral challenges in adaptation planning. The evolving discourse in this field increasingly views adaptation not only as a technical task but also as a behavioural and ethical imperative.

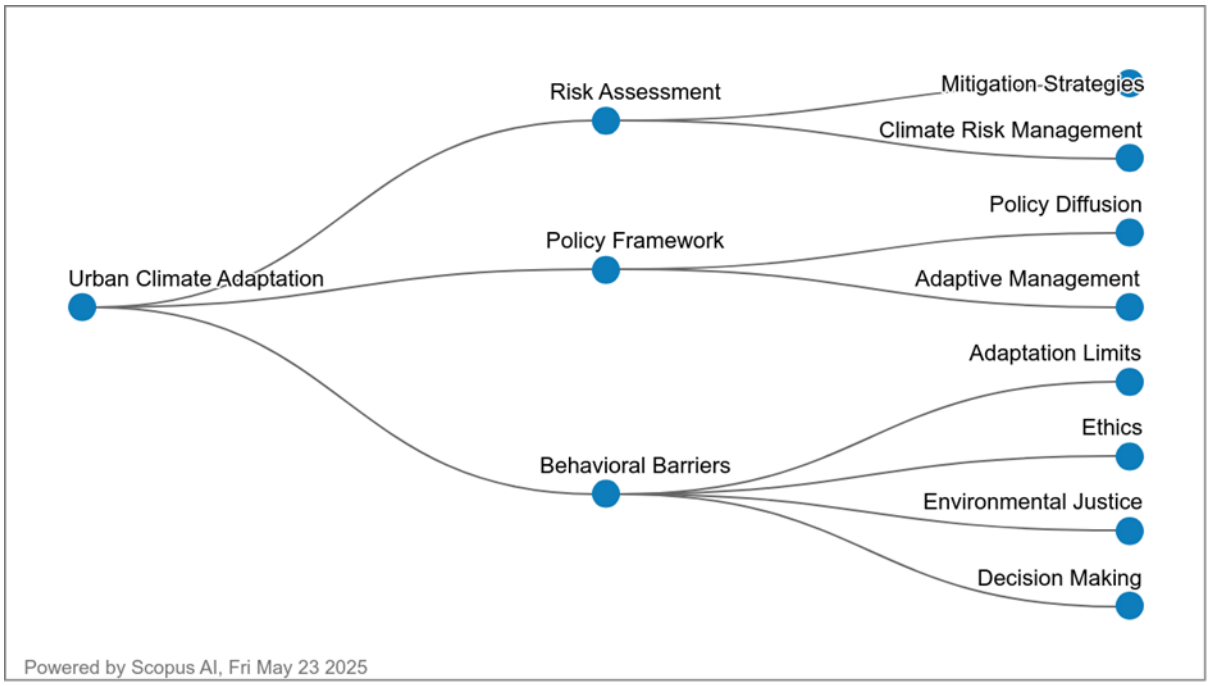

Figure 1: Conceptual Map of Thematic Clusters in Urban Climate Adaptation Research, Highlighting Interconnections Between Risk Assessment, Policy Frameworks, and Behavioral Barriers

Research Trends in Urban Climate Adaptation Studies

The publication trend from 2015 to 2025 illustrates a steady increase in scholarly output on urban climate adaptation (Figure 2). Table 3 shows a rise from 44 publications in 2015 to a peak of 125 in 2024. This growth reflects mounting concern over climate-related urban risks, such as floods, heatwaves, and infrastructure vulnerability. Key publication spikes in 2020 and 2024 suggest these years were influenced by global climate policy momentum, possibly in response to UN summits, IPCC reports, or high-impact climate disasters.

More significantly, the pattern reveals a possible thematic transition within the field. Meanwhile, early publications primarily focused on technical and planning frameworks. Recent years show a shift toward examining softer, implementation-related issues such as governance capacity, behavioral resistance, and institutional readiness. The notable jump between 2023 and 2024 supports this shift, indicating an evolving research focus that aligns closely with this study's emphasis on behavioral barriers.

