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A Comprehensive Bibliometric Analysis of Urban Renewal Research during 2012–2022

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Abstract: Rapid urban development has promoted economic development, but it has also created social problems. Urban renewal provides an important means of achieving sustainable urban development. After 2012, it became a research hotspot with people-oriented and organic renewal concepts. To understand the research trends in urban renewal during 2012–2022, a comprehensive bibliometric analysis was conducted to identify research progress, fields, hotspots, and trends. The core collection is based on the Web of Science (WoS) database, with a total of 2692 publications. The volume of publications, journal of publication, country, institution, research scope, and keywords were selected as the object of analysis. The results reveal that since 2012, the volume of urban renewal articles has been gradually increasing, reaching a maximum of 417 in 2022. China is the largest and most influential country in terms of the number of articles published, but the cooperation between institutions and authors is not strong. The research hotspots can be summarized as the connotation and practice of urban renewal, approaches to urban renewal, and sustainable urban development. Future directions for research are identified as including an innovative multi-corporate governance model, community-based renewal, further exploration of sustainable renewal practices, and interdisciplinary applications of urban renewal.

Keywords: urban renewal; sustainable development; bibliometric analysis; visualization

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1. Introduction

Urban renewal is a process of reutilizing resources and rebuilding the urban environment, in order to be consistent with the requirements of modern urban development [1]. This concept was first introduced in an urban renewal seminar in the Netherlands in 1958. There are several concepts similar to renewal, such as recovery and renovation. Urban renewal approaches the city as a comprehensive system and places a higher emphasis on the integrity and coordination of urban development. Urban renovation is a part of urban renewal that primarily focuses on the physical dimension of the city. However, urban renewal extends its focus beyond the physical environmental, also giving significant attention to the environmental, economic, and cultural dimensions [2]. After World War II, the suburbanization of the central cities of Western countries became obvious. Many people, businesses, and services constantly moved to the suburbs, causing central cities to go under and the economy, society, and environment to deteriorate [3]. In the 1960s, urban renewal in Western countries was a slum renovation activity to improve the human living environment and promote economic development. However, the rough expansion created such social problems as inequalities, poverty, and diseases [4,5]. By 1980, urban renewal shifted from large-scale renovation to a small-scale redevelopment model, and such social issues as social equity, welfare, and health began to be considered in the renewal

process. After entering the 21st Century, Western countries' urban vitality improved in various aspects based on sustainable development in several ways—including economic, environmental, social, and humanistic forms—and a series of practical activities have been carried out, such as historical and cultural preservation, and resident participation [6–8]. At the same time, over the last three decades, China has experienced remarkable urbanization, with an annual increase of 2.86%. Urbanization refers to the process of population concentration moving from rural areas or small towns to cities, usually accompanied by economic structural transformation and industrial upgrading, and the degree of urbanization is often measured by the urbanization rate. Urban development, on the other hand, mainly refers to the sustained development of cities in terms of economic growth, social progress, cultural enhancement, and environmental improvement, emphasizing the all-round progress of cities as a whole. China's urban renewal activities have taken place mainly since 1980 and have undergone three stages: large-scale demolition and construction, culturally oriented renewal, and organic urban renewal [9,10].

In order to help gain insight into the current progress and future trends of urban renewal, a systematic analysis of existing studies is necessary. So far, urban renewal research has covered a number of different fields of discipline, and it has systematically explored the definition of urban renewal [11,12], its development objectives, and the specific implementation process from multiple perspectives [13], including project case studies, climate change, and public participation issues [14,15]. Urban renewal is an important approach for achieving sustainable urban development. It can promote the sustainable development of urban areas through the physical transformation of cities, such as improving infrastructure, enhancing public services, and upgrading the city's image. Simultaneously, urban renewal can also foster sustainable urban development by revitalizing the city's communities, economies, and environments to improve the quality of life and enhance the city's attractiveness and competitiveness [16]. The New Urban Agenda and Sustainable Development Goal 11 of the United Nations indicate that sustainable development should be incorporated into urban renewal programs [17]. Many studies on evaluating sustainability have been carried out to ensure the viability and suitability of urban renewal systems [18,19]. Social, economic, and ecological factors are considered as co-principles in the assessment of urban renewal, since urban renewal is compatible with sustainable development in these respects [20].

Urban renewal has already been a key way to promote economic growth, as well as to improve people's quality of life, preserve the environment and achieve sustainable development [21]. However, existing studies still lack a systematic analysis of urban renewal. In addition, the number of review articles is low, and there are no recent relevant studies. In recent years, urban renewal has gradually shifted to a new development stage driven by new urbanization, sustainable development, and high-quality development [22]. Therefore, it is necessary to analyze cutting-edge articles and their research hotspots and trends, which can facilitate an understanding of the characteristics of urban renewal in the current stage and provide new ideas for sustainable urban development practice.

Therefore, this study addresses the following three research questions (RQs):

- RQ1: What are the annual trends in the urban renewal literature between 2012 and 2022?
- RQ2: What are the most published journals, countries, authors, and research institutions, and most influential papers in the field of urban renewal?
- RQ3: What are the research hotspots and frontiers in urban renewal at different development stages from different research perspectives?

To answer these questions, bibliometric analysis methods are used to systematically identify urban renewal research's current status, developments, and hotspots, and examine the relevant literature to reveal future research trends. In this respect, this work provides an inspirational guide to urban renewal research and has implications for the future development of such structures.

2. Research Methods

2.1. Data Collection

Urban renewal has different names at different stages. To ensure data integrity, the data range has been restricted by the search formula: TS = "urban renewal" OR "urban redevelopment" OR "urban revitalization" OR "urban regeneration" OR "urban renaissance", where TS is the topic. The specific inclusion and exclusion criteria adopted by this study are as follows:

(1) Studies published between 2012 and 2022 were included. The global urbanization rate exceeded 50% for the first time in 2009, reaching 50.1%, which means that the urban population exceeded the rural population for the first time. Meanwhile, China's urbanization rate exceeded 50% in 2011, which has entered a stage of rapid development and caused a series of impacts on the economy, resources, environment, and ecology. The growth of the urban population and rapid construction of many cities worldwide has led to new development trends in urban renewal. In the background of sustainable urban development, urban renewal has also entered a new stage of "organic renewal", which emphasizes the project's role in environment optimization and stresses the participation of the public and social organizations. As a result, the data collection is drawn from the Web of Science (WoS) Core Database from 2012 to 2022.
(2) Article indexing was restricted to SCIE and SSCI; the categories of articles were restricted to being urban and engineering related.
(3) Only articles published in their final form in peer-reviewed academic journals were considered for this data analysis, owing to the rigorous review process they undergo prior to publication [23], while conference papers, book reviews, and newspapers were excluded.
(4) Articles authored in languages other than English were not taken into account for the review.

A final total of 2692 articles in the field of urban renewal published between 2012 and 2022 were retrieved on 28 August 2023 to serve as the foundation for the data analysis.

2.2. Data Analysis

Bibliometrics is a cross-cutting science that quantitatively analyzes knowledge carriers and is widely used to analyze published information. A bibliometric analysis can be used to comprehend the current state of research in the field and to predict trends in relevant scientific and technological fields by analyzing the publication numbers, author numbers, keywords, etc. [24]. Choosing the appropriate visualization software is of great importance. Current visualization and analysis software commonly used by scholars includes *CiteSpace*, *HistCite*, *Gephi*, *SciToo*, and *VOSviewer*. Compared to other software, *CiteSpace* is particularly suitable for this study, as it can conduct self-occurrence, co-occurrence, and clustering analysis of scientific and technical data in specific knowledge areas, highlighting the connections between research topics and presenting them clearly [25,26]. This study, therefore, uses *CiteSpace* 6.2.R3 software and bibliometrics to visually analyze the collected literature.

