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# THE IMPACT OF SUSTAINABLE DEVELOPMENT GOALS ON URBAN GREEN SPACE: A BIBLIOMETRIC ANALYSIS OF THE LITERATURE

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**Abstract**
Urban green space (UGS) benefits residents and has become essential in promoting sustainable urban development. The 2030 Agenda for Sustainable Development of the United Nations in 2015 proposed 17 Sustainable Development Goals (SDGs), pointing out the direction for future sustainable development. The construction of UGS is of great significance for realising the SDGs. This article aims to evaluate the impact of the SDGs proposal on the concept of urban green space. To this end, we applied the VOSviewer bibliometric analysis tool to analyse the relevant literature data in the Scopus database, revealing the intrinsic connection between UGS and the SDGs. It was found that keywords such as sustainable development, sustainability and human ranked highly in the literature in both fields. In addition, keywords such as urban area, urbanisation, biodiversity, and ecosystems appear in both fields but with slightly different focuses. At the same time, these keywords are missing in the combination of overlapping keywords. This study has important implications for UGS planning, construction, and management practices to maximise the synergy between UGS and the SDGs and promote sustainable urban development.
**Keywords**: Urban Green Space; Bibliometric analysis; Sustainability; Sustainable development goals

## 1. INTRODUCTION

With the rapid advance of global urbanisation, cities have become the main places of human activities. In 2021, the global urban population reached 56% and is expected to increase to 68% by 2050 (United Nations, 2022). Cities play a crucial role in promoting economic growth and social progress, but they also face multiple challenges, such as environmental degradation and biodiversity loss (de Oliveira et al., 2022). In responding to these challenges, urban green spaces (UGS), as the primary source of contact between urban residents and nature (Stessens et al.,

2020), play an irreplaceable role in improving the environment of human settlement and maintaining ecological balance. Unfortunately, despite the apparent positive impact of UGS on the outdoor activities of urban residents and health and well-being, evidence shows that UGS supply in some cities still needs to be increased, and the distribution needs to be more reasonable (Nesbitt et al., 2019). This phenomenon exacerbates environmental problems within cities and poses a challenge to achieving sustainable development goals (SDGs) (Zuniga-Teran et al., 2020). To this end, there is an urgent need to optimise UGS's spatial layout and functional design to maximise its ecological, social, and economic benefits (Jin, 2020).

The 2030 Agenda for Sustainable Development of the United Nations 2015 proposed 17 SDGs, charting the direction for future global development. Among them, SDG11 directly focuses on sustainable urban development, and UGS makes an essential contribution to the implementation of SDG11 (Akuraju et al., 2020; Wey et al., 2022). Some recent studies have focused on the connection between UGS and other SDGs. Some studies have found that UGS has a positive impact on residents' good health and well-being (SDG3), reduces inequality (SDG10), and climate action (SDG13) by providing ecosystem services (Labadi et al., 2021; Tate et al., 2024). In addition, there are close connections and mutual influences among the various SDGs. If the systematic correlation between them is addressed, it may be easier to achieve the intended purpose (Collste et al., 2017).

Although there is widespread recognition of the need to develop an integrated approach to advance the implementation of the SDGs at the city level, progress in integrating UGS with the SDGs has been limited to date (Dhakal et al., 2022; Valencia et al., 2022; Valencia et al., 2019). As an essential part of urban sustainable development, UGS has unique advantages in promoting the synergy of SDGs (Halecki et al., 2023; Stessens et al., 2020). Therefore, this article aims to use bibliometric methods to systematically sort out the literature on UGS and SDGs and analyse the intersection between the two. We conduct a literature review on two levels. The first level identified critical achievements and gaps based on keyword analysis of articles in Scopus listing UGS about the SDGs. The second part deepens our understanding of UGS and SDG literature integration by analysing and reclassifying relevant papers listed with two focus keywords in Scopus. It provides a new idea and perspective for the integrated implementation method of SDGs.