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The sudden dip to 57 publications in 2025 may be due to ongoing indexing or indicate the start of a new thematic wave post-saturation in foundational research. Overall, this trend underlines that urban adaptation research is expanding in quantity and evolving in focus. The growing interest in behavioral dimensions signals the relevance of this study's goal: understanding how implementation barriers, particularly psychological and institutional, influence the success of adaptation measures.

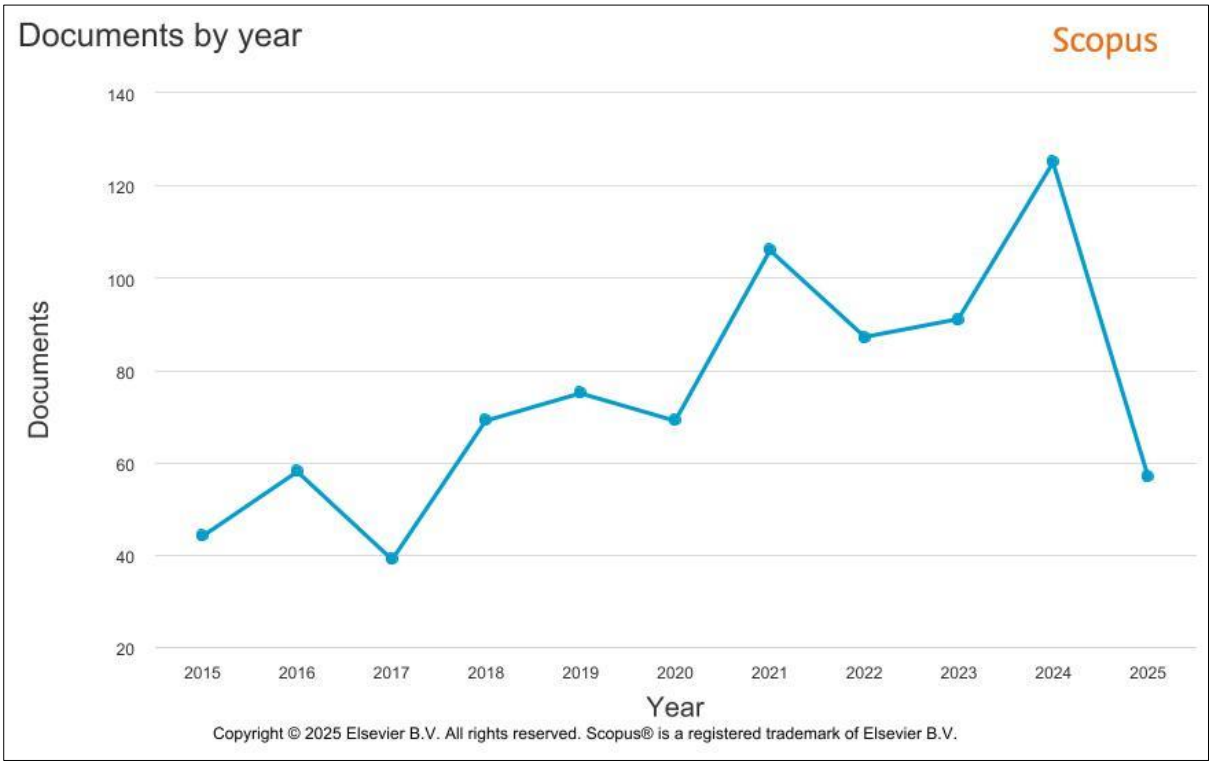

Figure 2: Annual Publication Trends on Urban Climate Adaptation (2015–2025), Showing A Steady Increase with Peaks In 2020 And 2024

Table 3: Annual Publication Count and Percentage of Total Documents in Urban Climate Adaptation Literature (2015–2025)

Year	Total publication	Total percentage %
2025	57	0.070
2024	125	0.152
2023	91	0.111
2022	87	0.106
2021	106	0.129
2020	69	0.084
2019	75	0.091
2018	69	0.084
2017	39	0.048
2016	58	0.071
2015	44	0.054

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Most Cited Articles Between 2015 and 2025

The ten most cited articles from 2015 to 2025 highlight dominant research themes and influential voices in the field. Table 4 shows that Kabisch et al. (2016) lead the list, with their work on Nature-Based Solutions (NBS) receiving 935 citations, reflecting the high demand for integrative approaches that address both mitigation and adaptation goals. Meanwhile, other top-cited works emphasize capacity building, urban governance, and planning integration, all of which are crucial for real-world adaptation outcomes.

