

Article

Emerging Trends and Knowledge Structures of Urbanization and Environmental Sustainability: A Regional Perspective

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Abstract: More than 59 million people reside in the six member countries of the Gulf Cooperation Council (GCC) (the United Arab Emirates, Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia). The rate of urbanization is more than 80% in each of these countries. To better understand the trends and knowledge structures and to aid policy design and implementation, more research is needed on the topic of urbanization in GCC countries. In order to address this knowledge gap, bibliometric analysis and scientific mapping procedures utilizing VOSviewer were employed. A total of 415 academic papers covering four decades, from 1980 to 2021, were collected from the Web of Science database and split into three time periods: 1980–2017, 2018–2019, and 2020–2021. The findings indicate that the topics related to sustainable development, environmental regulations, renewable energy, and smart cities have received the most attention. In addition, land use planning, urban growth, and energy consumption have been dominant themes over different periods. Several intertwined factors have contributed to the evolution of research over these periods. These include the widespread diffusion of the sustainability agenda, the rise of advanced ICT, and the escalating rate of urbanization. It can also be explained by the fact that the world has been grappling with numerous environmental challenges, increasingly requiring innovative solutions for sustainability. The findings of this study can be used to develop better strategies for sustainable urban development in the region.

Keywords: urbanization; environment; sustainability; GCC countries; bibliometrics



Citation: Almulhim, A.I.; Bibri, S.E.; Sharifi, A.; Ahmad, S.; Almatar, K.M. Emerging Trends and Knowledge Structures of Urbanization and Environmental Sustainability: A Regional Perspective. *Sustainability* **2022**, *14*, 13195. <https://doi.org/10.3390/su142013195>

Academic Editors: Enrico Ivaldi, Leonardo Salvatore Alaimo and Alfonso Piscitelli

Received: 15 September 2022

Accepted: 6 October 2022

Published: 14 October 2022

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1. Introduction

More than 59 million people reside in the six member countries of the Gulf Cooperation Council (GCC) (the United Arab Emirates, Bahrain, Kuwait, Oman, Qatar, and Saudi Arabia) [1]. Saudi Arabia alone is home to roughly 67% of the GCC's total population [2]. The growth of the population in many countries worldwide has indeed been modest, and even dropping, with the notable exception of Qatar. This may be true for some countries but absolutely not the case for all countries, as many countries in Asia and Africa are experiencing rapid rates of population growth and urbanization. However, in a 2015 record, approximately 82.2% of the GCC countries' inhabitants live in urban areas, with 100% in Kuwait and Qatar [3]. This makes the GCC among the most urbanized regions in the world. Demographic changes and the surge of immigrant workers drawn to the region due to the

employment opportunities and demonstrated economic success in recent decades have both contributed to these trends.

Fishing and pearling on the coastlines were the primary means of subsistence for residents of these nations for much of their history [2]. Coastal areas are also where the majority of the region's earliest towns sprang up, establishing connections with trade routes to India and beyond. Oil was discovered in the 1960s, and since then, the economy has flourished, and levels of prosperity have increased. The GDP per person in the GCC countries is presently among the highest in the world [3]. In line with its economic growth, the region's population has increased substantially over the past few decades, and the silt cities developed into commercial metropolitan areas connected to the world economy [4–6]. Urbanization as a global trend has also persisted in the region over the past several decades, and this trend is expected to continue further into the future. It is, however, crucial to regulating urbanization to forestall the emergence of squatter settlements, urban environmental challenges, and other forms of externalities.

High rates of urbanization among the GCC countries have propelled their major metropolitan areas to the forefront of international progress. These countries are no longer merely places to live, build products, and get things accomplished; they now play a pivotal role in shaping and influencing political and social interactions on many fronts, from determining the success or failure of new manufacturing methods to introducing novel approaches to established standards and aesthetics. Within these countries, cities have emerged as key political and economic hubs that are crucial in realizing the region's vision and determining the policies that shape its future. Urbanization also has implications for environmental protection and long-term sustainability based on innovative solutions [7]. Although urbanization has contributed to limiting urban expansion, it is, nonetheless, crucial to regulate urbanization to enhance environmental management and performance based on more effective solutions. For these reasons, the region's urbanization trend is providing the stage, the foundation, and the impetus for several shifts. The trend toward a more urbanized lifestyle is not just the result of expected demographic changes and other shifts from one place to another. A more accurate description would be that it follows a transformative process that represents the driving forces behind many other facets of global growth. However, the trend also entails a continuing phenomenon with many repercussions.

Bearing in mind the foregoing, the goal of this study is to provide an overview of the knowledge structure and trends in research into urbanization in the GCC countries. While there are a few bibliometric studies on the topic of urbanization in the GCC countries, they remain short and thus not comprehensive. Therefore, this study intends to close this knowledge gap in the literature on the topic of urbanization in the GCC countries. This is the first comprehensive scientometric study conducted in the GCC context on the urbanization domain. Rapid urbanization and its associated environmental difficulties necessitate the in-depth study of the emergent areas of this research. It is hoped that this examination of the academic landscape around the emergence, consequences, and long-term viability of urbanization in GCC countries will serve as a resource for researchers and other stakeholders. The findings can aid scholars, practitioners, and other stakeholders in understanding the evolution of urbanization in relation to the other trends at play today in the context of the GCC countries. Eventually, this could result in better-informed choices and improved urban policies. Moreover, with studies on the evolution of urbanization in GCC countries being in such short supply, the bibliometric analysis of urbanization in GCC countries is the main contribution of this work, as it allows for more complete insights into the development of this domain to better serve those with a vested interest in it. As a result, this study sets out to address the following research questions:

- How has research into urbanization in the region evolved during the 1980–2021 period?
- What is the current status of urbanization in research?
- What are the focus and direction of future research in urbanization?
- What are the most prominent journals and document types on the subject of urbanization?

- Who and what are the most-cited authors and publications in the field of urbanization?
- What are the authorship and collaboration patterns of research into urbanization?
- What are the current research themes/keywords in the literature on urbanization?

This study unfolds as follows: Section 2 provides a brief background to the study. Section 3 describes the materials and methodology used and provides a detailed account of data sources, procedures for literature search and selection, and data analysis. Section 3 presents the results from analyzing the available data using the VOSviewer program. The findings are depicted in several graphical and tabular formats. Section 4 provides an analysis and discussion of the results and their implications, followed by Section 5 with conclusions.

Background

It is useful to position the urbanization trend of the GCC countries in the global context. In this respect, urbanization is one of the greatest challenges facing all the world's major cities. The 55% of the world's population currently living in urban areas is expected to rise to 70 or 75% by 2050 [8,9]. Cities are already responsible for more than 60% of global greenhouse gas (GHG) emissions and consume more than 75% of the natural resources available globally. This is projected to increase by 90 billion tons by 2050 from 40 billion tons in 2010 [10]. For example, urban areas consume 78% of world energy in industries that are based in cities [11]. Urban growth has thus been dramatic and means more demand on natural resources and ecosystem services, creating greater pressures on limited resources and involving a multitude of urban conditions that pose unprecedented environmental, social, and economic challenges to policy makers and planners. Various literature reviews have been conducted on the subject of urbanization, each taking a slightly different view of the subject. A conceptual understanding of urbanization was the intended objective of the study conducted by Shahbaz et al. [12], one of the earliest literature reviews published on the issue focusing on the GCC countries, specifically the United Arab Emirates. The authors used data covering the years 1975–2011 to investigate the dynamics at play among economic growth, urbanization, and environmental decline. They adopted a specific design model and testing strategy to probe the nature and direction of the causal association between the studied variables over the long term, even when structural breaks were present. They revealed a link between urbanization and economic growth and increasing carbon dioxide (CO₂) emissions. The study by Mahmood et al. [13], covering all GCC countries except the UAE, reached similar conclusions. The authors modeled the link between urbanization and economic growth on the degradation of the environment through CO₂ emissions with the help of co-integration tests and regression analysis. The findings highlight a correlation between pollution levels and urbanization, prompting several recommendations for future policy action.

All things considered, it is important to be cognizant of the ramifications of urbanization concerning both economic and demographic expansion, even as its structures and development are ever-evolving. Review articles typically take a variety of stances on the subject of urbanization, addressing either conceptual or practical difficulties. However, the theoretical foundation and empirical evidence needed to analyze the potential adverse impacts of urbanization processes concerning operations, practices, and outcomes within GCC countries are lacking. Furthermore, the social and environmental dimensions of sustainability and their integration with the economic dimension of sustainability remain largely unexplored in both theory and practice. These driving factors are behind the pervasive nature of the growth of urbanization, and other intricacies are not covered in the systematic review papers that have come before. This bibliometric study of urbanization analysis now allows for the dissection of the creation, incorporation, functioning, and development of the field of urbanization as a discourse by virtue of its inclusion of massive amounts of scientific data. Beyond its particular topic, the bibliometric illuminates new research directions. In particular, it helps to close the knowledge gap about the structure

and trends of urbanization in GCC countries across periods, hence facilitating a better grasp of the development of the subject.

2. Materials and Methods

The main information about data (for example, the number of authors and journals, etc.) is shown in Table 1 and will be further explained below. The bibliographic details of scholarly articles retrieved from the Web of Science (WoS) serve as the source of data for the bibliometric analysis [14]. WoS was chosen from a pool of academic research databases because of its track record of indexing high-quality studies relevant to the topic of this research and related comprehensive bibliographical data, which was essential for conducting precise analyses with bibliometric tools such as VOSviewer [15]. Over the past two decades, various tools such as VOSviewer, SciMAT, and CiteSpace have been developed for bibliometric analysis [16]. All these tools are suitable for understanding trends in academic publications. What makes VOSviewer a relatively more suitable tool for bibliometric analysis is its strength in determining key terms and their interlinkages. This is conducive to highlighting key thematic areas and understanding areas that are underexplored and need more attention. The user-friendly interface and easily communicable outputs are also other strong features of the software. However, like any other bibliometric analysis software, VOSviewer outputs are not always easily interpretable, and the researcher's deep knowledge of the field is needed to avoid wrong interpretations. Further, bibliometric analysis needs to be complemented with other review methods to have a more comprehensive understanding of the field.