## 2. METHOD AND MATERIALS

VOSviewer is a visualisation software widely used in the field of bibliometrics. Its powerful function lies in its ability to build complex cocitation networks, author collaboration networks, keyword co-occurrence networks, etc. Based on data from the literature (Maier et al., 2020). Generate an intuitive two-dimensional visualisation map showing a specific research field's knowledge structure, research frontier, and evolutionary context. This study aims to map areas of convergence and the gap between urban green space and the SDG literature. To do this, we implemented a two-step approach. The first step consisted of keyword analysis of 21,619 articles published between 2015 and 2024, listed in the Scopus database in the categories Urban Studies, Environmental Science, and Ecology, and containing the keywords UGS and SDGs. The second step was to conduct a more in-depth analysis of 34 articles containing keywords related to UGS and the SDGs.



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To identify the intersections and differences between UGS and SDGs research, this article uses "urban green space*" OR "city park*" OR "UGS*" OR "green infrastructure*" in the title, abstract, and keyword fields to retrieves core documents on the theme of urban green space; for SDGs documents, the phrase "SDG*" OR "sustainable development goal*" OR "SDGs*" OR "sustainable development goals" is used, covering different expressions of SDGs. The Scopus database was selected as a literature source due to its broad coverage of journals, and the search included only English-language literature. The data was extracted on February 8, 2024. Figure 1 summarises the essential characteristics of the resulting data set.

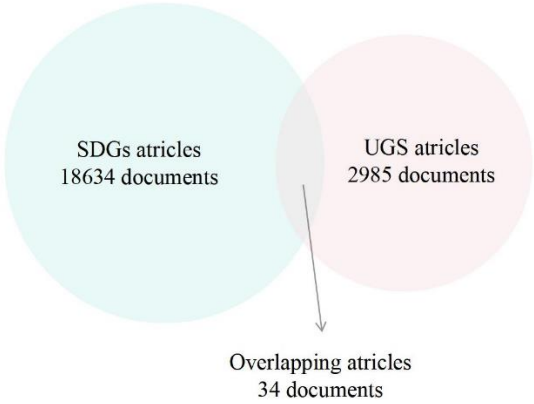


FIGURE 1 - DOCUMENTS ON UGS AND SDGS FROM 2015 TO 2024, Source: Own processing (2024).

After extracting data from the literature in this article, 34 papers contain keywords related to UGS and SDGs. We systematically sorted these 34 papers and constructed a two-dimensional matrix framework. The vertical dimension of the matrix includes the 17 SDGs, and the horizontal dimension corresponds to 34 documents. By in-depth reading each paper, we judged which UGS issues discussed have significantly contributed to the realisation of the SDGs and classified the literature.

## 3. RESULTS

Table 1 shows the top 30 most frequently occurring keywords in our sample of 21,619 papers. Through analysing these keywords, we have an in-depth analysis of the close relationship between UGS and the SDGs. Although among these keywords, UGS is closely related to urban planning, urban area, land use, and environmental protection, highlighting the multi-dimensional importance of UGS in sustainable development research. At the same time, the concept of sustainable development has also received considerable attention. SDGs are closely connected with sustainable development, climate change, human beings, economic development, and government. Sustainable development, sustainability, and humans occupy the top five keyword rankings.

Furthermore, keywords prominent in the literature on these topics include urban areas, urbanisation, biodiversity, ecosystems, land use, and cities. These keywords cover essential areas such as urban environment, ecological balance, land planning, etc. Comparing ego networks reveals differences between the two (on the left, the UGS

literature, and on the right, the SDGs literature). Even if the exact keywords are used, the two differ in meaning. This shows that although the keywords are similar in the research field, there are significant differences in the areas that literature focuses on under different topics.