Notably, several highly cited papers focus on equity and justice, such as Anguelovski et al. (2016) and Shi et al. (2016), which interrogate who benefits from adaptation efforts and who is left behind. These studies highlight the behavioral and social dynamics that affect adaptation uptake, including risk perception, community engagement, and institutional trust. Their prominence underscores a paradigm shift from solely "what to do" (technical) toward "how to make it happen" (behavioral and political).

This shift in citations mirrors broader discourse evolution. Increasingly, researchers are recognizing that adaptation is not just about designing green spaces or flood infrastructure but about navigating the human and systemic barriers that shape implementation. These top-cited works reflect a rising interest in the social construction of adaptation success, where perceptions, norms, and governance structures play a decisive role.

Table 4: Ten Most Cited Articles in Urban Climate Adaptation Research, Highlighting Influential Works with Behavioral and Justice-Based Perspectives

Authors / Citation	Title	Year	Source title	Cited by
Kabisch N.; Frantzeskaki N.; Pauleit S.; Naumann S.; Davis M.; Artmann M.; Haase D.; Knapp S.; Korn H.; Stadler J.; Zaunberger K.; Bonn A. (Kabisch et al., 2016)	Nature-based solutions to climate change mitigation and adaptation in urban areas: Perspectives on indicators, knowledge gaps, barriers, and opportunities for action	2016	Ecology and Society	935
Carter J.G.; Cavan G.; Connelly A.; Guy S.; Handley J.; Kazmierczak A. (Carter et al., 2015)	Climate change and the city: Building capacity for urban adaptation	2015	Progress in Planning	514
Anguelovski I.; Shi L.; Chu E.; Gallagher D.; Goh K.; Lamb Z.; Reeve K.; Teicher H. (Anguelovski et al., 2016)	Equity Impacts of Urban Land Use Planning for Climate Adaptation: Critical Perspectives from the Global North and South	2016	Journal of Planning Education and Research	463
Shi L.; Chu E.; Anguelovski I.; Aylett A.; Debats J.; Goh K.; Schenk T.; Seto K.C.; Dodman D.; Roberts D.;	Roadmap towards justice in urban climate adaptation research	2016	Nature Climate Change	399

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Roberts J.T.; Van Deveer S.D. (Shi et al., 2016)				
Frantzeskaki N.; McPhearson T.; Collier M.J.; Kendal D.; Bulkeley H.; Dumitru A.; Walsh C.; Noble K.; Van Wyk E.; Ordóñez C.; Oke C.; Pintér L. (Frantzeskaki et al., 2019)	Nature-based solutions for urban climate change adaptation: Linking science, policy, and practice communities for evidence-based decision-making	2019	BioScience	329
Zhou Q.; Leng G.; Su J.; Ren Y. (Zhou, Leng, Su, & Ren, 2019)	Comparison of urbanization and climate change impacts on urban flood volumes: Importance of urban planning and drainage adaptation	2019	Science of the Total Environment	305
Balogun A.-L.; Marks D.; Sharma R.; Shekhar H.; Balmes C.; Maheng D.; Arshad A.; Salehi P. (Balogun et al., 2020)	Assessing the Potentials of Digitalization as a Tool for Climate Change Adaptation and Sustainable Development in Urban Centres	2020	Sustainable Cities and Society	282
Muis S.; Güneralp B.; Jongman B.; Aerts J.C.J.H.; Ward P.J. (Muis, Güneralp, Jongman, Aerts, & Ward, 2015)	Flood risk and adaptation strategies under climate change and urban expansion: A probabilistic analysis using global data	2015	Science of the Total Environment	271
Sharifi A. (Sharifi, 2021)	Co-benefits and synergies between urban climate change mitigation and adaptation measures: A literature review	2021	Science of the Total Environment	269
Araos M.; Berrang-Ford L.; Ford J.D.; Austin S.E.; Biesbroek R.; Lesnikowski A. (Araos et al., 2016)	Climate change adaptation planning in large cities: A systematic global assessment	2016	Environmental Science and Policy	269