Table 1. Main Information About Data.

Description	Results
Periods	1980–2021
Annual growth rate %	17.6
Sources (journals, books, etc.)	251
Documents	415
Authors	1215
Single-authored documents	61
Multi-authored documents	1154
Total citations received by all publications	6295
Total references cited	15,456
Average citations per documents	15.17
Authors' keywords	1292
Document types	
Article	347
Proceedings paper	42
Review	26
International co-authorships %	61.45

The WoS databases were selected in order to obtain data on urbanization. The relevant literature was searched for in the "Title, Abstract, and Keywords" field using the following search string: TS = ("Urbani *" OR "Urban Spraw *" OR "Urban Develop *" OR "Urban Grow *" OR "Urban Expansio *") AND CU = (Saudi Arabia OR Oman OR Qatar OR United Arab Emirates OR Bahrain OR Kuwait).

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) is designed to help systematic reviewers transparently report why their review study was done, what the authors did, and what they found in their research after the review [17,18]. PRISMA has recently increased in popularity, with authors using it more frequently in bibliometric studies [17,18]. Using a PRISMA framework, Figure 1 presents an overview of the results of the above query, which yielded 959 search results on 17 April 2022. These were screened for duplicates and irrelevant documents. The inclusion criteria used in the search process were based on selecting all the related research articles, conference papers, and

review papers published in English. All affiliated countries from the GCC were included in the selection. The exclusion criteria included editorials, notes, letters, errata, short surveys, conferences, and summary articles written in a non-English language. Sixty-five records were eliminated by applying document types and year filters. After final retrieval, the remaining data were exported into MS Excel for scanning purposes. The inclusion and exclusion criteria were applied to ensure the relevancy of the data, and 479 irrelevant records were excluded from the initial list after careful scanning of the abstracts and titles of each record. As shown in Figure 1, the method resulted in a final selection of 415 relevant data items. The final selection for the analysis comprised 347 selected articles, 42 conference papers, and 26 review papers. The publication dates of retrieved records ranged from 1981 to 2021.

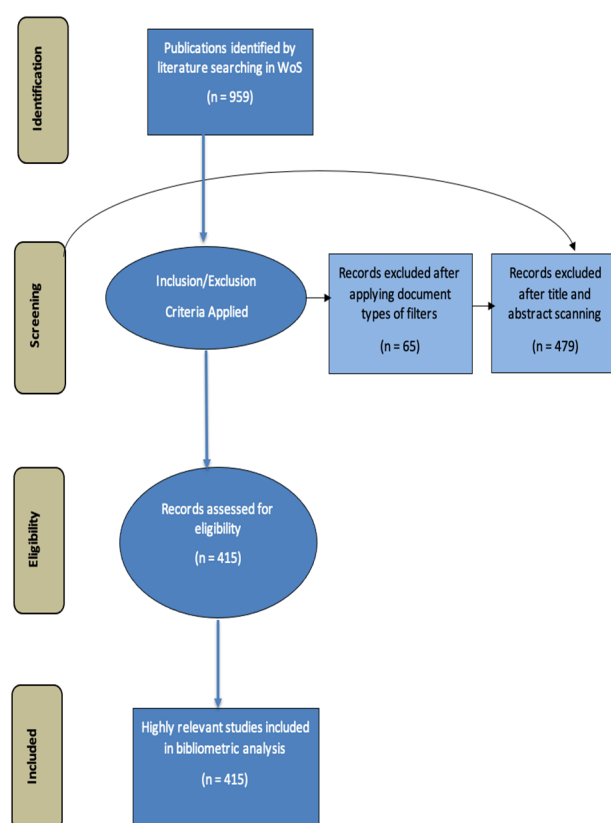


Figure 1. PRISMA Flow Diagram: four-phase flow chart of data extraction and filtration process for urbanization research.

The following tools were used to process, analyze, and visualize highly relevant documents: (1) Microsoft Excel (version 16.0): different excel functions and formulae used to obtain results from the data analysis; (2) Microsoft Word (version 19): for word processing creation of this document and flow diagram (Figure 1); (3) Google OpenRefine (version 3.5.2) [19]: for data cleaning and data clustering (especially keyword mergers); (4) Biblioshiny (version 4.0) [20]: an app providing a Web interface for the bibliometrics package of computer language “R”; (5) BibExcel (version 2017) [21]: to generate data files for MS Excel, and other tools for further processing; and (6) VOS viewer (version 1.6.18) [22]: to conduct the following analyses: term co-occurrence, co-citation, and bibliographic coupling. VOSviewer is a Java program available at no cost (<https://www.vosviewer.com>, accessed on 19 July 2022). It was used because it has a more intuitive user interface and produces better interpretable visual outputs than its competitors [22,23]. The developers provide free access to user guides and demo projects. Those interested in learning more about the various phases involved in conducting an analysis should consult the tool’s manual.

The following settings were used for each analysis: term co-occurrence analysis (using the “Full Counting” method of counting and setting “All Keywords” as the unit of analysis); co-citation (using the “Full Counting” method of counting and setting “Cited References,” “Cited Sources,” and “Cited Authors,” respectively); citation (setting “Documents” as the unit of analysis); and bibliographic coupling (using the “Full Counting” method of counting and setting “Organizations” and “Countries” as the units of analysis) [24]. Because of the clarity of its results, the “Full Counting” option was chosen [25]. Researchers propose that for future studies, a comparative analysis using fractional counting be carried out so that outputs can be compared [25].

The term co-occurrence analysis was used to aid understanding of the thematic focus areas related to the topic and to examine how they have changed over time. The research also employed co-citation analysis to determine which authors, publications, and sources have made the most significant contributions to the growth of the subject. According to Van Eck and Waltman [22], “A co-citation link is a link between two items that are both cited by the same document.” In other words, co-citation analysis also considers the cited references of the chosen publications. In order to find out which nations and institutions have made the largest contribution to the growth of a discipline, bibliographic coupling is used. In the field of bibliography, two works that share the same cited source are said to be “coupled” [22]. For more details, the readers are referred to the VOSviewer manual.

3. Results

The results collected after running the data in VOSviewer are presented in this section. The Publication Trends subsection identifies the number of scholarly works devoted to the topic of urbanization in GCC countries. This is followed by the subsection on journals publishing the most related papers. Then come the two subsections on the most-cited articles and the most-published authors. Major contributing countries and institutions are the subject of the subsequent subsection. The Key Analyses subsection is followed by these categories. Lastly, the Overall Thematic subsection presents the findings for each of the three time periods that are used to categorize the publication years.

3.1. Publications Trends

The number of scholarly works devoted to the topic of urbanization has grown exponentially in the last two decades, coinciding with the rise in databases that record this phenomenon. Only 96 articles about urbanization-related topics in GCC countries were published between 1980 and 2015, providing further confirmation of the above statement (Figure 2 and Table 2). Even in this early publication wave of articles, scholarly interest in urbanization can be seen to have begun around 2014 and to have grown substantially by 2015. The natural growth in population and the rural-to-urban migration of the 2000s were two of the main drivers of urbanization research and its publication [26]. The increasing amount of urbanization research in GCC countries mirrors the rate of urbanization in the region and the wider public consciousness of urban issues. Examples include the United Nations Conference on Human Settlements (the Habitat II conference in Istanbul), which sparked global concern about the effects on human communities and resulted in the publication of the United Nations Commission on Human Settlements and the Vancouver Action Plan [27]. Measures to curb population growth and urban sprawl were passed at the 46th Session of the United Nations Economic and Social Commission for Asia and the Pacific [27]. Research on urbanization has taken on greater significance in the new millennium due to rising public interest in urban issues, as seen by the emergence of the World Urban Forum.

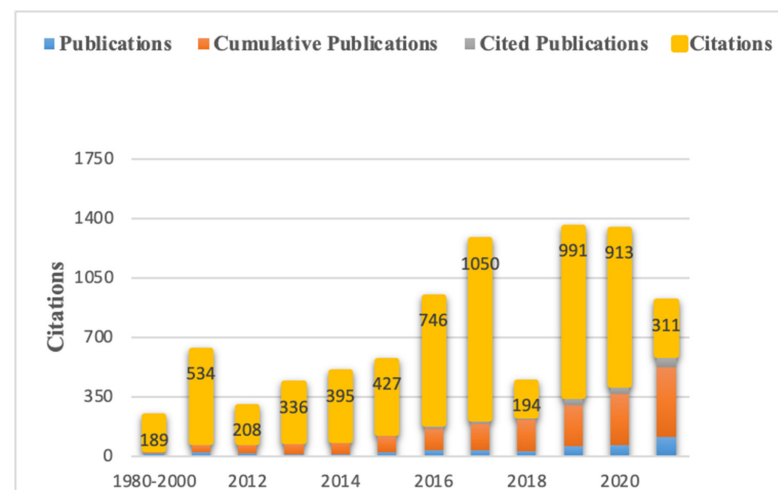


Figure 2. Publication and Citation Trends for Urbanization Research.

Table 2. Number of Publications on “Urbanization Research” Between 1980 and 2021.