To solve the proposed research questions, the bibliometric analysis in this study mainly focuses on the quantity of publications (for RQ1), publication journals (for RQ2), publication regions (for RQ2), publication authors (for RQ2), research institutions (for RQ2), research fields (for RQ2), keyword co-occurrence (for RQ3), keyword clustering analysis (for RQ3), keyword clustering timeline (for RQ3), and research trends (for RQ3). The *CiteSpace* parameters are set as (1) timespan = 2012–2022, (2) year per slice = 1, (3) node type = country/author/institution/reference/keyword, and (4) threshold selection criteria = g-index (k = 25). The other parameters are set by default. In particular, g-index is an index based on the number of citations, it finds the largest g value by sorting all papers of the authors according to the number of citations in descending order, so that the total number of citations of the first g papers is not less than g2. It further helps in composing and summarizing the research results, objectively revealing the dynamic development process and evolutionary trends, exploring the frontiers and hotspots, and providing a scientific reference for future research.

3. Results

3.1. Research Development

3.1.1. Quantity of Publications

The quantity of the literature published reflects the research progress in the subject area. As Figure 1 shows, the purple line represents the overall trend in the number of articles published, so the research trend in urban renewal has been increasing over the 11-year period. Regarding publication trends, 2012–2017 is a slow growth phase while 2018–2019 is a rapid growth phase and reaches the maximum publication volume of 417 articles in 2022—suggesting that widespread interest in urban redevelopment has made it a veritable research hotspot. The sharp soar from 2017 to 2019 may be directly attributed to this. For instance, China held an Urban Regeneration Forum (CURF) in 2017, which specialists from the nation's Ministry of Housing and Urban-Rural Development and the Department of City Planning of New York attended. It was a thought-provoking event that established fundamental "principles" for urban renewal in China. The top 10 urban renewal area renovation cases and the top 10 urban renewal building regeneration cases were selected in CURF, which provided a more systematic research idea for the broad scholars. The second CURF in 2018 attracted millions of viewers worldwide and sparked a burst of urban renewal research [27]. Subsequently, urban renewal gained popularity and attention in the whole academic community. Since 2019, it has remained a global hot trend by considering sustainable development.

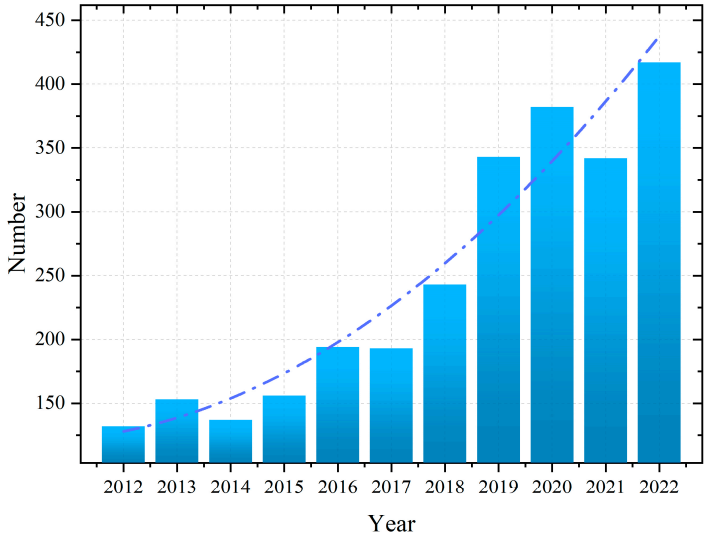

Figure 1. Research publications published between 2012 and 2022.

3.1.2. Annual Journal Publications

The distribution of published journals can more effectively represent the attention and influence of urban renewal studies in related publications, providing resources for scholars. Based on published statistics from 2012–2022, 2692 articles are found in numerous publications (Table 1). Among the journals with the most publications are *Sustainability* (279), *Cities* (171), *Urban Studies* (84), *Land Use Policy* (82), and *Habitat International* (67). These account for 22.62% of the total sample, with an average impact factor of 5.84. The *Land Use Policy* has the highest impact factor, which obtained 7.1. It is worth pointing out that *Sustainability* appears to have a higher volume of publications in the area of urban renewal, probably due to their high publication pattern in recent years.

Table 1. Breakdown of the 2692 urban renewal articles by source and year.

Source	Impact Factor	Publication Year											
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Total
Sustainability	3.9	2	4	1	5	8	14	19	49	54	50	73	279
Cities	6.7	5	13	7	5	23	7	21	15	30	19	26	171
Urban Studies	4.7	10	10	4	4	10	13	14	7	5	3	4	84
Land Use Policy	7.1	1	2		4	2	4	4	11	12	26	16	82
Habitat International	6.8	2	3	6	8	8	9	3	8	8	2	10	67
Urban Geography	3.8	2	5	4	4	5	5	7	14	6	6	4	62
Land	3.9							1	2	7	12	37	59
European Planning Studies	2.8	11	3	4	5		2	9	8	5	8	3	58
Journal of Urban History	0.4	1	11	3	10	2	2	2	7	14	4	2	58
Others		98	102	108	111	136	137	163	222	241	212	242	1772
Total		132	153	137	156	194	193	243	343	382	342	417	2692

3.1.3. Regional Cooperation Distribution

Analysis of the publications in the various regions reflects the significance and impact of the country in the field [28]. The software node type is set as "Country" and the time slice as one year to generate a map of country collaborations (Figure 2). The node and link values are 89 and 355, respectively. Each node represents a country, with larger nodes indicating a larger number of publications, and the color of the ring outside the node represents the year of publication. The lines represent cooperation between the parties, and the color of the lines represent the time of initial cooperation. It also shows that 89 countries have conducted research in this field, resulting in 355 collaborations. The most publications are 537 in China, 452 in the United States, 326 in England, 180 in Italy, and 179 in Spain. Betweenness centrality suggests highly connected nodes in the network, and a node with a high-betweenness centrality can achieve a mediating effect between two seemingly unrelated nodes. Nodes with centrality higher than 0.1 are generally considered to have a high-betweenness effect. In Figure 2, the purple line's thickness, which reflects academic influence, stands for the degree of centrality. As Table 2 shows, the best three countries in terms of centrality are England (0.37), China (0.33), and the United States (0.23). China, England, and the United States are leading in urban renewal research, providing technical support, and building a better research platform for future development. Cooperative networks between the different regions have been initially established.

Table 2. Main countries of the published papers.