Document Distribution by Country

Country-level analysis reveals a concentration of research in high-income Western nations, particularly the United States (142 documents), the United Kingdom (88), Germany (84), and the Netherlands (64). This geographic pattern reflects the presence of strong academic institutions, funding mechanisms, and climate policy agendas that support in-depth studies on

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urban climate adaptation. As shown in Figure 4, it also suggests that the discourse remains somewhat centralized within the Global North.

However, contributions from emerging economies are gradually increasing. China and India each produced 43 publications, while South Africa published 36. Although these countries have fewer publications, their inclusion reflects growing scholarly attention to climate adaptation in rapidly urbanizing and climate-vulnerable regions. This shift is important, as cities in these contexts often face distinct behavioral barriers tied to socioeconomic inequality, informal governance, and limited institutional trust.

Despite this positive trend, citation counts and link strengths remain disproportionately low in many countries in the Global South, including Malaysia and Indonesia. This disparity highlights a pressing need for more inclusive research collaboration and capacity building. By bridging this gap, future studies can better address how behavioral and contextual challenges vary across global urban settings, a crucial step in moving from generic technical recommendations to locally viable implementation strategies.

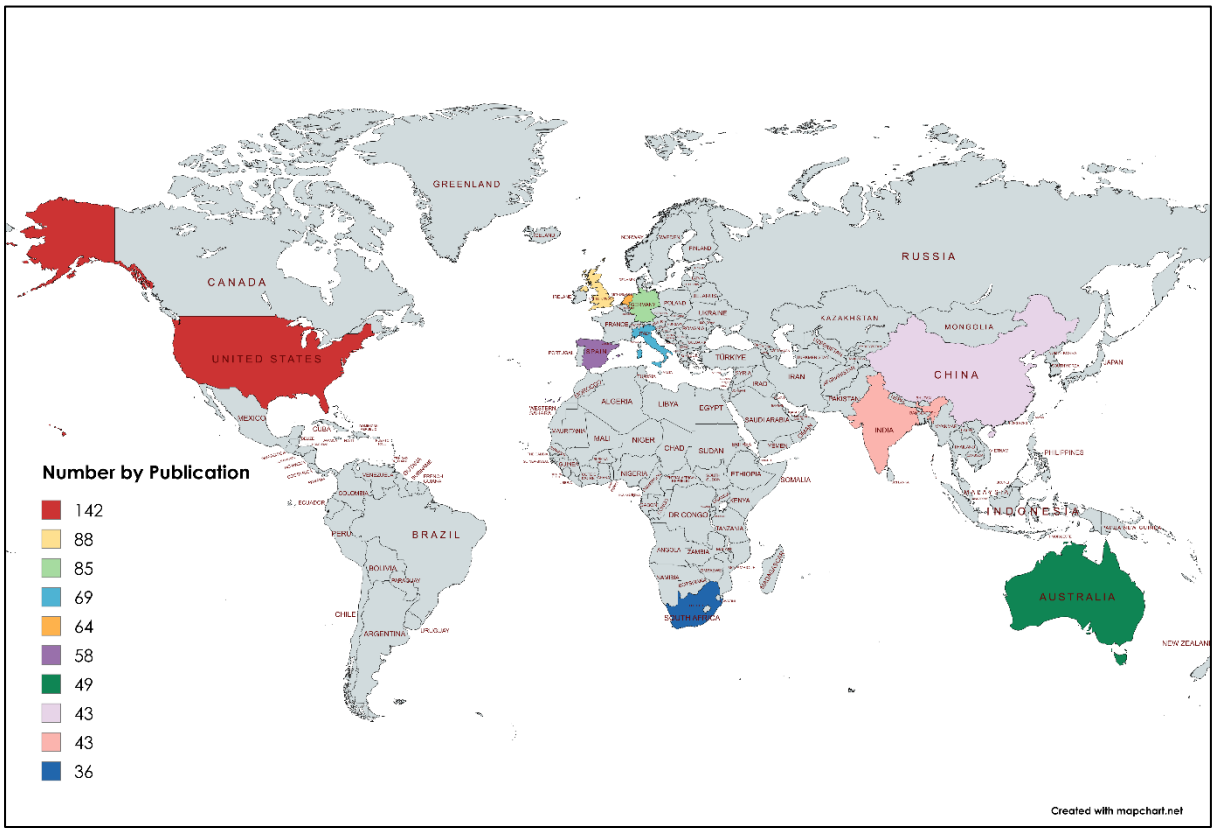

Figure 3: Geographic Distribution of Publications on Urban Climate Adaptation, Emphasizing Dominance by High-Income Countries and Emerging Contributions from the Global South