TABLE 1 - KEYWORD STATISTICS

| Rank | Keywords | Keyword count in articles of the area | | | |
|---|---|---|---|---|---|
| | | SDGs ∪ UGS | SDGs | UGS | SDGs ∩ UGS |
| 1 | Sustainable Development Goals | 6588 | 6571 (99%) | 13 (0%) | 17 (1%) |
| 2 | Sustainable Development | 6283 | 6123 (97%) | 158 (3%) | 2 (0%) |
| 3 | Sustainability | 3142 | 3002 (96%) | 140 (4%) | 3 (0%) |
| 4 | Human | 2298 | 1913 (83%) | 383 (17%) | 2 (0%) |
| 5 | Climate Change | 1834 | 1703 (93%) | 130 (7%) | 1 (0%) |
| 6 | Greenspace | 1530 | 40 (3%) | 1485 (96%) | 15 (1%) |
| 7 | Urban Area | 1170 | 357 (31%) | 811 (69%) | 2 (0%) |
| 8 | Economic Development | 974 | 957 (98%) | 17 (2%) | 0 (0%) |
| 9 | Decision Making | 881 | 764 (87%) | 117 (13%) | 0 (0%) |
| 10 | Urban Planning | 797 | 119 (15%) | 677 (85%) | 1 (0%) |
| 11 | Carbon Dioxide | 773 | 757 (98%) | 16 (2%) | 0 (0%) |
| 12 | Economic Growth | 767 | 756 (99%) | 11 (1%) | 0 (0%) |
| 13 | Urban Green Spaces | 741 | 9 (1%) | 730 (96%) | 22 (1%) |
| 14 | Environmental Economics | 721 | 711 (99%) | 10 (1%) | 0 (0%) |
| 15 | Economic And Social Effects | 707 | 666 (94%) | 41 (6%) | 0 (0%) |
| 16 | Urbanisation | 709 | 387 (55%) | 319 (45%) | 3 (0%) |
| 17 | Renewable Energy | 701 | 700 (100%) | 1 (0%) | 0 (0%) |
| 18 | Carbon | 691 | 656 (95%) | 35 (5%) | 0 (0%) |
| 19 | Alternative Energy | 678 | 677 (100%) | 1 (0%) | 0 (0%) |
| 20 | Spatiotemporal Analysis | 672 | 540 (80%) | 132 (20%) | 0 (0%) |
| 21 | Environmental Protection | 662 | 602 (91%) | 60 (9%) | 0 (0%) |
| 22 | Carbon Emission | 651 | 640 (98%) | 11 (2%) | 0 (0%) |
| 23 | Biodiversity | 613 | 383 (62%) | 229 (37%) | 1 (0%) |
| 24 | Environmental Impact | 521 | 488 (94%) | 33 (6%) | 0 (0%) |
| 25 | Ecosystems | 489 | 337 (69%) | 152 (31%) | 0 (0%) |
| 26 | Land Use | 489 | 289 (59%) | 200 (41%) | 0 (0%) |
| 27 | Investments | 462 | 459 (99%) | 3 (1%) | 0 (0%) |
| 28 | City | 406 | 176 (43%) | 229 (56%) | 1 (0%) |
| 29 | Government | 399 | 384 (96%) | 15 (4%) | 0 (0%) |
| 30 | Greenhouse Gases | 383 | 378 (99%) | 5 (1%) | 0 (0%) |

Source: Own processing (2024)

First, in UGS literature, as shown in Figure 2, the urban area covers keywords such as urban design, urban population, urban planning, and green infrastructure, reflecting the critical role of UGS as an element of urban space



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in optimising urban form and improving liveability. This is consistent with existing research. For example, the review by Halecki et al. (2023) pointed out that the rational layout of UGS can shape a compact and continuous urban spatial structure and improve the quality of the urban environment and the quality of residents' lives.

In the SDGs literature, the urban area is more related to keywords such as water supply, climate change, and rural area. Looking at the latest research on the urban area, sustainable urban development needs to coordinate multi-dimensional goals such as economic, social, environmental, and institutional goals and coordinate the interest relationships within urban areas and between cities and rural areas (Du et al. 2021). In addition to optimising urban water systems, improving water resource utilisation efficiency (Deng et al., 2022; Saikia et al., 2022), and strengthening urban emission reduction and climate change adaptation capabilities (Sharifi, 2021).