S/N	Country	Number	Centrality	Percent
1	China	537	0.33	19.95%
2	United States	452	0.23	16.79%
3	England	326	0.37	12.11%
4	Italy	180	0.22	6.69%
5	Spain	179	0.09	6.64%
6	Netherlands	142	0.19	5.27%
7	Australia	138	0.07	5.13%
8	South Korea	116	0.06	4.31%

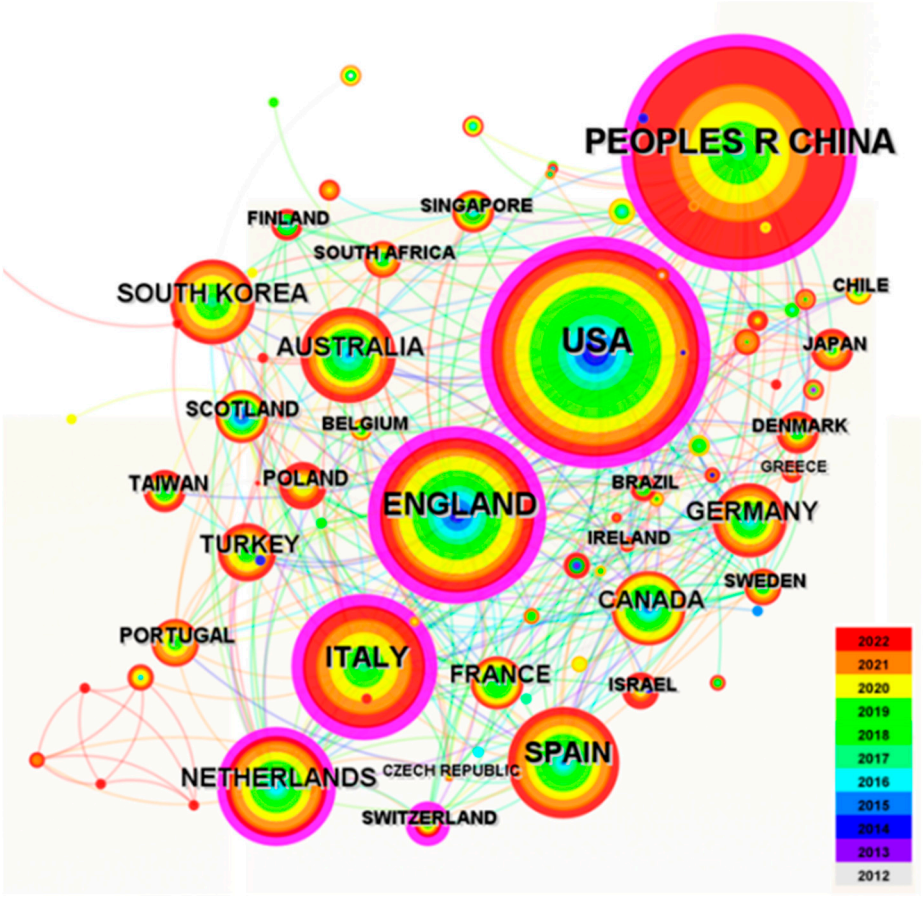

Figure 2. Collaborative co-occurrence map of urban renewal regional cooperations.

3.1.4. Author Collaborative Distribution

The author cooperation map shows the publishing status of studies in related research fields, identifying authors with strong research capacities and highlighting the collaboration of increasingly significant and engaged researchers [29]. For the purpose of creating an author cooperation map, the software node type is set as "Author" and the time slice as one year (Figure 3). The map's 535 nodes and 756 lines represent the 756 relevant collaborations and the relevant research that 535 authors have undertaken. Each node represents an author, the size of the node represents the number of publications, i.e., the larger the node indicates the more papers published by the author. The color of the outer ring of the node represents the year of publication. The distance between two nodes represents the level of collaboration between the respective authors and the color of the line represents the time of the first collaboration. The "count" parameter's high value indicates that the author has a high number of publications. The size of the author's name label increases with the "count" argument, for example, Guiwen Liu (China, count = 15), Edwin HW Chan (China, count = 13), Ade Kearns (UK, count = 9), Esther Yung (China, count = 7), Tao Zhuang (China, count = 7), Jingke Hong (China, count = 6), Antonio Serrano-Jiménez (Spain, count = 6), Mariël Droomers (Netherlands, count = 6), Frank Kee (United Kingdom, count = 6), and Yung Yau (China, count = 5). Notably, Changdong Ye published four articles in 2022, and his research can be found at community renewal and public participation.

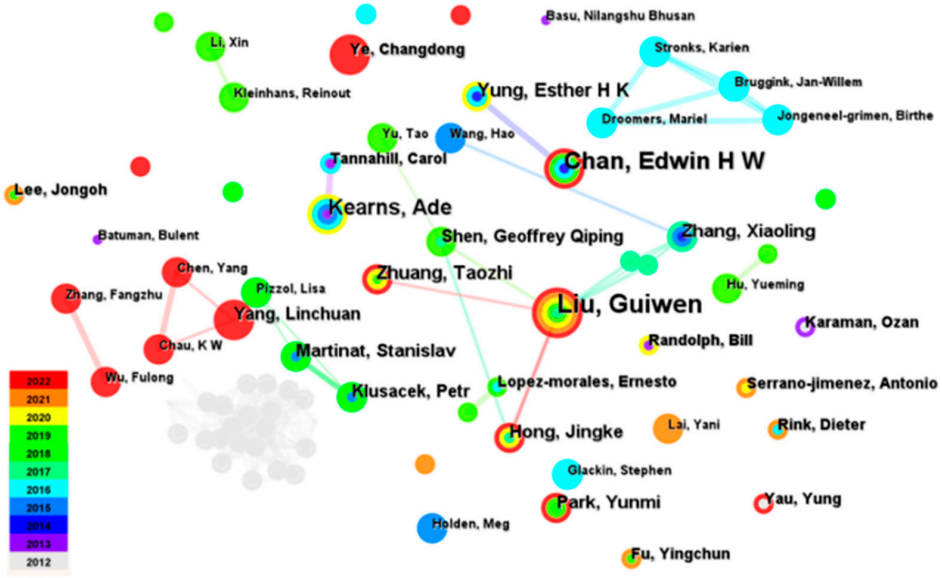

Figure 3. Collaborative co-occurrence map of urban renewal authors.

It can be noticed from Figure 3 that many authors tend to cooperate with a small group of collaborators, resulting in several clusters of authors, each of which typically includes two or more core authors. The research results of the authors' regional distribution are more in line with the results of the regional collaborations' distribution. The author with the most publications (i.e., Guiwen Liu from Chongqing University, China) co-authored an article with Martek, Igor, Shrestha, and Asheem from Australia's Deakin University in 2017. Similarly, Xiaoling Zhang from China's City University of Hong Kong published another article in 2017 in collaboration with Martek and Igor from Australia's Deakin University. This transnational collaboration indicates that some scholars are inclined to collaborate with their counterparts from different countries.

As shown in Table 3, there are very few authors with a large number of publications, and most of the authors with a small number of publications have published only one or two papers. It is noteworthy that many of the authors tend to work with a small group of collaborators, resulting in several major clusters of authors. Each of clusters usually has two or more core authors who belong to the same university or different universities in the same country, so are less likely to collaborate across borders. Therefore, cooperation between authors still needs to be strengthened. A total of nine authors have published over six publications. The author who published the most papers was Guiwen Liu, Vice President of Chongqing University, who won 15 papers and ranked first. His research can be found on the topics of urban renewal and sustainable construction management.

Table 3. Number of articles published by highly productive authors of urban renewal research.

