

Scientometric Analysis of Urban Resilience Research: 2005–2023

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Abstract

Urban resilience has emerged as a critical concept in the face of rapid urbanization and increasingly complex risks in cities. While urban resilience research has gained significant momentum in recent years, its foundational principles remain unclear. This paper aims to explore the evolution of urban resilience research over the last two decades, examining the growth trends, geographic distribution, institutional contributions, and research hotspots. Using CiteSpace 6.2.R, we conduct a bibliometric analysis of 1,716 scholarly articles published between 2005 and 2023. Our findings reveal that research on urban resilience has witnessed exponential growth since 2012, particularly after the COVID-19 pandemic, signaling a shift towards interdisciplinary and context-specific approaches. Geographic and institutional analysis highlights the dominant roles of China, the United States, and Western Europe, as well as leading institutions such as Arizona State University and Hiroshima University. Furthermore, keyword clustering analysis identifies key research themes including flooding, climate change, urban policy, and resilience frameworks. The study concludes by identifying emerging research directions and offers insights into how urban resilience can be further developed to tackle contemporary challenges in urban environments.

Keywords

Scientometric Analysis; Urban Resilience; CiteSpace

1. Introduction

With the rapid development of the urban process, the problems faced in the operation of the city have gradually become more complex, and the corresponding risks are also expanding. Cities with the ability to combat risks are better able to adapt to such changes and continue to develop safely (Huang et al., 2023). This ability we call urban resilience. Although the concept of urban resilience has been widely used in research in recent years, its basic meaning and constitutive principles remain undefined (Sharifi, 2023). Initial research related to urban resilience considered urban resilience to be the ability to recover from a disaster and argued that this ability, like disaster, is site-specific (Vale & Campanella, 2005). Today's research is still tied to

the characterization of catastrophe, such as the epidemics we have encountered (Escorcia Hernández et al., 2023). What are the reasons behind this connection? This article hopes to speculate on the future direction of urban resilience and explore the changing trends of its research in the last 20 years by analyzing the literature related to the topic of urban resilience econometrically, providing relevant researchers with a macro perspective to advance the field of urban resilience. Through this article, we will also clarify the hotspots and vectors of development of research on urban resilience.

2. Materials and methods

The tool used for this article is CiteSpace 6.2.R, which is a visual bibliometric tool that can help researchers identify future research directions and opportunities, as well as collaborations between existing studies, among other things (Chen, 2006).

In this paper, Scopus was chosen as the sample database. The sampling process is described as follows: open the search box of the Scopus database and enter “urban resilience” OR “city resilience”. The search methods used were title, abstract, and keyword search. The search period was limited from 2005 to 2023. The type of literature was restricted to articles and reviews, the kind of source publication was set to journal, and the language was set to English, so the final search equation was TITLE-ABS-KEY(“urban resilience” OR “city resilience”) AND PUBYEAR > 2004 AND PUBYEAR < 2024 AND (LIMIT-TO (SRCTYPE, “j”)) AND (LIMIT-TO (LANGUAGE, “English”)) AND (LIMIT-TO (DOCTYPE, “ar”) OR LIMIT-TO (DOCTYPE, “re”)). The data were imported into CiteSpace for processing to eliminate duplicates, and finally, 1716 bibliographic records were obtained as the research sample of this paper.

3. Results

In this section, we present in detail the results of the analysis of 1,716 papers on urban resilience between 2005 and 2023.

3.1. Publication trend analysis

Changes in the annual publication volume of a paper (Figure 1) can reflect the changing dynamics of a topic and its related research over time, thus reflecting the degree of scholarly interest in it and the trend of future research.

From Figure 1, we can find that research on urban resilience has only just begun in 2005, and in the six-year period from 2005 to 2011, the progress of related research was relatively slow. However, it is worth noting that the situation has changed since 2012, when there was an explosive growth in the number of publications. (From 4 articles in 2011 to 19 articles in 2012). After 2012, relevant studies show a steady upward trend in terms of number. Especially in 2020, after the COVID-19 pandemic, the increase in the number of publications relative to the previous year reached a

staggering 58%. This demonstrates the increasing interest of scholars in this topic and also marks the fact that research on urban resilience has entered a phase of rapid development since 2011. Based on this trend, it is not difficult to infer that research on urban resilience will increase further in the future.