Keyword Co-Occurrence Analysis

Keyword co-occurrence analysis reveals that "climate change" dominates the field, appearing 376 times with the highest total link strength (951). This underscores its centrality across multiple urban disciplines. “Adaptation” (192 occurrences) and “urban planning” (100) also feature prominently, reflecting the interdisciplinary nature of climate adaptation efforts.

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Notably, "climate adaptation" (95) is distinguished from broader adaptation themes, emphasizing a sharpened focus on applied, context-specific urban responses.

The presence of terms such as "nature-based solutions" and "urban green spaces," each with 43 occurrences, indicates sustained interest in ecosystem-based adaptation strategies. However, emerging keywords like "urban resilience," "environmental justice," and "governance," although less frequent, signal an evolving focus toward behavioural, equity-driven, and institutional dimensions of adaptation.

Figure 4 visualizes how keywords cluster across the literature, revealing an evolution from technical adaptation concepts, such as "urban planning" and "infrastructure," toward more socially grounded themes, including 'governance,' 'justice,' and 'resilience.' This shift supports the argument that behavioral and institutional concerns have become increasingly central to urban climate adaptation discourse over the past decade. Keyword trends such as 'resilience' and 'vulnerability' are also consistent with the growing focus in recent years on soft adaptation strategies (Pancewicz et al., 2023; Adi et al., 2024; Farinós-Dasí et al., 2024).