Year	NP	CP	NCP	NC	C/NP	C/CP	C/NCP
1980–2000	15	15	11	189	12.60	12.60	17.18
2001–2011	24	39	21	534	22.25	13.69	25.43
2012	15	54	11	208	13.87	3.85	18.91
2013	12	66	9	336	28.00	5.09	37.33
2014	10	76	9	395	39.50	5.20	43.89
2015	20	96	18	427	21.35	4.45	23.72
2016	32	128	29	746	23.31	5.83	25.72
2017	31	159	29	1050	33.87	6.60	36.21
2018	28	187	25	194	6.93	1.04	7.76
2019	57	244	54	991	17.39	4.06	18.35
2020	61	305	54	913	14.97	2.99	16.91
2021	110	415	71	311	2.83	0.75	4.38

Table 2 shows the annual citation picture for “urbanization research” between 1980 and 2021. It also shows the total number of urbanization publications (NP), cumulative number of publications (CP), number of cited publications (NCP), total citations (TC), average citations per publication (C/P), cumulative average citations per publication (C/CP), and average citations per cited publication (C/NCP).

Throughout 2020 and 2021, there was a sharp rise in the number of published works, which may be attributable to the growing interest in and discussion of urbanization in GCC countries and its consequences for society at large, the economy, and the environment. The growth in understanding of urbanization’s many facets has led to an upsurge in scholarly output on the subject, with new terms being coined and new fields of the study explored in response to the rising interest in the topic.

3.2. Journals Publishing Most Papers

Table 3 lists journals that have published frequently on this topic during the study period (1980–2021). In Table 3, it can be seen that Habitat International and Environmental Science and Pollution Research are the two most-cited journals on the subject, with 11 and 14 articles published on the topic, respectively. It is interesting to note that the journals with the most publications are not necessarily the most influential ones. The latter rather applies to those journals that publish research focused specifically on urbanization issues, with a scope that includes some of the most influential research areas that have emerged throughout the entire period under consideration on the subject. High levels of citations from journals whose topics include substantive urban challenges and sustainability initiatives demonstrate the widespread interest in sustainability-focused publications.

Table 3. Journals That Have Published Most Papers on Urbanization.

Rank	Journal	Publisher	Host Country	NP	NCP	NC	IF	Q	H-Index
1	Sustainability	MDPI	Switzerland	25	20	147	3.251	2	7
2	Arabian Journal of Geosciences	Springer	Germany	17	15	93	1.827	3	6
3	Environmental Science and Pollution Research	Springer	Germany	14	13	193	4.223	2	10
4	Habitat International	Elsevier	England	11	11	344	5.369	1	10
5	Water	MDPI	Switzerland	7	6	44	3.103	2	4
5	Open House International	Open House Int.	England	7	4	14	0.283	4	2
7	Cities	Elsevier	England	5	5	122	5.835	1	4
7	Remote Sensing	MDPI	Switzerland	5	4	61	4.848	1	2
7	Environment Development and Sustainability	Springer	Netherlands	5	4	19	3.219	3	2
7	Journal of King Saud University Science	Elsevier	Netherlands	5	3	5	4.011	2	2
7	Desalination and Water Treatment	Desalination Publication	Italy	5	3	4	1.254	4	1

Table 3 displays publisher, host county, number of publications (NP), number of cited publications (NCP), number of citations (NC), impact factor of source (IF), quartile of the source (Q), and h-index, of 10 preferred journals in urbanization research.

3.3. Most-Cited Articles

The most highly cited article in Table 4 is by Charfeddine and Mrabet [28], who expand on the topic of the effects of economic expansion and socio-political factors on Earth's natural surroundings in Middle East and North African (MENA) nations, which is now fundamental to any discussion of urbanization in the GCC region. The authors argue that economic strategies should be tailored to each country and that the intensive use of energy is detrimental to the environment. The work by Shahbaz et al. [12], which had 240 citations, was the second most cited article in the field, presumably because of its focus on the interplay between economic development, energy use, urbanization, and deterioration of the environment in the context of the UAE. The literature from this period reveals a significant correlation between urbanization and CO₂ emissions, with economic growth and urbanization being the root causes of these emissions and so fueling the growing interest in this area. Table 4 shows that most academics and publications were interested in studying the various facets of urbanization, even though most of the influential references gravitated toward sustainability.

Table 4. Most-Cited Articles.

TC	Title	Author	Publication	Year	CPY	NTC
241	The impact of economic development and social-political factors on ecological footprint: a panel data analysis for 15 MENA Countries	Charfeddine, L. Mrabet, Z. [28]	Renewable & Sustainable Energy Reviews	2017	40.17	7.12
240	Economic growth, electricity consumption, urbanization, and environmental degradation relationship in the United Arab Emirates	Shahbaz, M. Sbia, R. Hamdi, H. Ozturk, I. [12]	Ecological Indicators	2014	26.67	6.08
239	Rising rural body-mass index is the main driver of the global obesity epidemic in adults	Bixby, H.	Nature	2019	59.75	13.75
198	Determinants of the ecological footprint: role of renewable energy, natural resources, and urbanization	Danish, Ulucak, R. Khan, S. [32]	Sustainable Cities and Society	2020	66.00	13.08
182	The impact of energy consumption and economic development on ecological footprint and CO ₂ emissions: evidence from a Markov Switching Equilibrium Correction model	Charfeddine, L. [28]	Energy Economics	2017	30.33	5.37
161	Energy consumption, carbon dioxide emissions, and economic development: evaluating alternative and plausible environmental hypothesis for sustainable growth	Zaman, K. Moemen, M. [31]	Renewable & Sustainable Energy Reviews	2017	26.83	4.75
131	COVID-19 social distancing in the Kingdom of Saudi Arabia: bold measures in the face of political, economic, social, and religious challenges	Yezli, S. Khan, A. [29]	Travel Medicine and Infectious Disease	2020	43.67	8.66
95	Developing sustainable neighborhoods	Choguill, C.L. [33]	Habitat International	2008	6.33	2.17
91	The criticality of growth, urbanization, electricity, and fossil fuel consumption to environment sustainability in Africa	Asongu, S.A. Agboola, M. Alola, A. Bekun, F. [30]	Science of the Total Environment	2020	30.33	6.01
90	New Ecological Redline Policy (ERP) to secure ecosystem services in China	Bai, Y. Jiang, B. Wang, M. Li, H. Alatalo, J. Huang S.	Land Use Policy	2016	22.50	5.18

Table 4 lists the most frequently cited articles on urbanization research between 1980 and 2021. As well as showing the total citations (TC) associated with these publications, the table also presents the title, author(s), publication year, the average citations per year (CPY), and the normalized total number of citations (NTC).

3.4. Most-Published Authors

Urbanization is a hot topic since it has major socio-economic, physical, and environmental implications. As shown in Figures 3 and 4, the number of authors interested in urbanization and, by extension, GCC countries has increased steadily. Table 5 shows the leading authors on the issue of urbanization in GCC countries, with at least four publications and 22 citations between 1980 and 2021. Figure 4 shows clusters of authors, denoted by their various shades of color. Authors who write about urban revitalization and spatial planning strategies are grouped in purple. Authors whose works focus primarily on urbanization, urban structures, and environmental implications can be found in the green groups. Authors concerned with the effects of urbanization on public health and marine ecosystems are represented in the blue groups. Table 5's yellow nodes represent the most prolific authors who have written extensively on the topics of urban planning and environmental sustainability in the context of the long-term effects of urbanization.

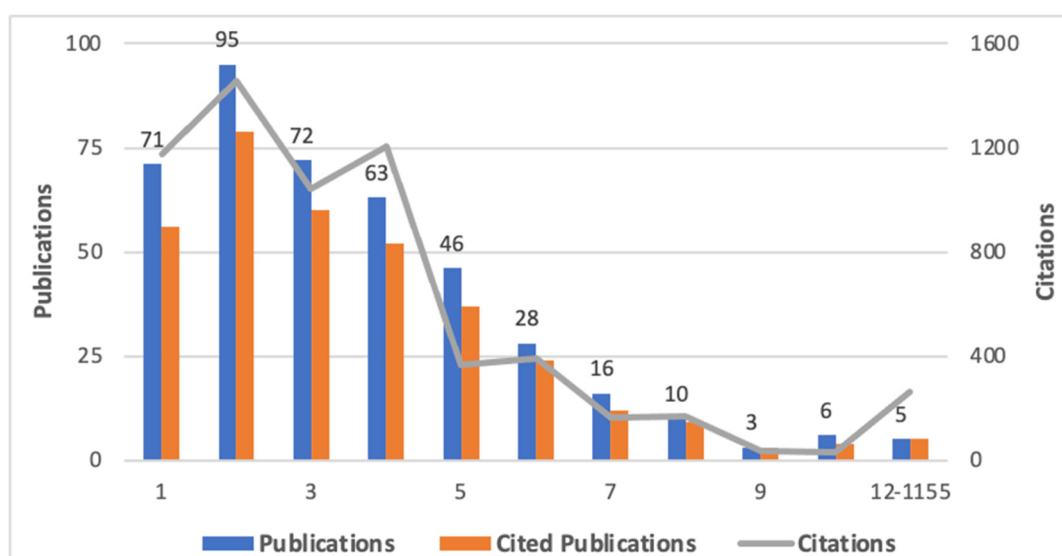


Figure 3. Authorship Pattern of “Urbanization Research” Publications.