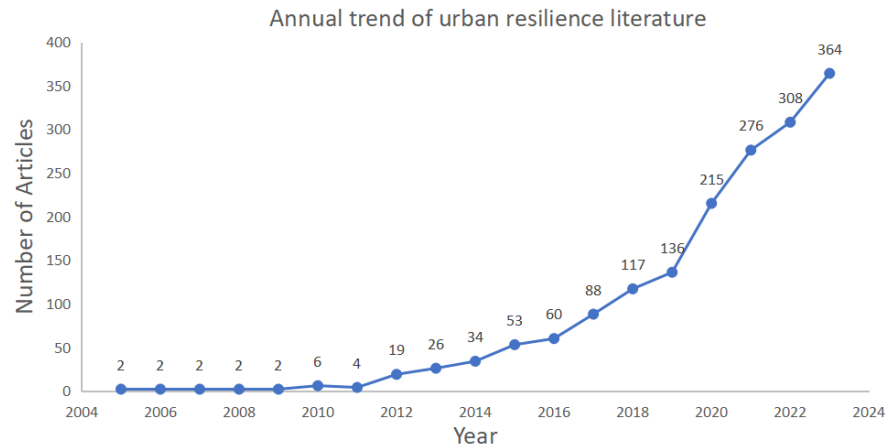


Figure 1. Annual trend of urban resilience literature.

3.2. Geographic distribution analysis

Figure 2 is a map of the network of national or regional collaborations in the field of urban resilience research. A total of 117 countries have published papers in this research area, among which there are 5 countries with more than 100 papers. Among them, China ranks first with 328 papers, followed by the United States with 295 papers, the United Kingdom with 193 papers, Italy with 160 papers, and Australia with 110 papers. From the network diagram, we can find that there is not a lot of linkage between countries, which indicates that although many countries are interested in this field, the cooperation between countries still needs to be strengthened.

In terms of geographic distribution (Figure 3), we find that the countries with relatively large number of articles are mainly China, Australia, and some developed countries located in North America and Western Europe. The analysis suggests that this difference is since the urbanization process in the above countries is relatively developed, and that more attention is paid to the risk resilience of cities in the post-urbanization phase.

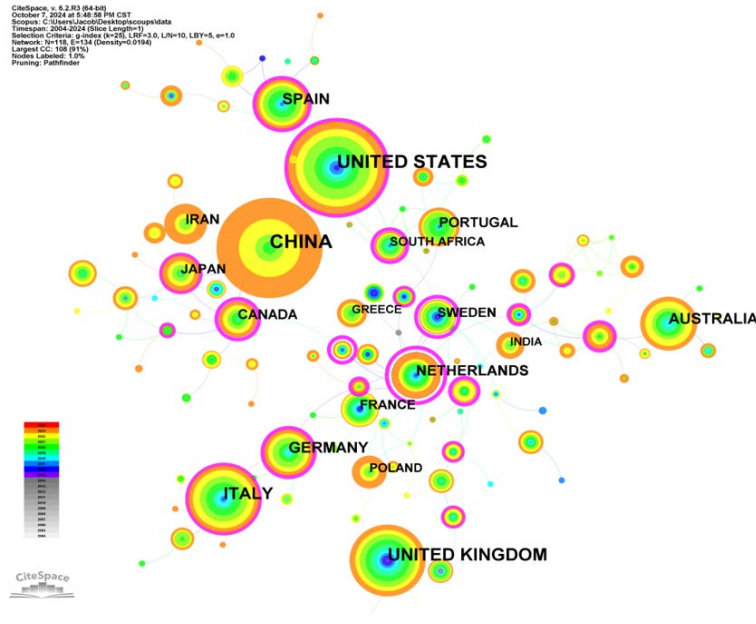


Figure 2. Countries or regions of the urban resilience research network.