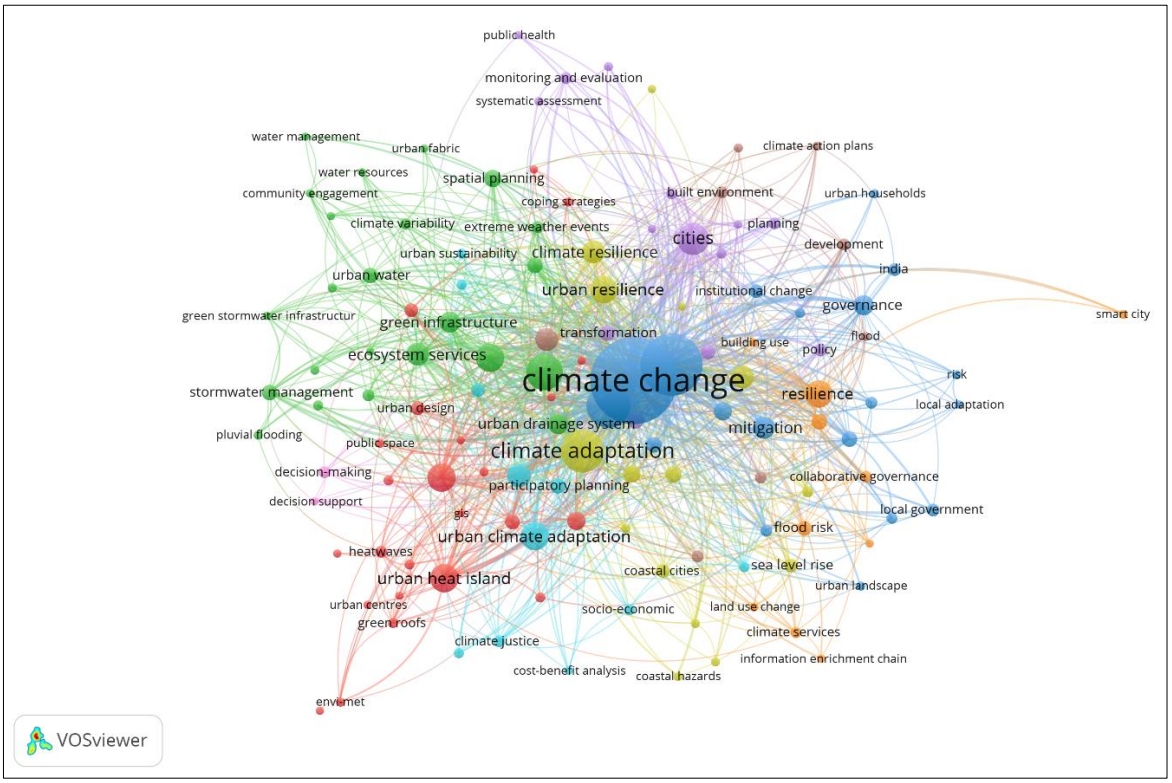

Figure 4: Keyword Co-Occurrence Network (VOSviewer) Showing Dominant Research Themes and Emerging Focus Areas Related to Behavioral and Institutional Dimensions of Adaptation

Meanwhile, Table 5 presents a numerical overview of the top 20 words that are the most used keywords and their interconnected strength across the literature. Terms such as "climate change," "adaptation," and "urban planning" remain dominant, reflecting the core focus areas of the field. At the same time, newer themes like "vulnerability" and "governance" are becoming more visible. Notably, the increasing use of terms like "justice" over the last five years suggests a growing interest in the institutional and behavioral aspects of climate

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adaptation. This trend indicates a broader shift in scholarly discourse from prioritizing technical solutions to recognizing the importance of social and political factors. The strong network connections of these emerging keywords underscore the expanding attention given to non-technical approaches within urban climate resilience research.

This shift in keyword trends aligns directly with the premise of this paper, which is that a deeper understanding of behavioral barriers is both timely and necessary. The emergence of terms related to vulnerability, justice, and governance reflects a growing scholarly commitment to examining how perceptions, institutions, and equity influence the success of adaptation. These evolving themes suggest a pivot in the research landscape: from "what we need" to "why implementation struggles" and "how people and institutions react."

Table 5: Most Frequently Occurring Keywords and Their Total Link Strength, Revealing Evolving Focus from Technical to Behavioral Themes

Keyword	Occurrences	Total Link Strength
Climate Change	376	951
Adaptation	192	505
Urban Planning	100	289
Sustainable Development	68	209
Climate Adaptation	95	208
Cities	53	180
Nature-Based Solutions	43	127
Urban Green Spaces	43	126
Resilience	40	125
Urban Resilience	39	119
Urban Heat Island	42	113
Urban Climate Adaptation	41	95
Ecosystem Services	29	91
Environmental Justice	27	86
Mitigation	26	83
Urban Adaptation	30	82
Vulnerability	29	81
Green Infrastructure	23	70
Climate Resilience	27	69
Governance	22	59

Co-Authorship Patterns and Collaboration Trends by Country

Analysis of co-authorship networks reveals a strong dominance of Western countries, with the United States, United Kingdom, Germany, and the Netherlands showing high levels of both publication volume and collaborative link strength. The United Kingdom leads in total link strength (175), suggesting more international collaboration and keyword alignment. This confirms the presence of tight academic clusters and robust transnational partnerships, particularly across Europe and North America, that drive much of the discourse on urban adaptation.

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Meanwhile, countries such as China, India, South Africa, and Malaysia are participating more actively in collaborative networks, though with fewer links. Their increasing presence in co-authorship maps is promising, indicating growing research capacity and potential for cross-cultural insights. However, overall global collaboration still tends to mirror existing geopolitical and economic divides, which may limit knowledge diversity and context-sensitive solutions, especially in behavioral research, which is highly shaped by culture and local institutions.