S/N	Author	Institution	Country	Number
1	Guiwen Liu	Chongqing University	China	15
2	Edwin HW Chan	Hong Kong Polytechnic University	China	13
3	Ade Kearns	University of Glasgow	United Kingdom	9
4	Esther Yung	Hong Kong Polytechnic University	China	7
5	Tao Zhuang	Chongqing University	China	7
6	Jingke Hong	Chongqing University	China	6
7	Antonio Serrano-Jiménez	University of Seville	Spain	6
8	Mariël Droomers	Municipal Utrecht	Netherlands	6
9	Frank Kee	Queen's University Belfast	United Kingdom	6
10	Yung Yau	Lingnan University	China	5

3.1.5. Research Institution Collaborative Distribution

Based on the analysis of the findings from the regional collaboration map, it can be seen that the quantity of regional publications and the strength of the academic impact depend largely on the research capacity of the research institutions in the main countries. The mapping of research institutions makes it possible to see which institutions are presently interested in and studying topics related to urban renewal [30]. It can effectively distinguish the development achievements and research capabilities of the corresponding institution, thereby promoting cooperation with each other. A collaborative pattern among the productive institutions was examined using *CiteSpace* 6.2.R3, as shown in Figure 4. In total, 255 nodes and 366 links are shown upon the mapping, suggesting that 255 institutions developed research in this field, resulting in a total of 366 relevant collaborations. This means that the major research institutions are more independent in publishing articles and tend not to form well-developed cooperative networks. It can be noticed that several institutions tended to cooperate with a small group of collaborators, generating several major clusters of institutions, each of which usually have one or more core institutes, such as the University of Siena in Italy, the University of Florida in the USA, the United States Environmental Protection Agency in the USA, the Chinese Academy of Sciences, and Beijing Normal University in China. Notably, Tongji University published an article in the *Climate Change* journal in 2020 in collaboration with Arizona State University in the U.S., Bogazici University in Turkey, NEOMA Business School in France, and the University of Oxford in the U.K. This collaboration was an attempt to collaborate among five institutions.

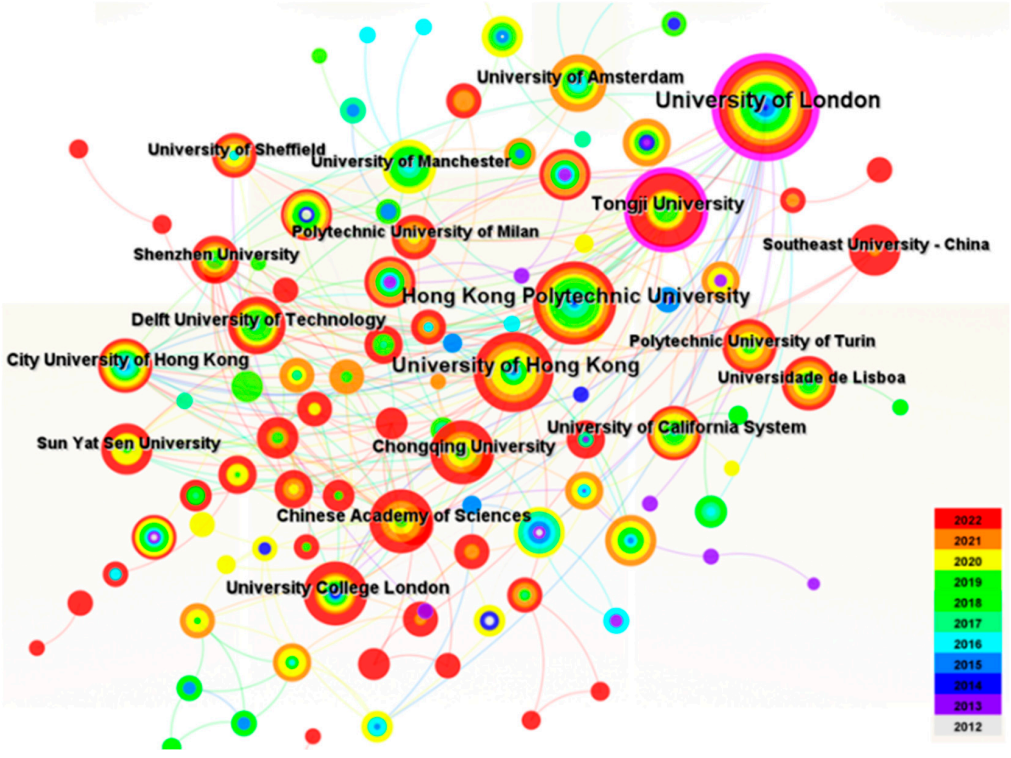

Figure 4. Collaborative co-existence map of urban renewal research institutions.

Most of the publishing institutions are from the University of London, with 76 publications in the last 11 years. Other institutions boasting a large number of publications include Hong Kong Polytechnic University (55), the University of Hong Kong (51), Tongji University (39), University College London (33), the Chinese Academy of Sciences (32), and Chongqing University (32). Chinese institutions have shown a trend of higher publications since 2012. In addition, the University of London and Tongji University have high-betweenness centrality, 0.21 and 0.13, respectively, which means that these two universities act as bridges

between different institutions. This result is also consistent with the results concerning the institutions of high-producing authors. For instance, Edwin HW Chan and Esther Yung are both from the second-highest institution in terms of the number of publications, namely the Hong Kong Polytechnic University, and Guiwen Liu, Taozhi Zhuang, Jingke Hong belong to Chongqing University, where they collaborated on seven articles. Authors from different regions have also collaborated on articles, such as Guiwen Liu from Chongqing University and Geoffrey Qiping Shen from Hong Kong Polytechnic University, who co-authored an article in 2019. Similarly, Xiaoling Zhang from City University of Hong Kong and Hao Wang from the Central University of Finance and Economics collaborated on an article in 2015.

3.2. Research Field

3.2.1. References Cited

Co-cited literature is a well-recognized phenomenon in science, where two references are cited in the same literature, and the citation frequency and betweenness centrality can determine the importance of the literature and the interconnection between two topics [31,32]. The node type is set as "Reference" for generating a cooperative map of the co-cited literature (Figure 5). In descending order of citations, there are 10 papers with more than 10 citations and a betweenness centrality greater than 0.1 (Table 4). There was a total of one paper cited in 2012, two papers cited in 2013, three papers cited in 2014, two papers cited in 2015, one papers cited in 2018, as well as one paper cited in 2019. One of the most frequently cited publications was a work by Canadian researcher Florida Richard in 2014, which had 82 citations and had a centrality of 0.15, and one of the most betweenness-centrality publications was a work by British researcher Lees L in 2014, which had 14 citations and had a centrality of 0.48.

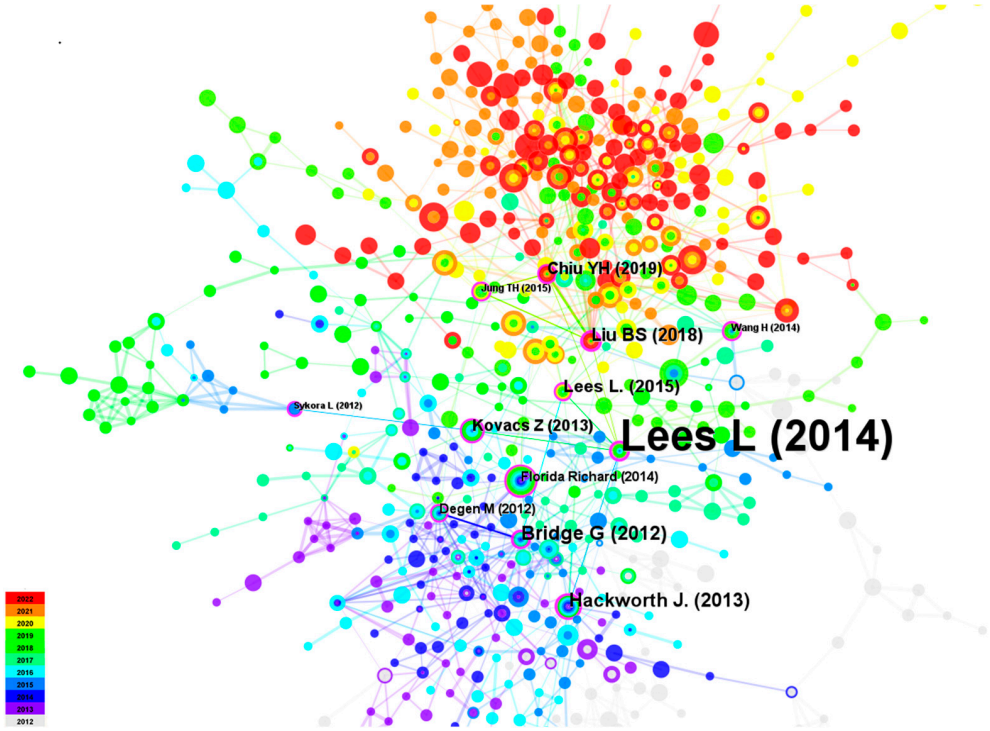

Figure 5. Collaborative co-occurrence map of highly cited articles.