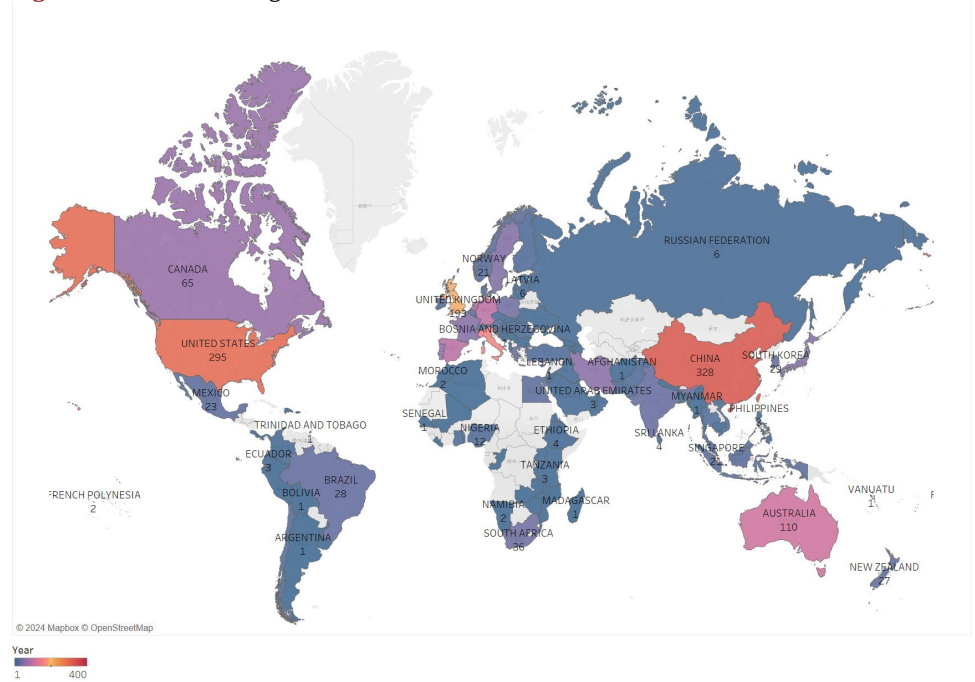


Figure 3. Geographical distribution of publications.

3.3. Leading journals and institutions

The top ten journals in terms of publications are Sustainability Switzerland (208), Cities (77), International Journal Of Disaster Risk Reduction (53), Sustainable Cities And Society (52), Land (41), Urban Climate (33), International Journal Of Environmental Research And Public Health (32), Journal Of Cleaner Production (27), Environmental Science and Policy (25), Water Switzerland (22). Our analysis reveals

that these journals have one thing in common, which is that they all focus on the field of environmental or urban studies.

In the institutional network diagram (Figure 5), we can find that Arizona State University (25), Hiroshima University (24) Stockholm University (15), Beijing Normal University (14), Utrecht University (14), and Delft University of Technology (14) are the top six research institutions in terms of the number of articles published, with two institutions from China and the Netherlands on the list. In terms of the centrality value, which represents the degree of impact of the articles, the top six institutions are Stockholm University (0.11), Peking University (0.10), Delft University of Technology (0.08), University of Melbourne (0.07), China University of Geosciences (0.07), and Hiroshima University (0.06). Taken together, China, Sweden, the Netherlands, and Japan are influential in the field of urban resilience research.