As shown in Figure 5, collaboration networks are dominated by Western countries, particularly the United Kingdom, the United States, and Germany, highlighting both the concentration of research and a potential gap in knowledge exchange with the Global South. This visual emphasizes the need for more equitable global collaboration, especially as adaptation must consider culturally specific behavioral contexts.

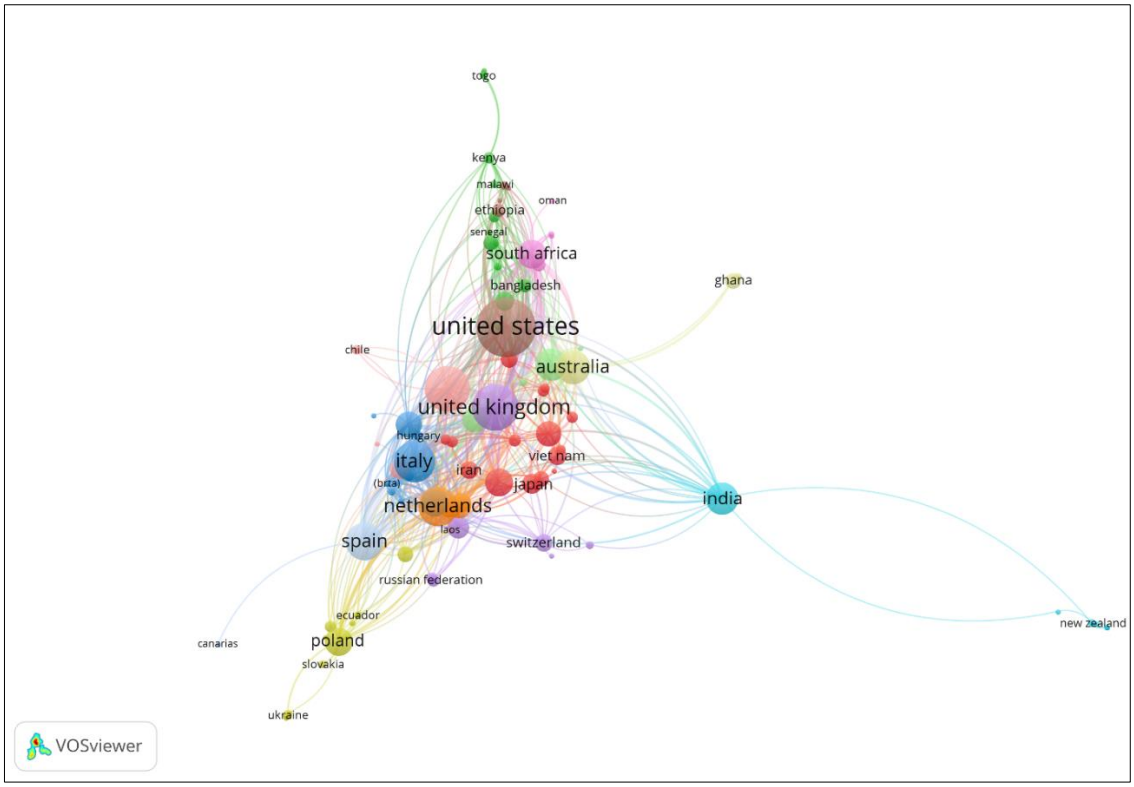

Figure 5: Country-Level Collaboration Network in Urban Adaptation Research, Highlighting Concentrated Partnerships Among Western Countries and Underrepresentation from Southeast Asia and Africa

Furthermore, Table 6 details country-level contributions, citations, and collaboration strength, showing that the United States and United Kingdom dominate in volume and influence. Meanwhile, countries such as Malaysia and India are increasing their presence but remain underrepresented in global co-authorship networks. This table substantiates the visual insights from Figure 5, confirming disparities in collaboration that could impact locally relevant adaptation strategies.

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The relatively limited collaboration from Southeast Asian and African nations presents a key research gap. Addressing behavioral barriers in urban adaptation requires not just technical expertise but a deep understanding of local social norms, institutional contexts, and historical inequalities. Without more inclusive collaboration, global solutions risk becoming one-size-fits-all. Strengthening academic ties across underrepresented regions would enrich the worldwide discourse and support more implementable, locally responsive adaptation strategies. To build inclusive, context-sensitive strategies, more South-South and interregional collaborations must be fostered, especially in culturally specific behavioral contexts.