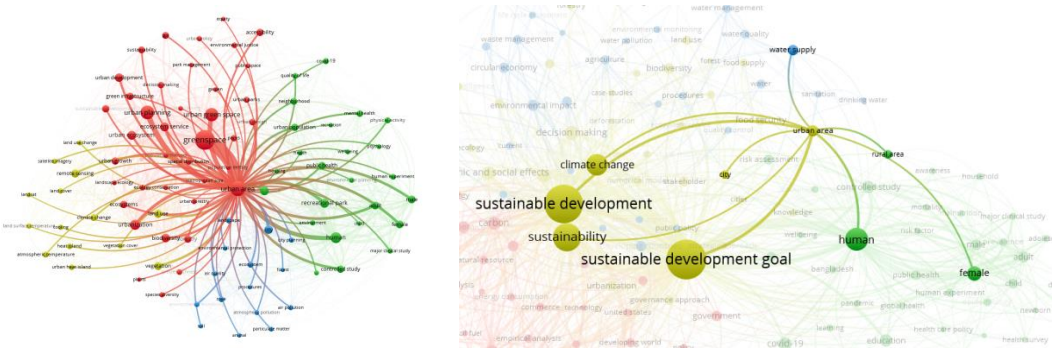


FIGURE 2 - COMPARATIVE ANALYSIS OF KEYWORDS IN URBAN AREAS, Source: Own processing (2024)

Secondly, urbanisation in the UGS literature focuses more on ecosystem services, green space, land use, etc., as shown in Figure 3. Recent research has particularly emphasised the urbanisation process's impact on UGS's ecological functions (Semeraro et al., 2021) and UGS's importance in planning and land use management (Zou et al., 2021). By introducing GIS (geographic information system) technology and landscape index methods, we can detect fragmentation, reduced connectivity, and damage to ecological functions of green spaces caused by the expansion of urban agglomerations (Chu et al., 2022). By simulating urban expansion under different scenarios, changes in urban expansion on natural vegetation cover and ecosystem service value were analysed (Basu et al., 2023).

Unlike in the literature on the SDGs, urbanisation is mainly associated with keywords such as economic development, environmental protection, and investment. Because urbanisation is regarded as an essential driving force for sustainable development (Kalfas et al., 2023), it also faces challenges such as energy consumption and pollution emissions (Yao et al., 2023). To achieve a comprehensive balance, the SDGs advocate that while promoting urban economic growth, green development and the construction of ecological civilisations must be coordinated (Hu et al., 2023), such as integrated urban and rural development, housing security, and equalisation of public services (Wu et al., 2023; Zhu et al., 2022), in order to achieve social equity and justice while promoting urban modernisation (Hariram et al., 2023).

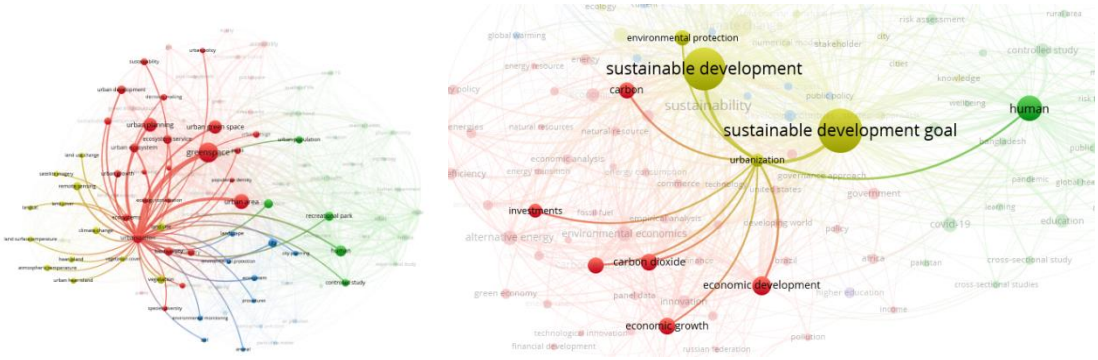


FIGURE 3 - COMPARATIVE ANALYSIS OF URBANISATION KEYWORDS, Source: Own processing (2024)