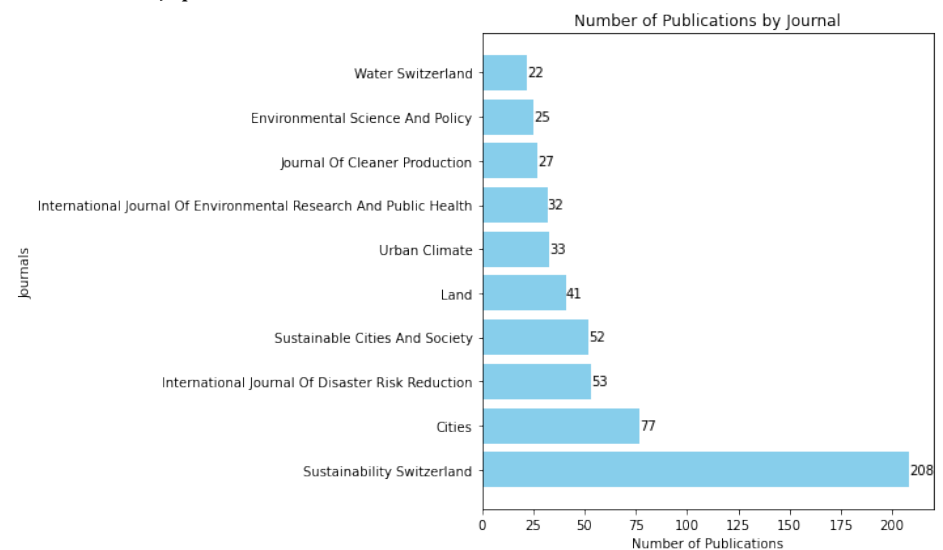


Figure 4. Number of publications by Journal.

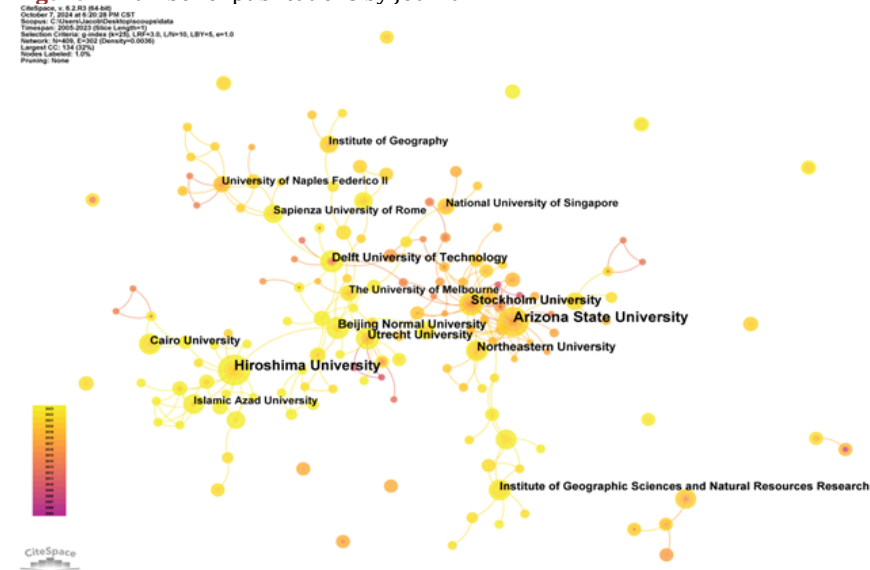


Figure 5. Institutions of the urban resilience research network.

3.4. Co-authorship analysis

Author co-occurrence analysis (Figure 5) can identify the core authors in a certain field and the intensity of cooperation between authors. The number of publications is presented in the form of the size of the node, the intensity of cooperation between authors is presented in the form of the thickness of the connecting line, and the time of publication is presented in the form of the color. Among all the nodes, four large nodes can be seen, which are Sharifi, A, Liu, Y, Labaka, L, Wang, Y.. Thus, these 4 are highly productive authors of research in this field. Among them, Meerow, S, Frantzeskaki, N, Andersson, E, Mcpherson, T form a group of authors. There are also some small collaborative teams, such as Pisello, AL, and Pigliautile, I, but there is only one link between the nodes, and the network is not expanded, thus limited to two people working together, and the collaborative power is weak. Looking at the whole map, we can see that there are many isolated points, and there is no network connection between the groups, indicating that there is a lack of academic cooperation between authors in this field.