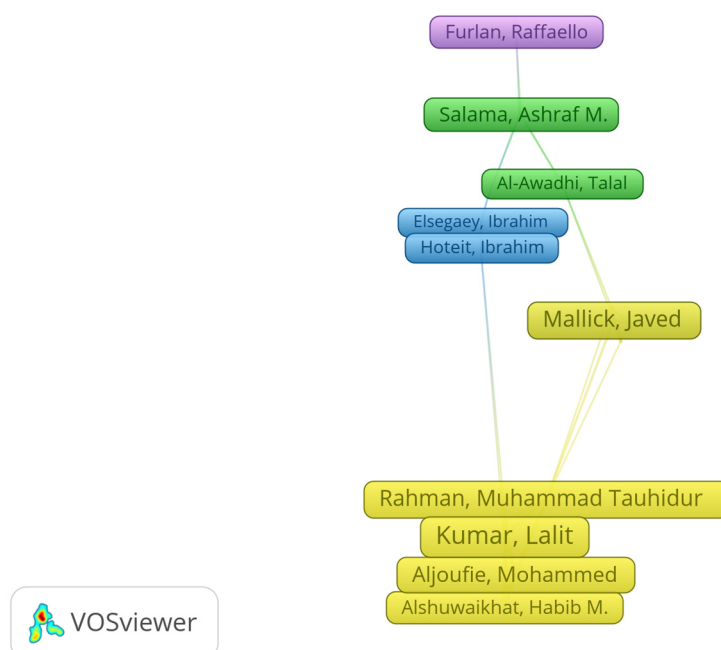


Figure 4. Most Influential Authors in the Field of Urbanization.

Table 5. Most-Published Authors.

Rank	Authors	Institution	Country	TP	TCP	TC	C/P	C/CP	H-Index
1	Abdelrahman, K.	King Saud University	Saudi Arabia	8	5	13	1.63	2.60	2
2	Mahmood, H.	Prince Sattam bin Abdulaziz University	Saudi Arabia	7	7	89	12.71	12.71	5
2	Alatalo, J.M.	Qatar University	Qatar	7	7	216	30.86	30.86	4
2	Mallick, J.	King Khalid University	Saudi Arabia	7	6	196	28.00	32.67	4
5	Aljoufie, M.	King Abdulaziz University	Saudi Arabia	6	5	155	25.83	31.00	4
5	Rahman, A.	King Khalid University	Saudi Arabia	6	5	190	31.67	38.00	3
7	Aina, Y.A.	Yanbu Industrial College	Saudi Arabia	5	5	57	11.40	11.40	5
7	Rahman, M.T.	King Fahd University of Petroleum and Minerals	Saudi Arabia	5	5	154	30.80	30.80	4
7	Ibrahim, E.	King Saud University	Saudi Arabia	5	2	6	1.20	3.00	2
10	Ahmed, F.	Yanbu Industrial College	Saudi Arabia	4	4	54	13.50	13.50	4
10	Alshuwaikhat, H.M.	King Fahd University of Petroleum and Minerals	Saudi Arabia	4	4	133	33.25	33.25	4
10	Rahman, S.M.	King Fahd University of Petroleum and Minerals	Saudi Arabia	4	3	29	7.25	9.67	3
10	Saleh, M.A.E.	King Saud University	Saudi Arabia	4	4	39	9.75	9.75	3
10	Al-Awadhi, T.	Sultan Qaboos University	Oman	4	4	57	14.25	14.25	3
10	Alqurashi, A.F.	Umm Al-Qura University	Saudi Arabia	4	3	45	11.25	15.00	3
10	Al-Ansari, T.	Hamad Bin Khalifa University	Qatar	4	4	87	21.75	21.75	2
10	Hoteit, I.	King Abdullah University of Science and Technology	Saudi Arabia	4	3	24	6.00	8.00	2
10	Furlan, R.	Qatar University	Qatar	4	4	22	5.50	5.50	2

Table 5 lists the top authors with at least four publications and 22 citations between 1980 and 2021. It also shows the institution and country affiliated with the author, the total number of publications by each author (TP), total citations associated with these publications (TC), citations per publication (C/P), the average citations per publication (C/CP), and h-index of author publications.

3.5. Major Contributing Countries and Institutions

The data presented in Figure 5 show that Saudi Arabia, Qatar, Pakistan, England, the People's Republic of China, and Oman are the leading countries with the most contributions to urbanization studies in the GCC. This may be seen from the fact that Saudi Arabia's node is the largest among these six countries. It can also be seen that countries such as India, Australia, Germany, the United States, and Italy are starting to pay more attention to urbanization studies. This means that researchers based in those countries are starting to do research on urbanization studies in GCC countries through collaboration or other reasons or that students from this region are doing their studies in one of those countries. The countries appearing in the pink cluster seem to be carrying out the most research about the topic, while the green, blue, and yellow clusters are trailing behind.

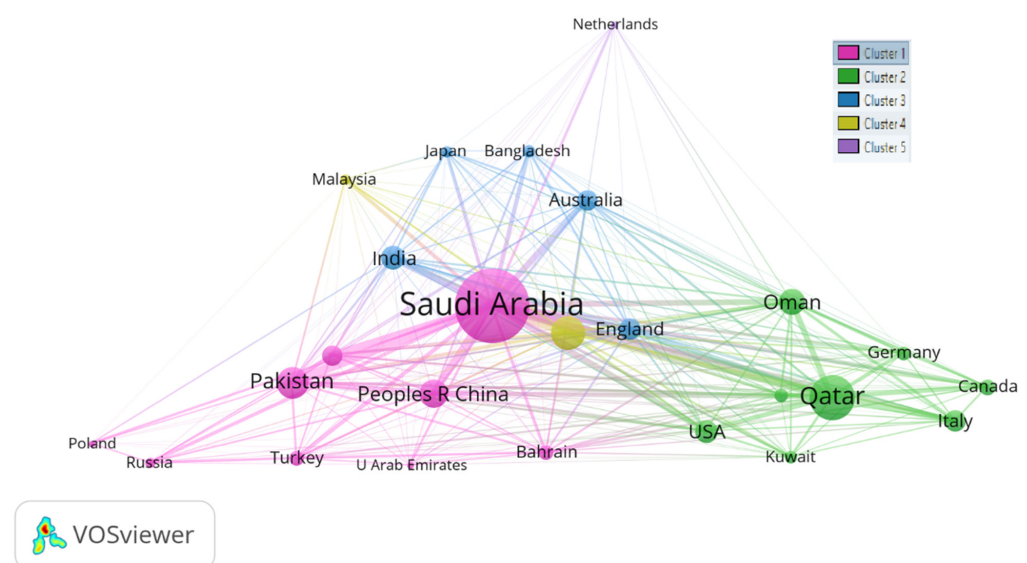


Figure 5. Countries with the Most Research Contributions in the Field of Urbanization in GCC Countries.

The results presented in Figure 5 are predictable, as the study is focused on GCC countries and consistent with the literature, justified by the fact that current sustainable strategies for urbanization in GCC countries have been shown to concentrate more on the Middle East zone (Saudi Arabia, Qatar, Pakistan, Oman). Its status as one of the regions most urbanized and most vulnerable to environmental concerns may have led to a heightened interest in urbanization-related topics such as sustainability, urban planning, and environmental legislation. Since Saudi Arabia pays close attention to any study involving the GCC, the interest in studying topics related to urbanization is not surprising. In addition, more than 85% of Saudi Arabia's population is expected to live in urban areas by 2030, a figure that is unmatched in the country's history [3]. Although there are benefits to the economy from rapid urbanization, it could also result in a tangled web of urban and environmental concerns [2,29]. In order to counteract the potential negative effects of urbanization on the environment, the economy, and communities, several appeals, proposals, and plans have been published around the country (See Table 6). Research into the GCC countries is largely driven by a desire to comprehend the notion of urbanization. Thus, other countries that are not from the Middle East zone, such as China and the UK, contributing to research on urbanization in GCC countries may be regarded as international students from the region, as mentioned earlier.

Table 6. Most Collaborative Countries with the GCC in the Field of Urbanization Research.

Rank	Country	TP	TCP	TC	C/P	C/CP
1	USA	93	78	1419	15.26	18.19
2	Egypt	57	43	738	12.95	17.16
3	Pakistan	38	33	1009	26.55	30.58
4	India	33	28	702	21.27	25.07
5	Peoples Rep. of China	28	26	993	35.46	38.19
6	UK	23	20	680	29.57	34.00
7	Australia	18	14	416	23.11	29.71
8	Tunisia	14	9	447	31.93	49.67
8	Malaysia	14	8	320	22.86	40.00
10	Canada	12	8	304	25.33	38.00

Table 6 shows total publications (TP), total cited publications (TCP), total citations (TC), average citations per publication (C/P), and average citations of cited publications (C/CP) of the 10 leading countries in urbanization research with respect to the international authors collaborating with GCC authors.

The top 10 urbanization research institutions that actively collaborate are included in Table 7. These are the GCC institutions with the highest total number of publications related to urbanization. King Abdulaziz University, King Saud University, and Qatar University accounted for 65, 55, and 47 of the total citations, respectively. While Saudi Arabian institutions make up the vast majority, some have produced a very small number of scholarly works. There are several prestigious universities in Saudi Arabia, including King Khalid University, Imam Abdulrahman Bin Faisal University, Umm Al Qura University, and Prince Sattam Bin Abdulaziz University.

Table 7. Most Collaborative GCC Institutions by Total Volume of Publications in the Field of Urbanization.

Rank	Affiliation	Country	TP	TCP	TC	C/P	C/CP
1	King Abdulaziz University	Saudi Arabia	65	65	1118	17.20	17.20
2	King Saud University	Saudi Arabia	55	55	1394	25.35	25.35
3	Qatar University	Qatar	47	47	859	18.28	18.28
4	King Fahd University of Petroleum and Minerals	Saudi Arabia	24	24	539	22.46	22.46
5	Sultan Qaboos University	Oman	20	20	242	12.10	12.10
6	King Khalid University	Saudi Arabia	16	16	225	14.06	14.06
7	Imam Abdulrahman Bin Faisal University	Saudi Arabia	14	14	74	5.29	5.29
8	Umm Al-Qura University	Saudi Arabia	13	13	152	11.69	11.69
9	Kuwait University	Kuwait	11	11	63	5.73	5.73
10	Prince Sattam Bin Abdulaziz University	Saudi Arabia	9	9	100	11.11	11.11

Table 7 shows total publications (TP), total cited publications (TCP), total citations (TC), average citations per publication (C/P), and average citations of cited publications (C/CP) of the top 10 leading affiliations in urbanization research.