Third, in UGS literature, as shown in Figure 4, biodiversity mainly focuses on species diversity, vegetation and plant communities. On the one hand, relevant research has revealed the critical role of UGS in maintaining species diversity, including providing habitats for various animals and plants and forming ecological corridors to promote species migration and genetic exchange (Zhou et al., 2023). On the other hand, the composition, structure and dynamic changes of urban green space vegetation were explored, and these factors affect the function and stability of urban ecosystems (Pantaloni et al., 2022). Numerous case studies show that plant diversity in UGS is affected by multiple factors, such as green space area, connectivity, management methods, etc. (Elbakidze et al., 2022; Zhu et al., 2022), and different types of UGS, such as parks, street trees, private gardens, etc., have other contributions to maintaining biodiversity (Vargas-Hernández et al., 2023).

In the SDGs literature, biodiversity mainly involves food security, climate change, and human health. From this perspective, some researchers have emphasised the importance of biodiversity in ensuring food security and nutrition (Kennedy et al., 2022), as biodiversity loss affects the resilience and productivity of agroecosystems (Hawes et al., 2021). Furthermore, there is a close connection between biodiversity and climate change, and biodiversity conservation can help improve the function of the ecosystem's carbon sink and its ability to adapt to climate change (Kangas & Ollikainen, 2022). At the same time, biodiversity is also crucial to human health because it provides various medicinal resources and ecosystem services to humans (Bawa et al., 2020; Marseille et al., 2021). However, current biodiversity conservation measures are still insufficient, and more comprehensive and transformative actions are needed to curb biodiversity loss (Xu et al., 2021). More importantly, integrating biodiversity conservation into the main agenda of sustainable development will help to achieve the 17 SDGs (Obrecht et al., 2021).

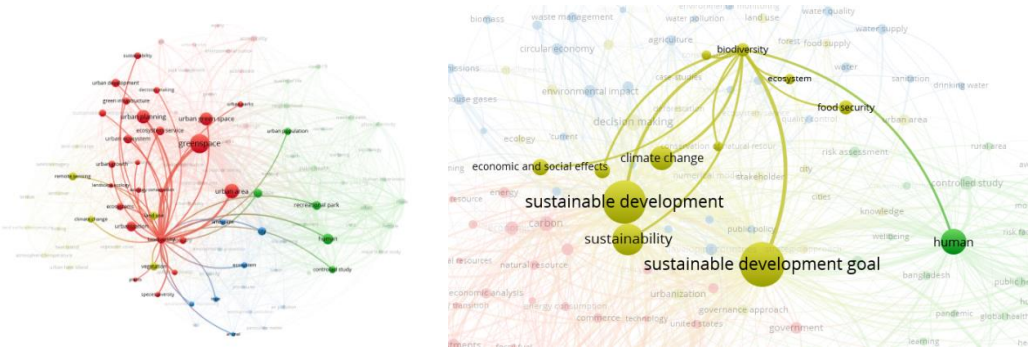


FIGURE 4 - COMPARATIVE ANALYSIS OF BIODIVERSITY KEYWORDS, Source: Own processing (2024)



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Fourth, ecosystems in UGS literature focus on urban climate regulation, air quality improvement, flood mitigation, etc., as shown in Figure 5. Research indicates that UGS can alleviate the heat island effect (Li & Zhou, 2019), purify the air (Xing & Brimblecombe, 2019), and reduce flood disasters (Li et al., 2020). Effective use of these ecosystems can help improve the quality of the urban environment and improve the health and happiness of residents. (Reyes-Riveros et al., 2021). The SDGs research examines ecosystems from a macro-perspective, closely linked to biodiversity, sustainable resource utilisation, and environmental governance. At the same time, sustainable development includes three essential elements: economy, ecology, and society. They emphasised that ecological development should be the foundation, economic development should be the means, and social development should be used to achieve the harmonious development of human culture and environmental systems (Jin et al., 2020). This means that nature must be respected, and ecosystem protection and rational utilisation must be strengthened in sustainable development (Wu et al., 2021).