Table 4. Highly cited references.

S/N	Article	Journal	Author	Year	Reference Number	Frequency	Centrality
A1	The Creative Class and Economic Development	*Economic Development Quarterly*	Florida R	2014	[33]	82	0.15
A2	The limits to market-based strategies for addressing land abandonment in shrinking American cities—Science Direct	*Progress in Planning*	Hackworth J	2013	[34]	31	0.21
A3	Arts-led regeneration in the UK: The rhetoric and the evidence on urban social inclusion	*European Urban and Regional Studies*	Lees L and Melhuish C	2015	[35]	16	0.19
A4	A framework of decision-making factors and supporting information for facilitating sustainable site planning in urban renewal projects	*Cities*	Wang H et al.	2014	[36]	15	0.11
A5	The role of stakeholder collaboration in culture-led urban regeneration: A case study of the Gwangju project	*Cities*	Jung T et al.	2015	[37]	15	0.11
A6	The Urban Injustices of New Labour's "New Urban Renewal": The Case of the Aylesbury Estate in London	*Antipode*	Lees L	2014	[38]	14	0.48
A7	Urban Renewal in the Inner City of Budapest: Gentrification from a Post-socialist Perspective	*Urban Studies*	Kovacs Z et al.	2013	[39]	11	0.18
A8	Culture-led urban regeneration strategy: An evaluation of the management strategies and performance of urban regeneration stations in Taipei City	*Habitat International*	Chiu Y et al.	2019	[40]	11	0.18
A9	Critical Success Factors for the Management of Public Participation in Urban Renewal Projects: Perspectives from Governments and the Public in China	*Journal of Urban Planning and Development*	Liu B et al.	2018	[41]	10	0.21
A10	The Transformation of the 'Barcelona Model': An Analysis of Culture, Urban Regeneration and Governance	*International Journal of Urban and Regional Research*	Degen M and Garca M	2012	[42]	10	0.15

3.2.2. Themes and Fields of Highly Cited Research on Urban Renewal

Through scrutinizing the top 10 highly cited and high-betweenness centrality literature, four themes were identified, namely, urban sustainable development theory and policy (A1 and A2), urban gentrification and fairness (A3, A6, and A7), decision making and public participation (A4, A8, and A9), and culture-led urban renewal (A5 and A10), which appear to be the main issues and hotspots in urban renewal research.

1. *Urban sustainable development theory and policy.* The Creative Economy Development Theory points out that the creative economy, with the characteristics of gathering space, less consumption, small capital, and high added value, has become an internal driving force for the sustainable development of cities. This theory has a significant impact on social and economic development policies [32]. Meanwhile, the management of existing land is gradually becoming an important part of urban development. Hackworth (2014) categorized the existing land reuse policies into conscious management type, limited management type, pure market type, and conducted a survey in a selection of eight cities. An interesting finding is that the pure market policy seems to be related to the weakening of market conditions, and most cities tend to continue to implement market-oriented strategies which complicates planning for land reuse [34].
2. *Urban Gentrification and Fairness*. This area remains a topical issue in urban development. Lees L (2015) recognized that "new urban regeneration", namely state-led gentrification, can also bring about urban injustice. In such cases, "tenants" and "residents" choices are manipulated and distorted by the government, and they end up making the wrong choices. In order to solve this dilemma, the status of the city must be treated correctly to promote sustainable urban renewal [35]. Apart from that, the traditional concept of "gentrification" is considered which could maintain the rationalization of the inner-city structure. This is due to the fact that it only affects a small part of the areas demolished and newly built due to renewal, while the old residential areas are less affected due to the high percentage of owner occupation and the social responsibility of the government [38,39].
3. *Decision making and public participation.* Urban renewal requires a more scientific decision-making framework and operation assessment framework of urban renewal agencies, which has been developed by combining Delphi, Hierarchical Analysis, and Network Analysis [39]. The framework can improve policy performance, identify key promoting factors, and provide a reference for implementing future urban renewal policies. In addition, the public, as a key stakeholder in urban renewal projects, has a decisive role to play in the success of the projects. A questionnaire designed by Liu (2018) was distributed to government officials and the public, in order to identify the key factors for successful public participation in urban renewal. The results showed that information openness, timely response, and participation ways are the most important factors, and provided instructive suggestions not only for China but also for other countries and regions [41].
4. *Culture-led Urban Renewal.* There is a complex relationship between urban cultural genetics and renewal projects. For large–scale culture–led urban renewal projects, Public–Private Partnerships (PPP) can have a positive impact on society, both culturally and economically [40]. However, there is a lack of motivation for active participation by stakeholders such as the private sector and social organizations. Therefore, there is a need to establish closer links between the government and the public-private sector [37]. On the other hand, combining cultural development strategies with urban renewal can contribute to sustainable urban development, and culture can be used as a functional tool to brand the city and promote social cohesion [42].

3.3. Research Hotpots and Trends

3.3.1. Keyword Co-Occurrence

Literature keywords represent the author's induction and abstraction of the article's primary ideas. Keyword word frequency analysis is universally utilized in bibliometrics

to suggest the distribution of hotspots for study [43]. When carrying this process out, set the node type as "keyword" in the software to generate a co-occurrence map of keywords (Figure 6). In this study, the node and link values are 502 and 4154, respectively. Given the variation in keywords that authors may employ to describe the same concept, all keywords were then subjected to a standardization process to promote consistency and uniformity. *CiteSpace* software was used to consolidate synonymous keywords in Figure 6, grouping those with comparable meanings before presenting them. For instance, terms like "urban renewal", "urban redevelopment", and "urban revitalization" were standardized to "urban renewal" and instances of "policy" were merged with "policies". Consistent with the findings of Cheng B et al. (2023), certain search terms such as "urban renewal" and "urban development" have been concealed to enhance the readability of the visual [44]. Excluding the effect of search terms, "city" has the largest node and the highest word frequency. It just reveals that urban renewal provides a positive urban development paradigm in the face of sustainable demand. Some cities have developed strict plans and regulations for different goals and areas to achieve sustainable development. A co-occurrence map of terms was created using *CiteSpace* 6.2.R3 to show hotspots for research and evolution tendencies. Based on the co-occurrence relationship and analysis of the main research contents accordingly, other high-frequency keywords also focus on city management, urban renewal policy, gentrification, governance, sustainability, and urban planning.