The literature review found that King Abdulaziz University was one of the major contributors to the publication of research on urbanization in GCC countries. As can be seen in Table 7, the university maintains tight ties with many other educational institutions. This may help to explain why the majority of the texts that could have influenced urbanization in GCC countries originated there.

3.6. Thematic Analysis

Cluster Analysis and Multivariate Statistical Analysis of the High-Frequency Keywords

This part of the study analyzes the terms associated with urbanization research in the GCC using the hierarchical clustering method. First, the terms that make up each cluster are treated as a separate category, and then, to create a new, more comprehensive cluster, each cluster is combined with the cluster that is most comparable to it. After that, every new cluster is, in turn, combined with the cluster that is most comparable to it. All of the separate clusters are eventually put together by repeating the previous steps. In the end, the entire classification scheme is turned into a tree diagram to illustrate the connection between the terms used in studies on urbanization in GCC countries (Figure 6).

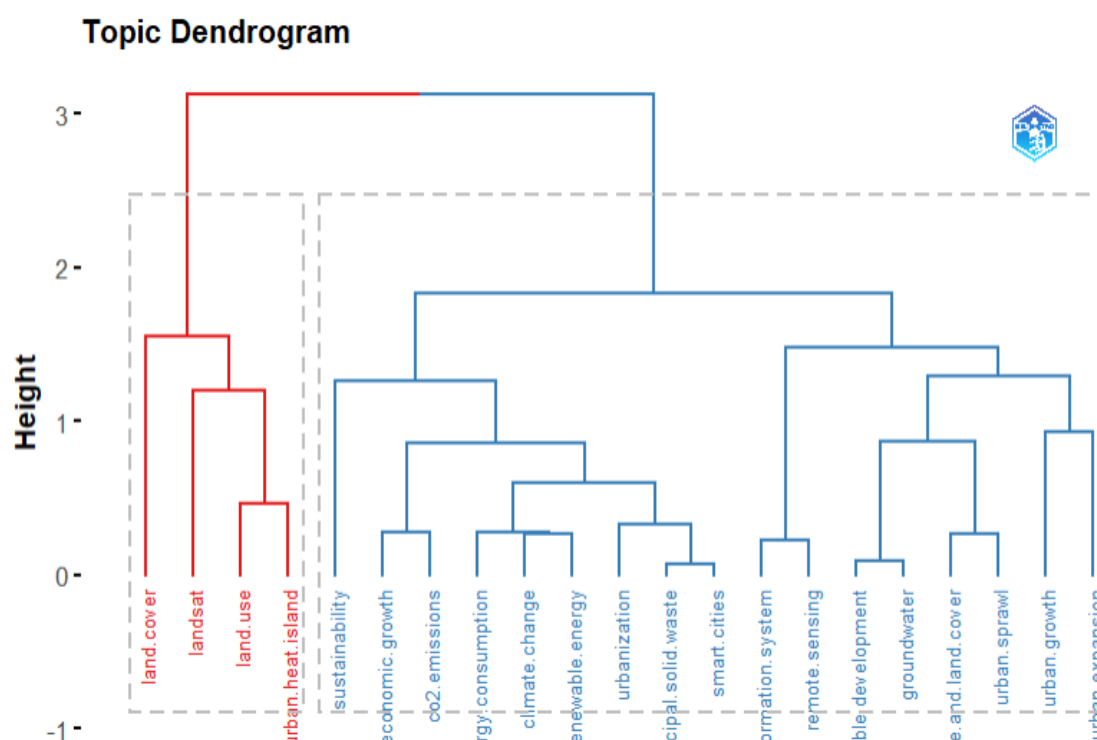


Figure 6. Tree Dendrogram of the Hierarchical Clustering of Keywords in Urbanization Research in GCC Countries (Illustration by authors).

When the data presented in Figures 6 and 7 are combined, it is possible to reach the conclusion that the research field of urbanization in the GCC may be broken down into the three categories that are presented in the following paragraphs. The primary focus of the first category, the red cluster, is on the connection that exists between rising GDP and rising levels of energy consumption and municipal solid waste. It is reasonable to anticipate economic growth in light of the rising population and increasing urbanization; however, this growth will not be devoid of unintended consequences, including large increases in energy consumption and the production of municipal solid garbage [2,28,30].

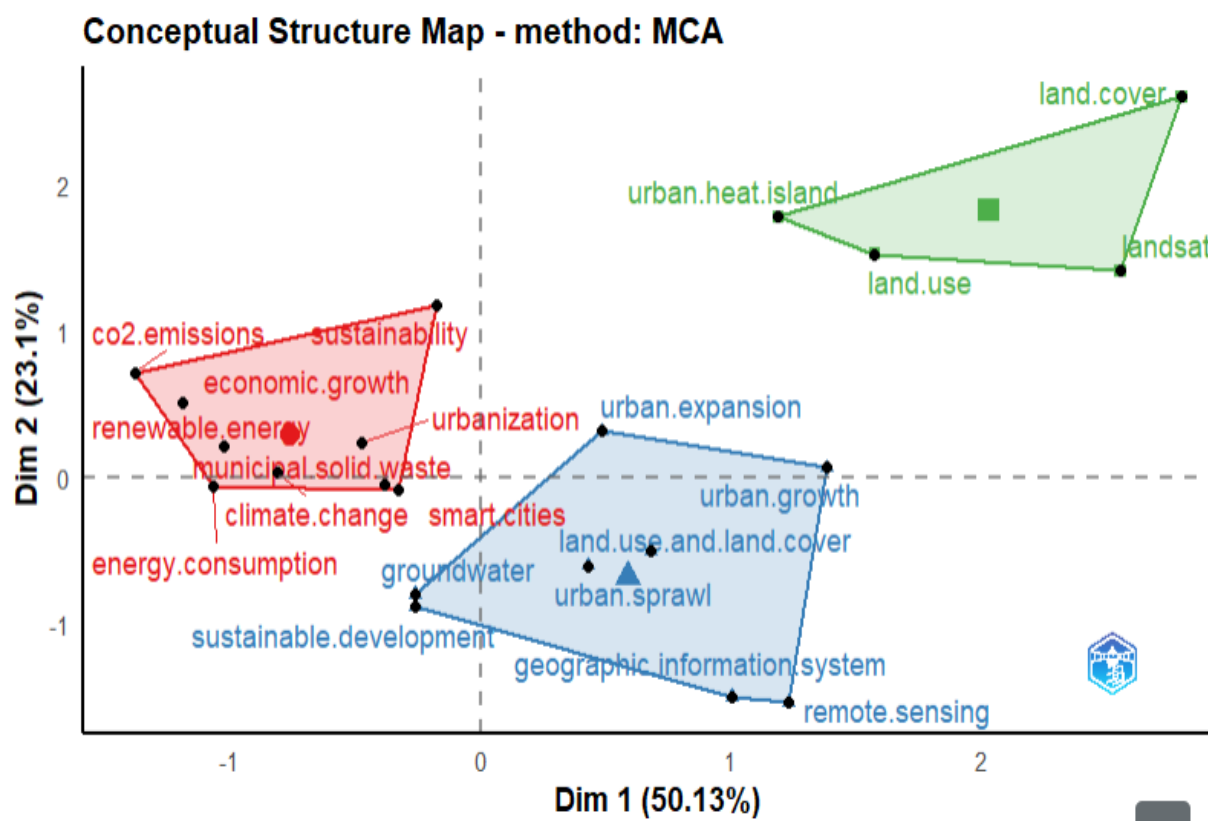


Figure 7. Conceptual Structure Map Using Multiple Correspondence for Urbanization Research in GCC Countries (Illustration by authors).

The cluster analysis uncovered a second group, the blue cluster, which primarily focuses on urban expansion and sustainable development as its primary topics of discussion. This indicates that urban sprawl in the cities of the region in question is a major focus of research on sustainable development strategies, and plans are urgently required to address the consequences of unregulated urban sprawl [29,31–33]. In this regard, the spatial features of urban design become important in terms of realizing the benefits of sustainability and enacting its effects as outcomes of processes, in addition to intensification as a strategy of compactness [34]. Furthermore, researchers in this cluster have indeed widely used land use and land cover detection to study patterns of urban growth.

The relationship between land cover and land use is the primary emphasis of the third category. Land and environmental policies are attracting the interest of a growing range of stakeholders. Planning the use of land is an endeavor that has repercussions for society as a whole. It requires the participation of a variety of persons, groups, and organizations. As a result, it is essential for land-use planning to incorporate considerations of factors that influence land cover [35,36].

3.7. Thematic Focus Areas and Their Transition

This section explores the thematic focus of research into urbanization in the GCC region and discusses how it has changed over time. This section is broken down into several different subheadings, each of which focuses on a different time period, as mentioned earlier. After providing an overview of the overarching topical theme, subsequent sections will then focus on each of the distinct periods.

3.7.1. Overall Thematic Focus and Structure

Since the 1980s, researchers in the GCC region have been eager to use data-driven methods to learn more about urbanization-related topics. As demonstrated in the preceding

sections, this interest has resulted in a significant increase in findings on a wide scope of topics. Various approaches have been taken since it became clear that geographical information systems (GIS) and remote sensing (RS) may affect urban governance, sustainability, and planning, among other factors (as seen in Figure 8). Different ideas are grouped into six categories represented by the colors red, green, blue, yellow, purple, and cyan in Figure 8. Concerns about the environmental implications of urbanization, such as CO₂ emissions, air pollution, agriculture, and renewable energy, are presented in the red cluster. These are issues of concern not only in the region but also in other parts of the world, given the climate emergency and the need to meet the decarbonization aims [37,38]. However, the concept of remote sensing is encapsulated by the green cluster, which recognizes and tracks problems associated with urbanization, sprawl, and land use. The blue group encapsulates ideas associated with sustainable development, the Internet of Things (IoT), and “smart” cities and technologies. The cyan group represents the application of GIS to the research concerning land use, the yellow group the issue of urban growth, and the purple group the concepts of urban development and globalization.