Table 6: Country-Wise Document Output, Citation Counts, And Co-Authorship Link Strength, Showing Disparity Between Publication Volume and Collaboration Levels

Country	Documents	Citations	Total Link Strength
United Kingdom	88	3659	175
United States	142	4930	139
Germany	84	3016	119
Netherlands	64	4386	111
Spain	58	2623	105
Australia	49	1333	79
South Africa	36	1280	78
China	43	1401	67
Portugal	29	568	66
Denmark	28	912	65
Italy	69	1185	61
France	21	454	57
Sweden	31	959	55
Greece	17	377	48
India	43	927	47
Malaysia	12	712	38
Poland	34	434	34
Cyprus	5	124	33
Finland	16	744	33
South Korea	24	651	33

Conclusion

This study aimed to examine the evolution of research on urban climate adaptation by identifying patterns, influential publications, country contributions, keyword developments, and collaborative networks over a ten-year period. The central aim was to understand how academic focus has shifted from technical adaptation strategies to the behavioral and institutional barriers that hinder their practical application in urban settings.

The analysis revealed a steady growth in publication volume between 2015 and 2025, with a significant increase in recent years reflecting heightened global attention to climate risks in cities. Highly cited articles within the field emphasized NBS, equity, and governance, suggesting a growing concern with the human and systemic aspects of adaptation. Country-level trends indicated dominant contributions from high-income regions, with emerging participation from rapidly urbanizing countries. Thematic keyword clusters highlighted an evolution in research interest, with behavioral terms such as governance, resilience, and justice

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gaining prominence. Collaboration networks showed an imbalance, with limited co-authorship linkages in lower-income regions despite their high vulnerability to climate change.

This study contributes to the growing body of knowledge by providing a structured overview of the behavioral discourse within urban adaptation research. Through the use of bibliometric techniques, it clarifies where academic attention has been concentrated and where gaps remain, particularly in addressing the social and institutional challenges of implementing adaptation policies. These insights support a broader understanding of how non-technical factors have become central in shaping climate resilience strategies.

The findings offer practical value for decision-makers, academic institutions, and funding agencies by highlighting areas of research that may require more support, especially in underrepresented regions. Identifying the gap between theoretical planning and real-world implementation is essential for developing actionable frameworks that consider not only environmental systems but also the behavioral dynamics within urban governance and communities.

Several limitations should be acknowledged. The analysis was limited to articles indexed in a single academic database, and the scope was confined to English-language peer-reviewed journal articles. Certain terms or regional studies may have been underrepresented as a result. Future studies may extend this work by incorporating qualitative assessments or case-specific evaluations to better recognize local adaptation experiences. Deeper research into co-authorship networks and cross-sector partnerships may also enhance the understanding of knowledge transfer and collaboration in this field worldwide.

Identifying where behavioral barriers exist and how they are represented in scholarly discourse is essential to narrowing the gap between theoretical potential and practical implementation. Bibliometric approaches offer a valuable means of tracing the development of urban climate adaptation research over time. To support more inclusive and effective strategies, continued attention must be given to emerging themes, regional diversity, and interdisciplinary collaboration. As behavioral dynamics increasingly influence adaptation outcomes, both research and policy must move beyond engineering solutions and “one-size-fits-all” planning. Greater emphasis on institutional structures, social responses, and psychological dimensions is needed to ensure that adaptation measures are not only technically sound but also socially grounded. In the context of a deepening climate crisis, the effectiveness of urban adaptation will depend on the ability to design systems that align with human realities, rather than bypass them.

Acknowledgments
The authors would like to acknowledge and extend special gratitude to the Ministry of Higher Education (MOHE) Malaysia under the Public Private Research Network (PPRN) grant for the research financial support related to this project.

International Journal of Innovation and Industrial Revolution
EISSN: 2637-0972
IJIREV
Volume 7 Issue 22 (September 2025) PP. 16-33
DOI 10.35631/IJIREV.722002

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