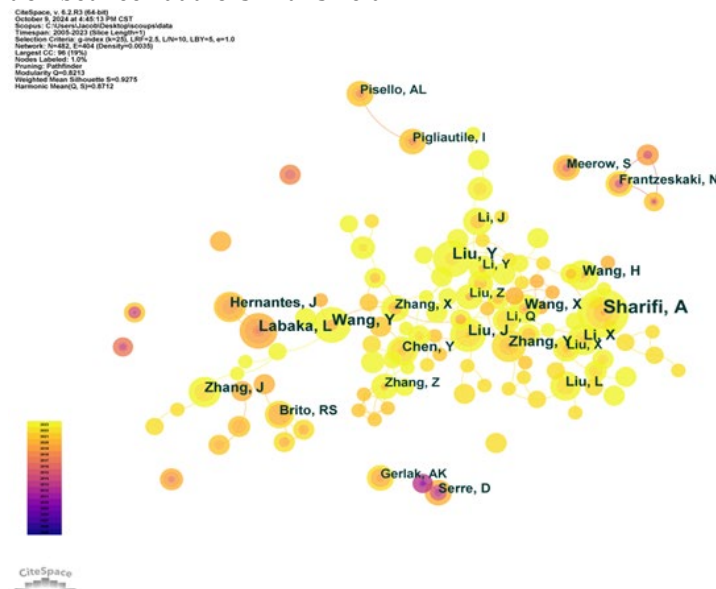


Figure 6. Author collaboration network of urban resilience research.

3.5. The hotspots of urban resilience research

In this paper, the keyword clustering analysis of urban resilience-related research is carried out using the LLR clustering method and the K-means clustering method. The clustering results show that the clustering module value (Q-value) is 0.8213, indicating that the clustering structure is more significant, and the clustering average profile value (S-value) is 0.9275, indicating that the clustering has credibility.

Keyword clustering can be summarized mainly in the following ten categories: Cluster #0 "China", one of the more representative studies is Zhu et al. studied

187 smart cities in China to explore the relationship between smart cities and urban resilience(Zhu et al., 2019).Cluster #1 "Flooding", an important study is that of Rosenzweig et al., who utilized stormwater flooding case studies from six cities in the continental U.S. to illustrate the challenges that cities currently face under the influence of flooding(Rosenzweig et al., 2018).Cluster #2 "Climate change", for example, Leichenko's research mentioned that cities should have the ability to recover from the shock of climate change(Leichenko, 2011). Cluster #3 "Resilience", (Meerow et al., 2016) identified six conceptual tensions fundamental to urban resilience. Cluster #4 "Urban residents", some researchers focused on the rights of urban citizens as the object of urban resilience (Ziervogel et al., 2017). Cluster #5 "Urban policy", Cluster #6 "Covid 19", for example, Ziervogel et al. developed a conceptual framework on economic resilience and tourism recovery during the late stages of the Covid-19(Ziervogel et al., 2017). Cluster #7 "Air quality", Cluster #8 "Vulnerability", Cluster #9 "Stakeholder". These clusters illustrate the research themes on urban resilience in recent years.

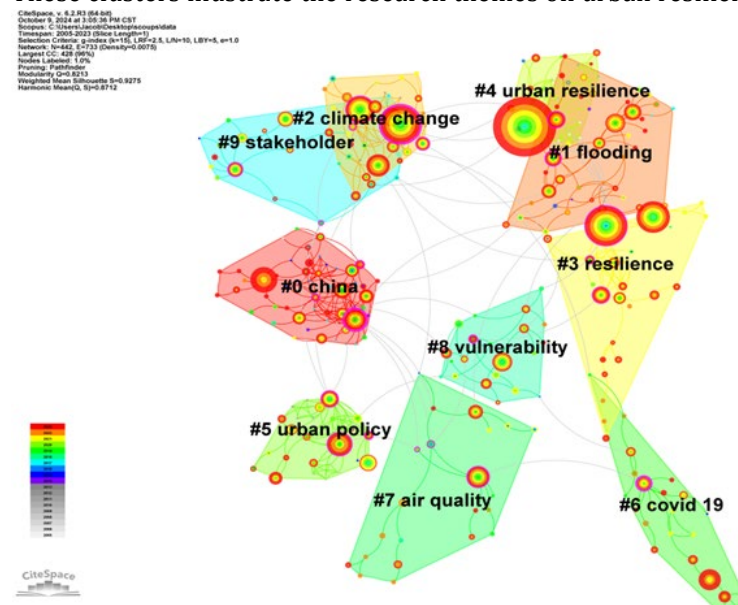


Figure 7. Keyword clustering map of urban resilience research.