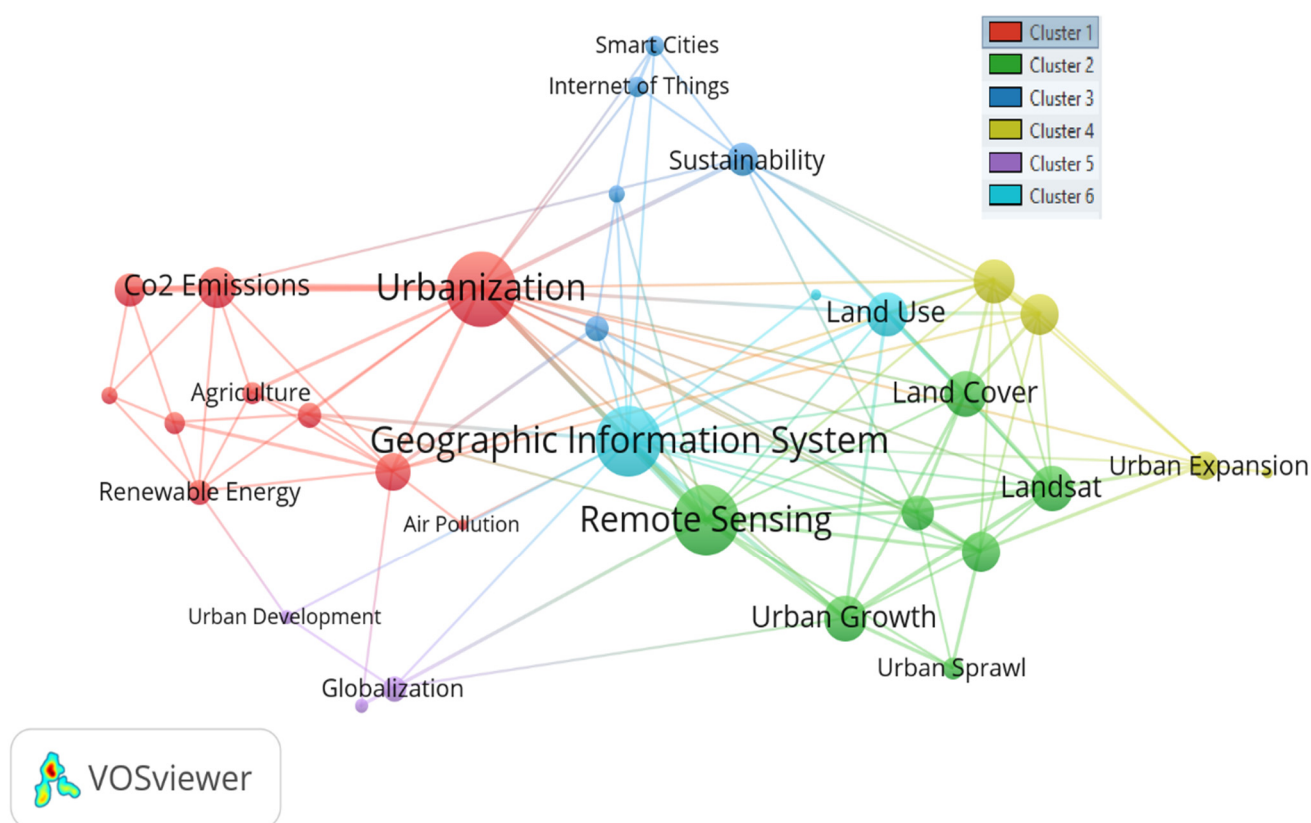


Figure 8. Overall Thematic Focus from 1980 to 2021 (Illustration by authors).

3.7.2. Evolution of Structure and Thematic Focus over Time

This section presents a discussion of the evolution of research into urbanization in GCC countries, focusing on the three time periods described earlier. The timelines created by a variety of factors, including technological development, global sustainability action reports, the emergence of the concept of smart cities, and the prevalence of the COVID-19 pandemic, were used to categorize these events into three distinct periods.

First Period (1980–2017)

Figure 9 presents the findings for the first period (1980–2017). While the concept of urban development may have been conceived earlier, it came to life in 1973 during the “oil boom,” when the need for foreign labor rose exponentially because the national

workforces in the GCC countries at the time were too limited and lacked the necessary abilities to implement these plans [39]. As a result, the population of foreign workers in the GCC countries expanded dramatically, beginning in 1985 and reaching about 4.4 million, an increase of more than threefold within the 10-year span [2]. The influx of foreign workers has significantly contributed to urban development and growth in the region as the immigration of these foreign workers allowed cities to grow at a rapid rate. In addition, numerous other factors, such as natural population growth, potential rural–urban migration, and increase in wealth, among other things, can be attributed to urban development and growth. Though the collection of subject topics being studied was not broad, as shown in Figure 9, the presence of urbanization, geographical information systems, and remote sensing are clearly the focus of studies carried out by researchers from 1980 to 2017 concerning GCC countries. This was a time when major international conferences drew attention to the urgent dilemmas that cities were experiencing, including urban heat islands, climate change, wastewater, and land usage. Spatial analysis and geographical information systems were developed in response to the need for action on a variety of urban concerns.

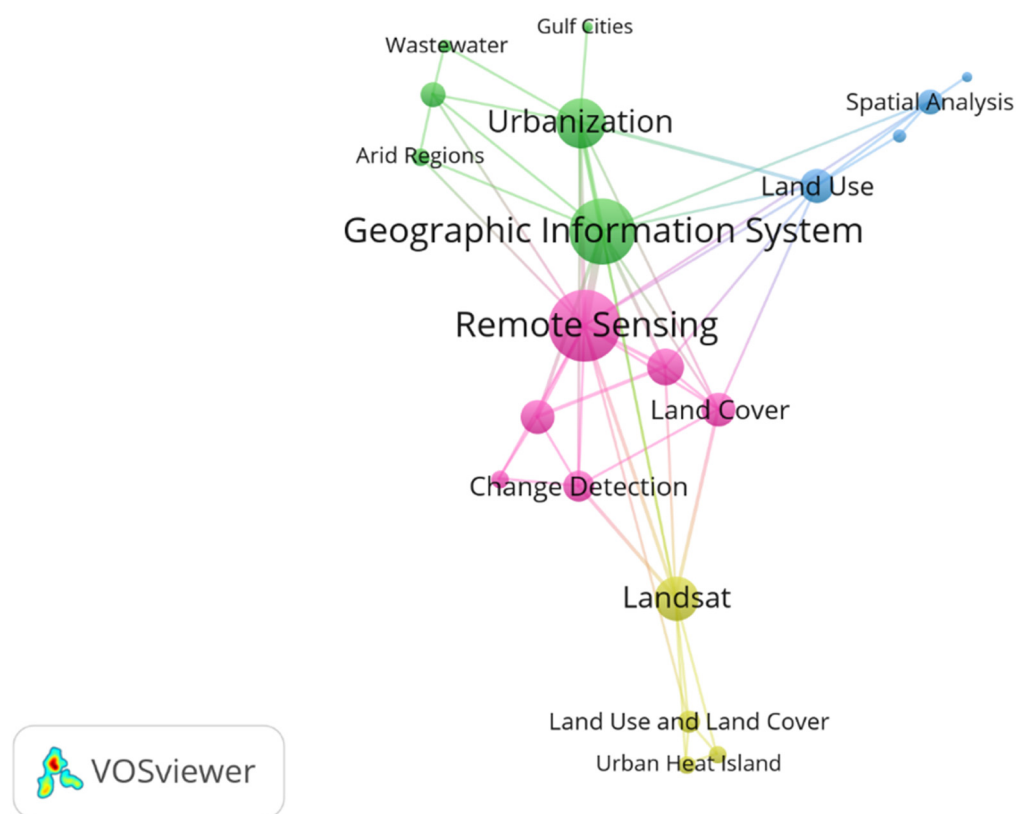


Figure 9. First Period (1980–2017) (Illustration by authors).

The Sustainable Development Goals (SDGs), the Paris Agreement, and the New Urban Agenda were all game-changing publications that sparked increased interest in various urbanization-related themes in GCC countries up to 2017. While these addressed a variety of issues on a global scale, the solutions they recommended converged on the need to manage urbanization better to improve sustainability, livability, and stability in urban areas, as evidenced by the review of the relevant literature.

Second Period (2018–2019)

As shown in Figure 10, there was a rise in urbanization-related academic interest in the years between 2018 and 2019. Figure 2 shows that there were roughly 85 publications during this period, with the number of studies increasing annually. Figure 10 shows that

there has been a significant escalation in the number of terms related to each of the four topics (urbanization, climate change, GIS, and globalization). For example, one of the key differences compared to the previous period is the emergence of terms related to climate change and CO₂ emissions. In this regard, Al-Badi and AlMubarak [40] synthesize a huge body of interdisciplinary and transdisciplinary literature on the topic of urbanization and climate change in GCC countries, resulting in novel insights and several new terminologies. There was also an increase in discussions of how GIS and globalization relate to one another. Figure 10 also shows that during this period, a great deal of attention was paid to the topic of urbanization in GCC countries, and several scholarly works were published on topics previously unexplored in the literature. These topics included CO₂ emissions and economic growth, among others. There has been a rise in awareness, exposure assessment, and social shifts relating to climate change. The urban climate and land cover were also explored under GIS.