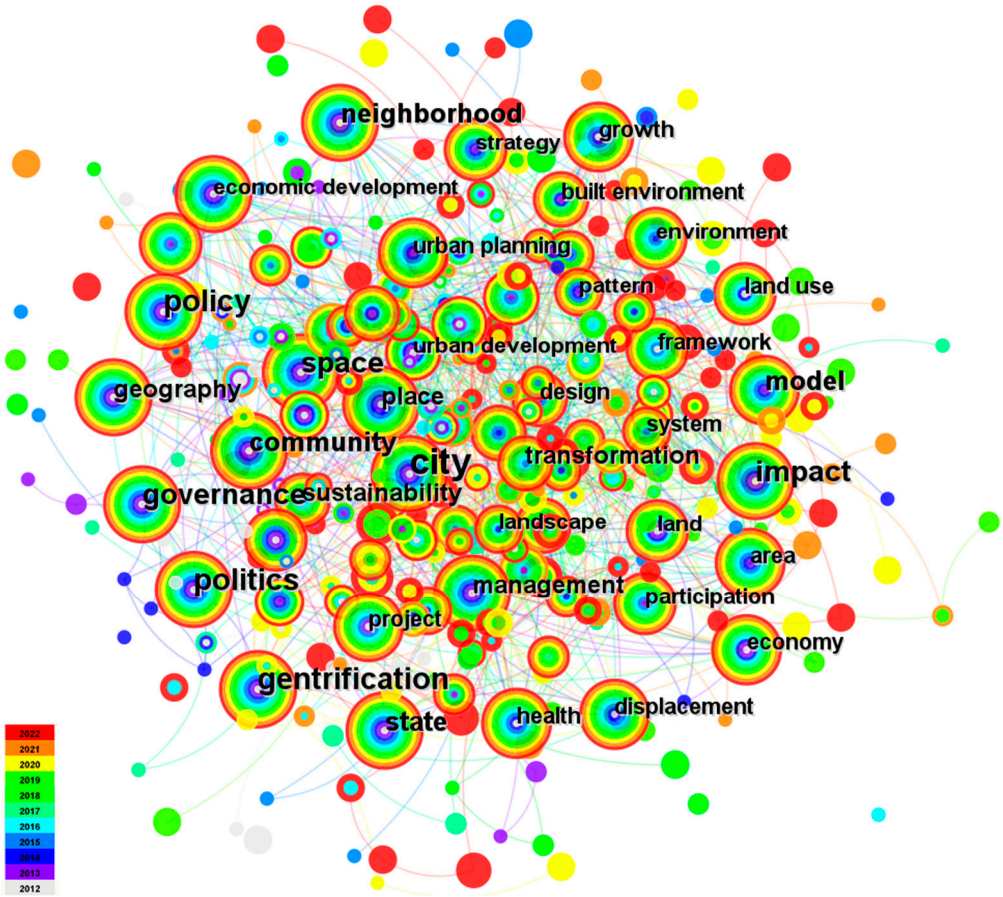

Figure 6. Collaborative co-occurrence map of keywords.

3.3.2. Keyword Clustering

Cluster analysis enables the functionality of data mining for statistical data analysis and knowledge discovery. It can help to identify research themes, trends, and their interconnections within a research area by dividing large research datasets into specific units [45]. It is well known that the log likelihood-ratio (LLR) strategy creates superior

clusters with a mixture of high and low inter-class affinity. Additionally, it can choose labels for all clusters according to the keywords of the articles referred to, representing the uniqueness and coverage of that cluster [46]. The LLR algorithm was used in the current study as a clustering method to discover 10 clusters (Figure 7) of #0 urban regeneration (94), #1 public health (71), #2 sustainability (65), #3 China (54), #4 nature-based solutions (46), #5 public–private partnerships (36), #6 green infrastructure (34), #7 urban regeneration (33), #8 urban renewal (31), and #9 land assembly (31). The modularity score of the network is 0.4813; since this score is between 0.4 and 0.8, the clustering is acceptable. Table 5 provides detailed information about the clustering, including size (i.e., the number of members) and subjects. When the silhouette score exceeds 0.7, the results of the clustering are highly reliable since they reflect the standardized homogeneity of the clusters.

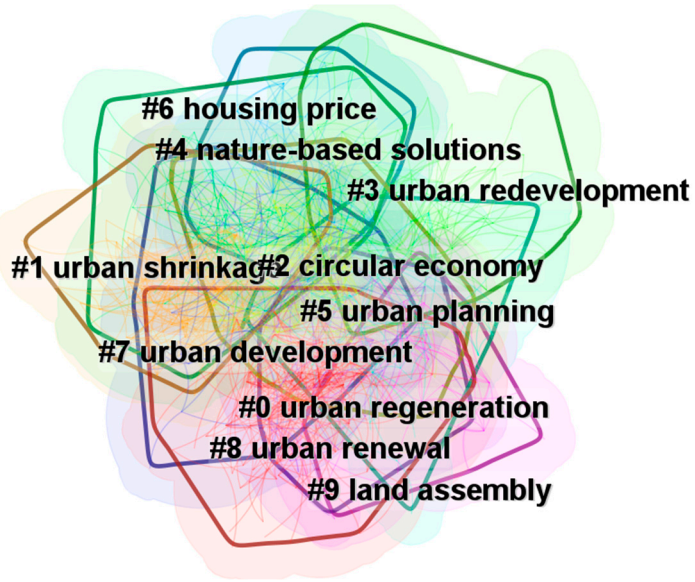

Figure 7. Cluster co-occurrence map of urban renewal keywords.

Table 5. Cluster details.

Cluster ID	Size	Silhouette	Cluster Label (LLR)	Mean Year
#0	94	0.775	Urban regeneration	2014
#1	71	0.78	Urban shrinkage	2015
#2	65	0.702	Circular economy	2015
#3	54	0.738	Urban redevelopment	2017
#4	46	0.785	Nature-based solutions	2017
#5	36	0.732	Urban planning	2014
#6	34	0.814	Housing price	2017
#7	33	0.725	Urban development	2017
#8	31	0.809	Urban renewal	2014
#9	31	0.731	Land assembly	2018

A keyword-based clustering map was used to reveal the scope of the research, and the keywords in each cluster were combined to reveal the specific research content. The studies under the theme of urban renewal in 2012–2022 can be divided into three categories of connotation and practice of urban renewal (#0, #3, #7, and #8), approaches to urban renewal (#4, #6, and #9), and sustainable urban development (#1, #2, and #5).

1. *Connotation and practice of urban renewal.* In 2000, Peter Roberts broadly defined urban renewal in *The Handbook of Urban Renewal* as an integrated, holistic philosophy and action to solve urban problems, aiming to bring sustainable economic, physical, social, and environmental enhancements to cities [47]. The connotation of urban renewal

has gradually evolved with the development of society. Current urban renewal focuses more on people centeredness, emphasizing the human experience in renewal and assessing it quantitatively [48]. Relevant research is more concerned with the problems arising in urban renewal and effective solutions. Of particular notice is that the financing problem has grown to be a significant factor that undermines efforts to promote urban renewal, especially in Asian countries where the renewal scale is relatively large [49]. For instance, the Shenzhen International Low Carbon City project provides practical experience on financing in urban renewal in terms of financing tools, financing platforms, and financing modes [50].