Furthermore, we can find similarities in the two knowledge graphs by comparing the positions and connections of biodiversity and ecosystem keywords in Figures 4 and 5. This reflects the intrinsic link between biodiversity and ecosystems. Biodiversity is an essential component of ecosystems, and species composition, richness, and diversity are crucial to maintaining ecosystem structure, function, and stability (Craven et al., 2018; Guo et al., 2021). On the contrary, the integrity and health of the ecosystem also provide the necessary habitat conditions and resource base to protect biodiversity (Hansen et al., 2021).

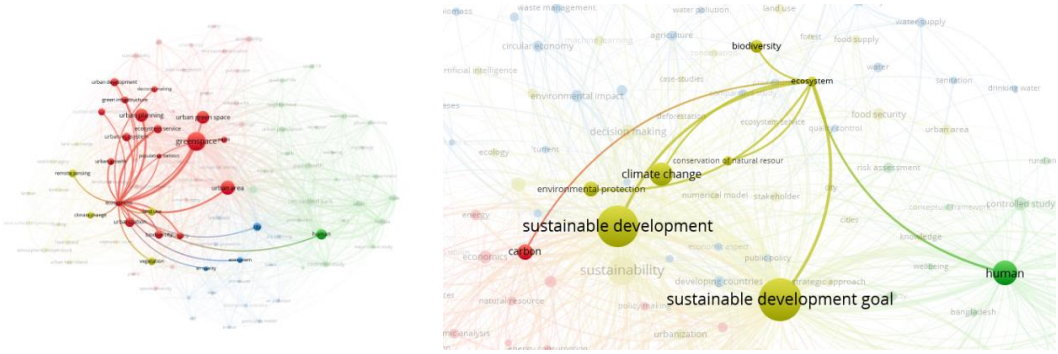


FIGURE 5 - COMPARATIVE ANALYSIS OF ECOSYSTEM KEYWORDS, Source: Own processing (2024)

Fifth, in UGS literature, as shown in Figure 6, the land use topic mainly focuses on planning, allocating, and managing green space. Relevant research emphasises that reasonable land use planning is crucial to creating a high-quality UGS system (Sun et al., 2019). By optimising the layout, connectivity, and accessibility of green spaces, the role of green spaces in providing ecosystem services to urban residents can be maximised (Elbakidze et al., 2022). In the context of the SDGs, land use is linked to keywords such as climate change and food security, mitigating the effects of climate change through effective land management, as well as ensuring food supply, protecting ecosystems, and promoting socioeconomic development (Loboguerrero et al., 2019).

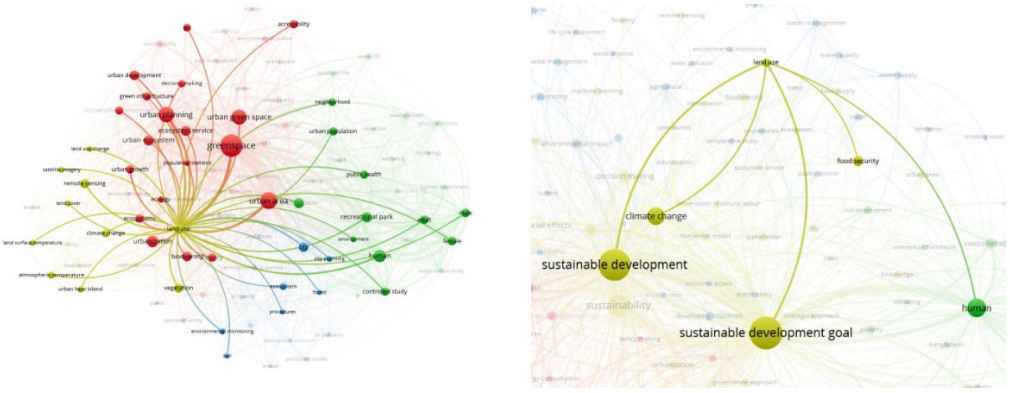


FIGURE 6 - COMPARATIVE ANALYSIS OF LAND USE KEYWORDS, Source: Own processing (2024)