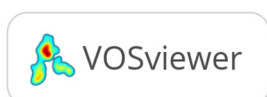
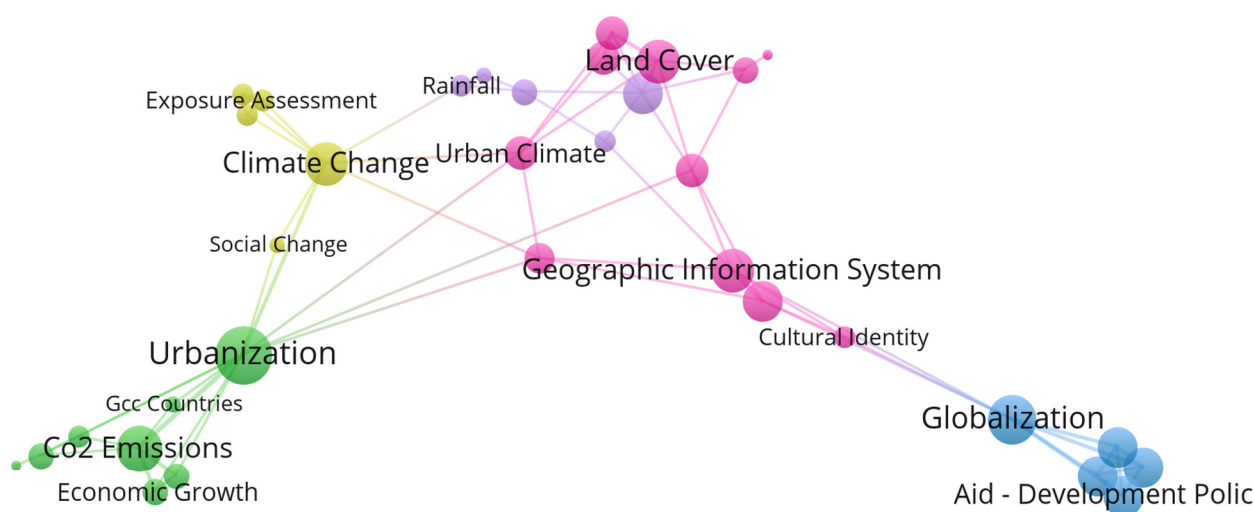


Figure 10. Second Period (2018–2019) (Illustration by authors).

Third Period (2020–2021)

The unprecedented global spread of the COVID-19 epidemic made the years 2020 and 2021 exceptional for the global community. Urban areas and cities were the most affected because of such factors as high population density, greater connectivity to the global economy, dependence on transport systems, and the nature of worksites [41]. Figure 11 shows that even with the obvious disruptions caused by COVID-19, the adoption and application of diverse components of urbanization concepts in GCC countries continued to gain popularity. The graphic shows how concerns related to sustainability, simulation, and renewable energy have received greater focus in recent years. Almulhim [42], for instance, talks about the idea of renewable energy and how it has attracted a lot of interest as a potential alternative energy source because it is connected to the environmental issues engendered by urbanization. The results demonstrate that Saudi Arabians have a fair amount of knowledge of renewable energy and that spreading awareness of this topic is crucial to set goals for Saudi Vision 2030 [42]. Almulhim and Abubakar's [43] research into the circular economy, a national sustainable development approach to address resource scarcity and environmental contamination issues, is another example of research conducted during this period. The transition to a circular economy is the subject of this study, which also examines the influence of public awareness, attitudes, and lifestyles. The results

indicate that Saudi Arabians have a positive outlook regarding this sustainable approach. Sustainable practices, the use of advanced technology, and an increase in alternatives to improve the impacts of urbanization have been the primary focus of these studies during this period.

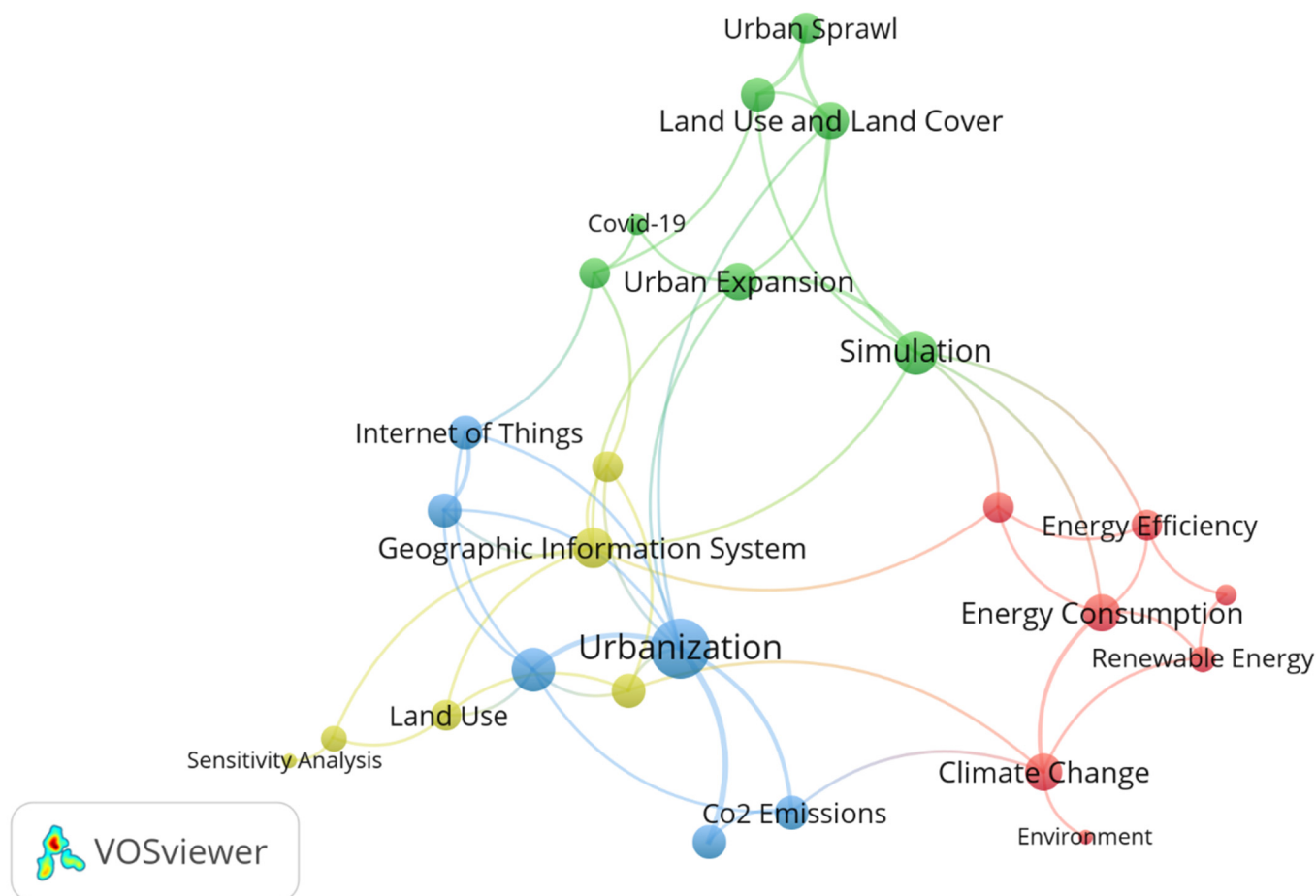


Figure 11. Third Period (2020–2021) (Illustration by authors).

Due to the impacts of the pandemic, topics including sustainability, urbanization, the IoT, and CO₂ emissions rose in popularity, with publishers understanding the need to address environmental problems faced by the region and urban management (shown by the color red in Figure 10). For example, prior to the outbreak of the COVID-19 pandemic, urban areas were thought to be the primary drivers of global warming, responsible for 70% of the total global GHG emissions. These, however, were said to have dropped by an unprecedented amount in 2020, with several factors, including water quality and urban air quality, showing remarkable improvement by that year [44]. This prompted talk of “smart cities” in the GCC region [45]. The impact of climate change can be attributed to the environmental problems brought about by urbanization, while the COVID-19 pandemic has made people realize the challenges faced by dense urban areas. Both of these events have had an impact on trends in urbanization research in this region and have sparked multiple studies on the topic in 2020 and 2021 compared to the two earlier periods.

4. Discussion

The uncontrolled rise in the world’s population and the acceleration of urbanization have had a substantial influence on the appearance of the Earth in this century. More than 40 million people are living in the countries that make up the GCC. It is one of the geographical locations in the world with the highest urbanization rates since more

than 80% of its people live in urban areas based on a 2015 record [3]. The simultaneous occurrence of the two phenomena has had major consequences, leading to a variety of pressing concerns, including, among others, deterioration of the natural environment, urban sprawl, increasing resource use, and climate change. However, as Wang et al. [27] point out, these various obstacles and urbanization rates might vary greatly from country to country. Regardless of this, the major cities in the GCC region, as representing part of both the problems and solutions in the quest for sustainable development, are likely to function as innovation hubs for driving the required transition toward sustainable development. In this respect, and in response particularly to the environmental challenges of urbanization in the region, urban and regional stakeholders and institutions need to devote considerable attention to sustainable development and allocate significant resources to incorporate both smart and nature-based solutions for sustainability into urban strategies and plans. Indeed, the pressures and effects of urbanization are increasingly inducing scholars, practitioners, and policy makers to enhance the existing approaches to urban development toward more integrated models in response to new global trends, especially urbanization, as well as to paradigm shifts in science and technology.