2. *Approaches to urban renewal.* As economic development becomes the main driver of urban renewal, decision makers often overlook the impact on the natural environment, and nature-based solutions can effectively improve urban ecosystems and increase the resilience of cities to natural disasters [51]. In addition, by combining nature-based and social-based solutions, the effectiveness and sustainability of urban renewal can be ensured [52]. Research has also shown that urban renewal can contribute to house price appreciation. Similarly, rising house prices can influence decision makers' choice of renewal approach [53]. Among the approaches to urban renewal, land assembly is an important means of effectively alleviating the pressures of urbanization. Therefore, it is necessary to make the process of land assembly more transparent and fairer, to improve the fairness of urban renewal [54].
3. *Sustainable urban development.* Urban sustainability continues to be a hot topic in academia, and its importance is gaining increased attention and recognition. However, there is no comprehensive assessment of sustainability and urban renewal. Zheng (2017) [10] critically reviewed 81 journal papers on sustainable urban regeneration research, focusing on urban regeneration's planning and social subsystems in sustainability assessment. In addition, the complexities, and priorities of achieving sustainable renewal were discussed, and suggestions for future research directions were made. Some studies have explored sustainable urban renewal by summarizing the conservation measures for traditional buildings in developed countries [55]. It has also been suggested that cities and historical centers need to shift from a linear to a circular economy, which can promote synergistic, equitable, inclusive processes and activate new forms of urban productivity, and social and economic innovation [56]. Urban research focuses on considering the future development of cities, including urban environment, temperature, spatial patterns, and land use [57,58]. Sustainable development is an important goal of urban construction, and urban renewal is an important means to effectively achieve this goal as it will contribute to upgrade urban infrastructure and thus facilitate waste recycling, significantly saving resources and reducing CO_2 emissions [59].

3.3.3. Keyword Timeline

The impact of time on the outcomes of cluster analysis must be taken into account in order to further study the development trends of keywords in the temporal dimension, in order to accurately reflect the development of each cluster. Figure 8 shows the network of keyword collaboration on a time axis, with the number of clusters as the y-axis and the year of publication as the x-axis.

The timeline diagram can reflect the evolution of the keywords in each cluster over the period. For example, between 2012 and 2016, some important research results on sustainable development were published with keywords including biodiversity, community, and brownfield redevelopment, illustrating the key paths for sustainable urban development in the future. From 2017 to 2021, the studies focus more on the role of green infrastructure, and the construction of smart cities and effective participation of the urban population.

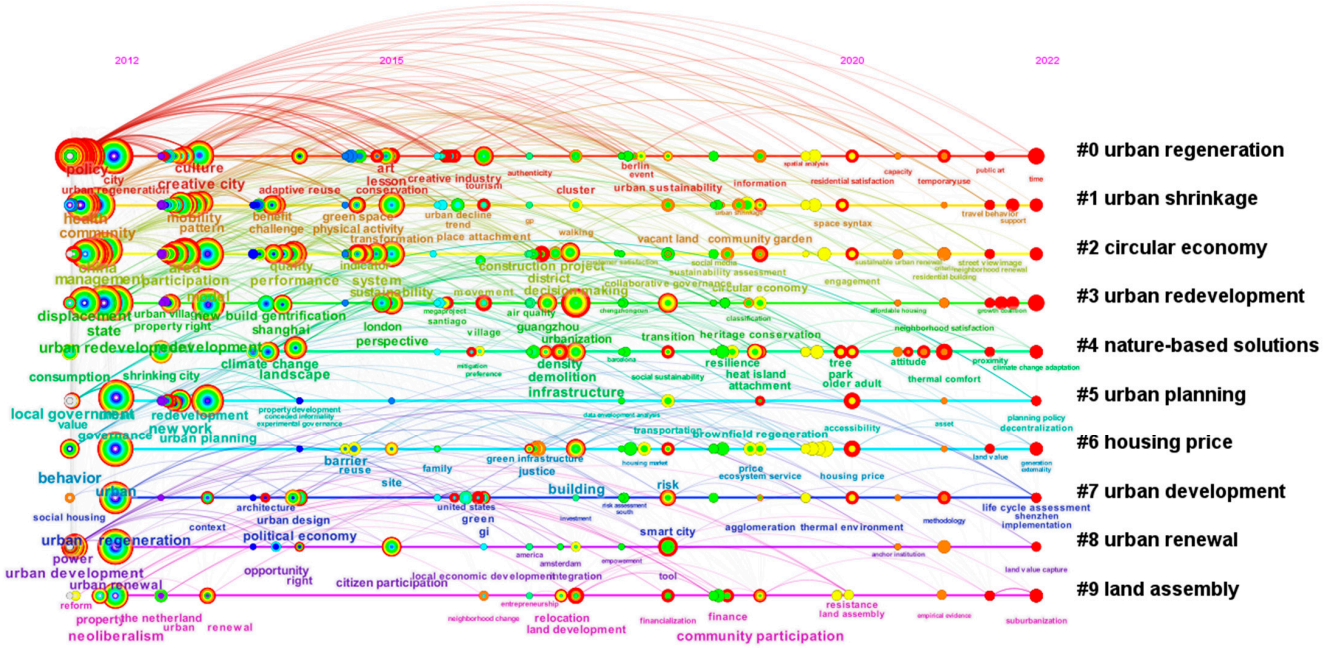

Figure 8. Timeline map of urban renewal keywords.

3.3.4. Research Trends

CiteSpace's *Citation/Frequency Burst* function offers burst word analysis (burst detection) by utilizing a word frequency growth method. By counting citation keywords, the method identifies professional phrases that change often in the short term and displays citation bursts with time distribution and dynamic change features in accordance with their ranking [49]. It is possible to analyze occurrence patterns and sudden shifts in discipline development through looking at the historical co-occurrence frequency distribution of occurrence terms and summarizing the changing trend over time [50]. Therefore, it can more accurately reflect the latest advancements and research boundaries of urban renewal. In order to generate 49 burst words, the network node is configured with the value "Keyword" and the burst term selection is made for the word class (Figure 9). Of these, "Strength" shows the likelihood of an event, "Begin" suggests the beginning year of occurrence, and "End" designates the final year of occurrence. The red line segments represent the year intervals in which the keywords burst out, and the blue line segments represent the year intervals in which the keywords appeared.

As Figure 9 shows, since 2012, the term "urban policy" has attracted attention as the first to be highly appreciated in studies on urban renewal. "Hong Kong" can be seen as the term with the greatest strength of emergence, being the focus of scholarly research during 2015–2018. This suggests that Hong Kong's urban renewal has seen a new focus in 2015, which may be attributed to the increase in number of over-aged buildings, leading to increasing urban density and a gradual decline in the public's life quality, hence the community's increased call for urban renewal action. Apart from that, from the beginning of 2020 to the present, the research hotspots focus mainly on cultural heritage, quality, patterns, system, and projects, which will continue to be research hotspots and provide more rich connotations for urban renewal.