Finally, we also compared the keyword "city" between the two documents. Figure 7 shows that in UGS research, cities are at the core and are closely connected with green space, urbanisation, ecosystem services, etc. With the intensification of urbanisation, the ecosystem service functions of UGS have attracted much attention. Recent research has focused on optimising the allocation of UGS (Liu et al., 2023) and improving ecological functions (Fu et al., 2023). In the study of SDGs, cities are not the core but are connected to knowledge, innovation, etc. This reflects that the content of the SDGs is more macro and comprehensive, and cities are only one factor. Sustainable cities and communities are the 11th goals, reflecting the critical position of cities in sustainable development but also emphasising that urban development needs to be in line with coordinated with other goals.

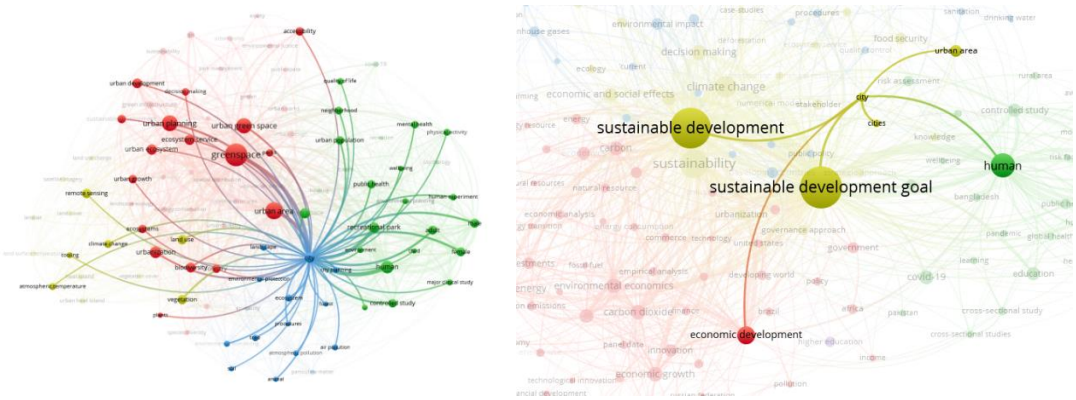


FIGURE 7 - COMPARATIVE ANALYSIS OF URBAN KEYWORDS, Source: Own processing (2024)

The 34 papers in Table 2 have been reclassified according to the SDGs and the UGS dimensions involved. The results show that most papers focus on SDG 11, Sustainable Cities and Communities, highlighting the broad focus on urban and community sustainability. Second, other SDGs are also targeted, such as SDGs 3 (good health and well-being), SDGs 10 (reduced inequality), SDGs 13 (climate action) and SDGs 15 (life on land). Finally, some papers focus on specific dimensions of UGS and address multiple SDGs.