The above analysis implies that the major cities in the GCC region need to develop and implement new approaches to restructuring and redesigning urban places in ways that enable the built environment, and hence urban systems, to function more efficiently through more dynamic and innovative planning and design methods that emphasize the form of the city. In particular, urban forms are associated with both compact cities and eco-cities, which are regarded as the leading paradigms of sustainable urban development. These two paradigms entail a number of design strategies (e.g., density, diversity, mixed land use, sustainable transport, green areas) and green technologies (e.g., renewable energy, sustainable waste, environmental management). These can further be integrated for the purpose of balancing the contribution of cities to the goals of sustainability. Cities have become a focal point of efforts to transition toward a more sustainable, low-carbon society, with many city governments championing compact city and eco-city initiatives of one kind or another.

Although researchers argue for, and policy supports, more compact cities in response to urban sprawl and urban growth, this model of sustainable urban development is not immune to criticism. The compact city generates high levels of noise pollution due to proximity as a feature of mixed land use [46], increases land and dwelling prices, causes traffic congestion, creates social exclusion [47], negatively affects neighborhood satisfaction [48] and the sense of the quality of public utilities [49], increases the ecological footprint due to higher consumption [50], and decreases living space for low-income groups [51]. Nevertheless, there is a risk that the generic problems of urbanization could be criticized as being problems of the compact city [52]. As Glaeser [53] p. 9 puts it, “Cities do not make people poor; they attract poor people.” This may apply to foreigners in the region, though, due to their living standards compared to locals.

According to the findings of this study, the interest in urbanization concepts in connection with GCC countries began to attract some attention as early as the 1980s and continued to grow consistently through the years. Based on the findings of the bibliometric research, it has been determined that the majority of publications during this period focused on a small number of concerns. These topics include climate change, urban heat islands, urban sprawl, and land utilization in connection with the implications of urbanization.

On the international stage, during the latter parts of the first period, the focus of attention was on the direct relationship that exists between urbanization and economic growth, through which urbanization generates CO₂ emissions [12]. Nevertheless, this was also a period (from 2015 to 2017) of significant international goals requesting the cooperation of different countries in addressing urbanization and its negative impacts, along with recommendations for improvement and targets such as the Sustainable Development Goals, the Paris Agreement, and the New Urban Agenda, all of which ignited increased interest in a variety of urbanization-related topics in GCC countries. Although they addressed a

variety of problems on a worldwide scale, the solutions that they advocated converged on the requirement to better manage urbanization in hopes of improving its sustainability, livability, and stability through sustainable and smart approaches to urbanism, such as compact cities and smart cities. This was confirmed by the analysis of the relevant literature.

Within this field of academia, scholars also ramped up their activity, and as displayed in the above figures, the number of publications from 1980 to 2017 rose to 159, with the year 2016 reaching an all-time high of 32 articles within the whole period. Table 3, which shows the most influential references, shows clearly that the majority of those reports were written between the years 2000 and 2017, which most likely can be attributed to more citations due to their being published earlier. This highlights the significant correlation between urbanization and CO₂ emissions, with economic expansion and urbanization being the root causes of these emissions, so fueling the growing interest in this area. Topics such as urban issues and sustainability initiatives, which demonstrate the widespread interest in a focus on sustainability, are also displayed in Table 3.

A variety of topics were explored between 2018 and 2019, including urbanization, climate change, GIS, and globalization in terms of CO₂ emissions, economic growth, and other factors. There has been a growth in awareness of climate change, an increase in the evaluation of people's exposure to it, and a shift in social attitudes. For instance, some authors have written about urban revitalization and spatial planning strategies [54–56]. On the other hand, some studies concentrate solely on urbanization, urban structures, and the environmental implications of urbanization [57–59]. At the same time, some authors are concerned with the effects of urbanization on public health and marine ecosystems [60,61], while others have written extensively on the topics of urban planning and environmental sustainability in light of the long-term effects of urbanization. This is because urbanization has the potential to have a significant effect on both public health and marine ecosystems [62,63].

Concerns relating to sustainability, simulation, and renewable energy are summed up in the concept of urbanization in GCC countries, which is displayed in Figure 11 and lists publications in the years 2020 and 2021. The application of cutting-edge technology to enhance the quality of sustainability has been the primary focus of the research carried out so far. With the escalating rate of urbanization being compounded by increased uncertainty in the world, it has become more challenging for cities to reconfigure themselves more sustainably without the use of the innovative technologies being offered by smart cities [64]. This implies that the city governments within GCC countries will face environmental challenges due to increased energy consumption, rising pollution levels, toxic waste disposal, resource depletion, inefficient management of infrastructures, and traffic congestion, and hence should look for alternative solutions that can contain the negative effects of urbanization. Nevertheless, these challenges can also create opportunities in cities in terms of advancing environmental sustainability in ways that allow for more efficient use of resources and reduced pressure on the services of ecosystems. In other words, cities in GCC countries can benefit from a better understanding of and searching for innovative ways to tackle the special conundrums of urbanization.

On the surface, it would appear that the unfortunate events that occurred during this year and were spurred by the outbreak of the COVID-19 pandemic could halt and put in jeopardy the activities related to urbanization and its impacts, as well as undermine the efforts deployed so far to achieve not only the environmental goals but also the social and economic goals, of sustainable development. The COVID-19 pandemic has raised serious concerns over the risks and impacts of the smart technologies that were rapidly and massively deployed to tackle it, both in the GCC region and globally. The negative implications in this regard relate to social and spatial sorting, social exclusion, dataveillance, geosurveillance, control, privacy erosion, unfairness, democratic decay, and shortages in some public services, such as water, to name but a few (e.g., [65–70]). As such, they pertain to how cities and societies will be digitally monitored and governed.

In addition to the above, the COVID-19 pandemic has disrupted the economic system in its entirety, with severe impacts on economic growth, particularly in relation to small businesses across many sectors of urban societies. This, in turn, means that billions of lives have been affected and the global economy has been endangered, as manifested in the escalation of job and business losses, putting the workforce and especially small firms at risk of losing their livelihoods, coupled with rising insecurities and vulnerabilities. In reporting on the progress of the SDGs, the United Nations Department of Economic and Social Affairs [71] shows how badly the COVID-19 pandemic has affected the progress of the SDGs. Nevertheless, Sharifi and Khavarian-Garmsir [72] conclude that the COVID-19 crisis provides a great window of opportunity for policy makers to undertake transformative endeavors toward creating more just, resilient, safe, and sustainable cities. Moreover, the effects of the COVID-19 pandemic have led to an expansion of research opportunities and a rise in the number of studies on the subject of urbanization both in GCC countries and globally.

5. Conclusions

As a whole, this study shows that researchers are today paying more attention to the ideas surrounding urbanization in GCC countries. Future predictions indicate that this trend will persist, with the anticipated growth in population and the emphasis of several smart cities on adopting and introducing more aspects of smart technology and sustainability. In spite of this, there is still much to learn about the topic in terms of understanding its potentially disastrous effects on the natural world, human society, and the economy. The problems caused by urbanization and its repercussions have been the subject of numerous academic investigations. Urban planning techniques, environmental legislation, sustainability practices, and other related factors offer solutions to deal with these consequences, but it is not enough, especially since urbanization continues to rise, not just in the GCC countries but in all countries around the world. Numerous studies have advocated for the importance of a new, more transformative approach to urbanization and for the necessity of new forms of human collaboration to achieve the desired goals, such as the improvement of the quality of urban life through sustainable practices.

Emerging trends in urbanization in GCC countries continue to grow, and topics change depending on emerging issues and the economic or environmental challenges faced by the region. Since most of the research topics revolve around the impacts of environmental degradation brought about by urbanization and sustainable solutions to address this problem, the research recommends reviewing, updating, and revising current environmental policies and the robust implementation of these policies, as well as urban management strategies. Urbanization is a phenomenon that cannot be dismissed in today's society as it allows for further economic development and human development. Nevertheless, it is not without its negative repercussions. In view of this, immediate action must be taken by policy makers to address urbanization's negative impacts on their region and implement and concretize promising sustainable solutions. This study's presentation of the evolution of urbanization studies in GCC countries paves the way for more robust research. For this reason, it is also recommended to fund and prioritize research into promising solutions and recommendations on the topic.

The research has allowed for the completion of the stated goals and answering the questions raised in the introduction section, but it does have certain limitations that will need to be addressed in future studies. This includes the reliance of this bibliometric study on scholarly literature only and in the English language. A more complete understanding can be attained through consideration of grey literature published in local magazines in future research to complement this study. Moreover, it was clear that the world is preparing for a "new normal" in the wake of the recent pandemic, in which the use of technology would become pervasive and ingrained in nearly every facet of urban life. Obviously, this will lead to new ways of thinking about the effects of urbanization in the GCC countries. For the academic community, these breakthroughs could lead to a rise in the number of

papers exploring these uncharted territories. Research to generate the publication landscape post-pandemic to trace the impacts of COVID-19 on urbanization in GCC nations would be relevant and useful for this reason. There is a need for further research into more precise issues, such as evolution patterns in relation to the operationalization of urbanization research and frameworks, strengths and weaknesses of different approaches, and challenges and opportunities to be addressed with regard to the mainstreaming of urbanization studies in urban planning and sustainable development. Future work may furthermore investigate how emerging themes can be better integrated within ongoing research into urbanization in GCC.

Author Contributions: Conceptualization, A.I.A.; methodology, A.I.A. and S.A.; validation, S.E.B., A.S. and K.M.A.; formal analysis, A.I.A., S.A. and S.E.B.; investigation, S.E.B. and A.I.A.; resources, A.I.A.; data curation, A.I.A. and K.M.A.; writing—original draft preparation, A.I.A. and S.E.B.; writing—review and editing, A.I.A., S.E.B., A.S., S.A. and K.M.A.; visualization, A.I.A.; supervision, A.S.; project administration, A.I.A.; funding acquisition, A.I.A. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The authors would like to acknowledge the support from Deanship of Scientific Research at Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia.

Conflicts of Interest: The authors declare no conflict of interest.

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