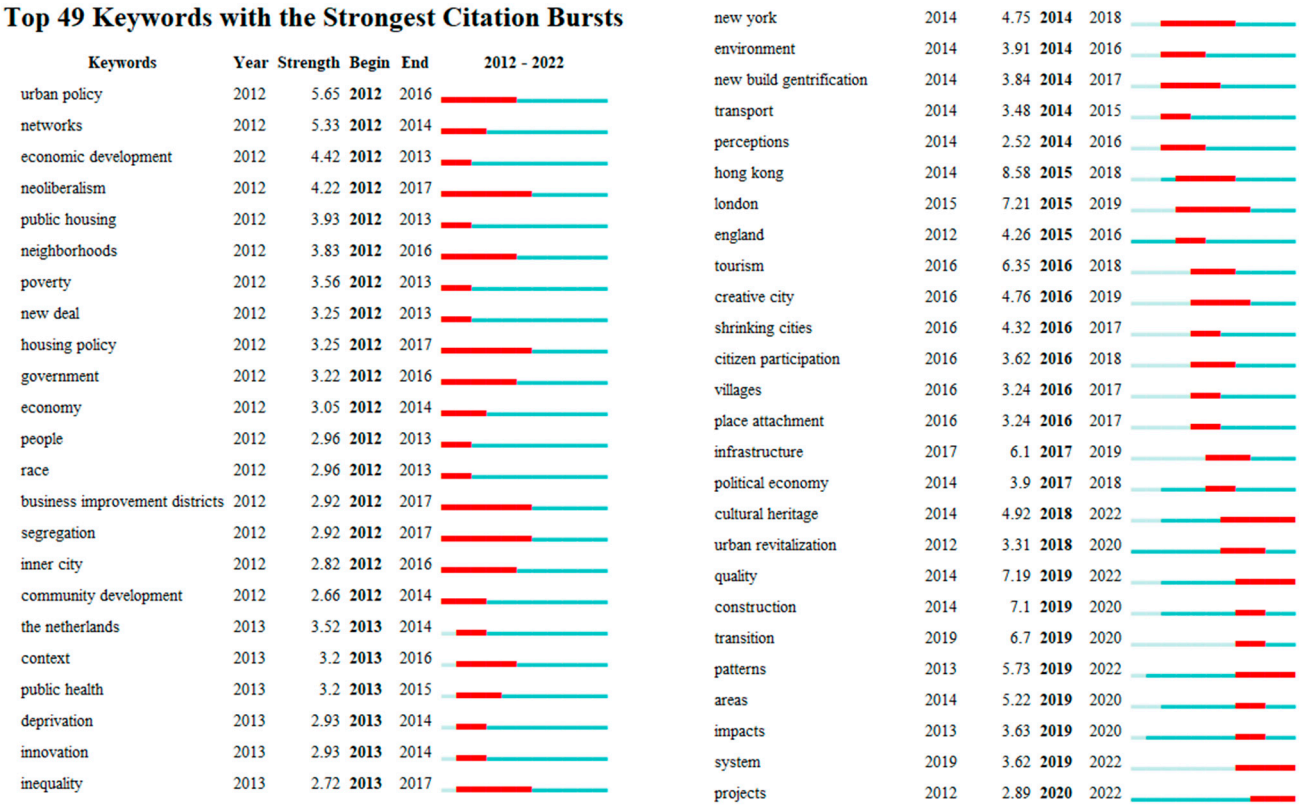

Figure 9. Top 49 greatest citation outburst for certain keywords.

4. Conclusions and Future Directions

This research conducts a systematic bibliometric analysis of urban renewal over the past 11 years, indexed by the WoS database using *CiteSpace* 6.2.R3. This research analyzes, classifies, and interprets (1) research development, (2) research field, and (3) research hotpots and trends. Moreover, the research reveals research hotspots through the keyword-based thematic clustering of co-occurring networks. Finally, based on the timeline distribution characteristics of the keywords, the trend of urban renewal theme evolution is summarized, and the following conclusions are drawn.

Based on the characteristics of urban renewal research, there was growth in the overall volume of articles of 21.93%—an average rate of 13.3%, with 417 being the most published in a single year (2022). In addition, they were mainly concentrated in countries with the highest levels of urbanization or rapid urbanization. Major research groups and research institutes are centralized in universities, and there is a distinct lack of cooperation with professional research institutions and social organizations. There is also a markedly closer collaboration of authors from the same university and a lack of transnational cooperation.

In terms of literature co-citation, through the analysis of high centrality and highly cited literature, this can be divided into four facets: urban sustainable development theory and policy, urban gentrification and fairness, decision making and public participation, and culture-led urban renewal. In terms of research hotspots, three main research contents were identified: the connotation and practice of urban renewal, approaches to urban renewal, and sustainable urban development. An interesting finding is that there is some similarity between the topics of highly co-cited, high-betweenness centrality literature and the topics obtained from the research hotspots, which also suggests that these key studies can represent the research hotspots in this field to some extent. This also provides an easy way of thought for later scholars who want to quickly understand the research hotspots in a certain field.

In recent years, research into urban renewal has developed rapidly and yielded some rich research results. However, the extant literature has some deficiencies in terms of

renewal models, objects, and practices. Combined with the above analysis of hot spots in the field of urban renewal, it is suggested that the main directions of future research should focus on the following four areas:

1. *Innovative multi-corporate governance model.* The government mainly leads traditional urban renewal projects, and a single entity's governance model cannot consider the specific demands of various stakeholders, which often leads to the uneven distribution of interests and social conflicts and affects the urban renewal efficiency [60]. A governance model with multiple subjects can effectively solve these problems. The government, enterprises, the public, and social organizations need to participate in urban renewal actively, thus creating a situation of interconnection, consultation, and risk sharing, which can improve the efficiency of urban renewal. In the meantime, strengthening and completing the social governance system of public participation is necessary for enhancing its effectiveness. In addition, we can learn from mature experiences and promote the establishment of professional urban regeneration agencies composed of multiple interests to improve decision making.
2. *Community-based renewal*. Urban renewal has embarked on a new trend toward community-based, small-scale, and progressive transformation, with communities becoming the basic unit of renewal and having obvious aggregation, territoriality, and symbiosis [61]. From practical experience, problems such as functional rigidity, reverse urbanization, and inequity in the central city have emerged during the urban renewal process through traditional blueprint planning. Sustainable development advocates a shift from a crude to a refined approach to urban spatial development. Community renewal emphasizes "people-oriented" and pays more attention to the quality of living space. Using the community as a unit can optimize the spatial land layout, improve the community governance model, and create enhancement of human living standards and encouragement of the rational use of existing urban land stock.
3. *Further exploration toward sustainable renewal practices*. Current urban renewal research focuses on transforming physical space and has not yet formed a harmonious unity among the economy, society, culture, and environment. In the future, more in-depth research needs to be conducted into preserving historical buildings and reusing industrial relics, resolving social conflicts, and pursuing a harmonious co-existence between humans and nature. In addition, the extant research mainly focuses on exploring renewal practices in developed cities, gradually forming a combination of theory and practice. However, in China, for example, there is less research into renewal and transformation for second- and third-tier cities, which only stays at the theoretical level. Therefore, future research needs to help strengthen the dissemination of practical experience of typical regeneration projects. For small- and medium-sized cities, continuous renewal should be combined with urban characteristics to accumulate practical experience in urban renewal.
4. *Interdisciplinary applications of urban renewal.* Urban planning disciplines still dominate urban renewal; future research needs to focus on the synergistic study of multidisciplinary theories. Disciplines such as architecture, geography, environment, management, sociology, psychology, art, medicine, and political science in urban renewal research need to be fully utilized to build multidisciplinary integrated urban renewal research theory and practice systems.

5. Limitations

It should be mentioned that our study is limited in the data source being mostly restricted to the WoS core database. In addition, although we have considered the words of urban renewal in different periods, there may still be some literature that cannot be retrieved. Moreover, our study analyzes only the highly cited literature and does not examine the authors' subsequent studies. As the database remains dynamically updated, the results of the bibliometric analysis are also time sensitive. Further research is therefore needed to help rectify this situation. Overall, the continuous and dynamic focus of urban

renewal research needs to be maintained in the future, with continued attention paid to research progress in interdisciplinary fields.

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