Through the Time-zone view of the keyword of urban resilience research(Figure 8). We find that there are four phases of research on urban resilience, the first phase: from 2005 to 2009, the keywords from “disaster” and “government governance” to the specific natural disaster---- “flooding”, the second phase: from 2011 to 2015, the keywords of “sustainability” gradually shifted to “disaster management”, “risk management” and so on. “In the third phase, from 2016 to 2022, we find the keywords “USA”, “China”, “Italy”, “smart cities”, “COVID-19” and other words related to specific countries and events, which shows that researchers have begun to deeply integrate urban resilience with specific countries and specific issues we face. The fourth: In 2023 and beyond, the top research terms related to urban resilience are “spatial distribution”, “ecosys-

tem”, and “economic and social effects”. These words indicate that research on urban resilience has been conducted in a variety of fields, including economic, social, and geographic disciplines.

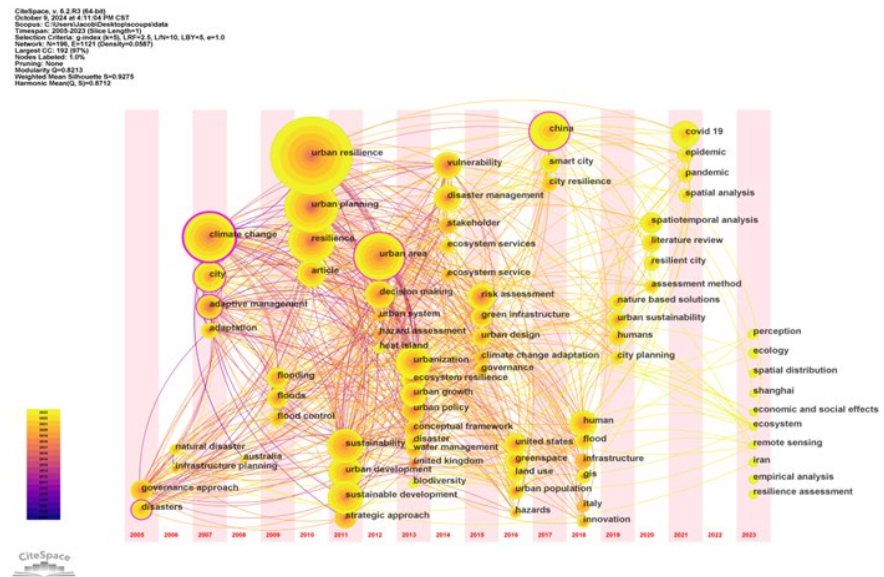


Figure 8. Time-zone view of the keyword of urban resilience research.

4. Conclusion

This study has provided a comprehensive overview of the evolution of urban resilience research over the last two decades, identifying key trends, hotspots, and geographical patterns. The explosive growth of publications after 2011, particularly in the wake of global crises like COVID-19, signals an increasing recognition of the importance of resilience in urban systems. Geographically, while China, the USA, and Europe lead the way in publications, there is a clear gap in international collaboration, indicating a need for more cross-border research efforts. The keyword analysis revealed the multi-faceted nature of urban resilience, encompassing not only disaster and climate-related issues but also economic, social, and technological dimensions such as smart cities and the COVID-19 pandemic. The shift from disaster-centric research to more holistic studies focusing on social and economic impacts marks the evolving understanding of resilience. Moving forward, the field must expand its interdisciplinary collaboration, foster global partnerships, and integrate new dimensions such as ecosystem services and spatial distribution to strengthen urban resilience frameworks and policies.

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