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TABLE 2 - THE DIMENSIONS OF UGS AND 17 SDGS WERE RECLASSIFIED FOR 34 PAPERS

| No | 17 SDGs | Papers |
|---|---|---|
| 1 | No Poverty | |
| 2 | Zero Hunger | |
| 3 | Good Health and Well-Being | Matos et al. (2019); Wang et al. (2023); Ajmi et al. (2023); Scaioli et al. (2023); Yang et al. (2022) |
| 4 | Quality Education | |
| 5 | Gender Equality | |
| 6 | Clean Water and Sanitation | |
| 7 | Affordable and Clean Energy | |
| 8 | Decent Work and Economic Growth | |
| 9 | Industry, Innovation, and Infrastructure | |
| 10 | Reduce Inequality | Chen et al. (2023); He et al. (2023); Howes & Reynolds, (2021); Vidal et al. (2021) |
| 11 | Sustainable Cities and Communities | Çınar et al. (2018); Das et al. (2022); Priess et al. (2021); de la et al. (2023); Pinto et al. (2021); Li et al. (2022); Wey et al. (2022); Reynolds & Howes, (2023) Chen et al. (2021); Chen et al. (2023); Patra et al. (2021); He et al. (2023); Bille et al. (2023); Huang et al. (2021); Wang et al. (2023); Farfán Gutiérrez et al. (2021); Akuraju et al. (2020); Yuan et al. (2024); Stoddart et al. (2021) Van Zyl et al. (2021); Gottero et al. (2021); Kuang et al. (2021); Giuliani et al. (2021); Verdú-Vázquez et al. (2021) |
| 12 | Responsible Consumption and Production | |
| 13 | Climate Action | Çınar et al. (2018); Das et al. (2022); Yuan et al. (2024); de la et al. (2023); Li et al. (2022); |
| 14 | Life below Water | |
| 15 | Life on Land | Giuliani et al. (2021); Howes & Reynolds, (2021); Dampte et al. (2022); Bille et al. (2023); Marino et al. (2023) |
| 16 | Peace, Justice, and Strong Institutions | |
| 17 | Partnerships for the Goals | Patra et al. (2021) |

Source: Own processing (2024)

An in-depth analysis of these 34 papers reveals their close links with the keywords highlighted in Table 1, such as urban area, urbanisation, biodiversity, and cities. These papers cover a wide range of topics, including: the availability and accessibility of UGS and their impact on public health and well-being (Farfán et al., 2021; Akuraju et al., 2020; Wang et al., 2023; Chen et al., 2021; Das et al., 2022; Scaioli et al., 2023; Yang et al., 2022; Chen et al., 2023; He et al., 2023); the impact of UGS on biodiversity Impact, especially on bird diversity (Howes & Reynolds, 2021; Reynolds & Howes, 2023; Damptey et al., 2022); assessment of ecosystem services of UGS, including regulating the urban heat island effect, improving air quality, etc. (Marino et al., 2023; Vidal et al., 2021; Priess et

al., 2021; Matos et al., 2019; inar et al., 2018; Yuan et al., 2024; Li et al., 2022); Global and research on the correlation between urban green space pattern and human development, population density and other factors on the regional scale (Bille et al., 2023; de la Barrera et al., 2023); Planning and optimisation of urban green space, including multifunctionality and equity and spatial layout optimisation (Van Zyl et al., 2021; Chen et al., 2023; Wey et al., 2022); mapping and mapping of UGS based on remote sensing and geographical information technology (Chen et al., 2023; Huang et al., 2021; Kuang et al., 2021; Giuliani et al., 2021); Research on residents' perception, cognition and practical behaviour of UGS (Stoddart et al., 2021; Wang & Foley, 2023); Urban fringe areas Planning and classification of blue-green infrastructure (Gottero et al., 2021; Verdú-Vázquez et al., 2021). These papers generally explore UGS's important role and potential in coping with urbanisation, maintaining biodiversity, promoting public health, mitigating climate change, etc., from different angles, providing the theoretical basis and practical guidance for realising SDGs.

## 4. THEMATIC ANALYSIS FINDINGS

The study's thematic analysis explores the intrinsic connections between urban green spaces (UGS) and the Sustainable Development Goals (SDGs), focusing on how UGS contributes to realising these goals. Using VOSviewer for bibliometric analysis, several themes emerge that highlight the multifaceted role of UGS in promoting sustainable development.

Key Themes Identified firstly are sustainable urban development and UGS. UGS plays a critical role in sustainable urban development by improving urban areas' liveability and ecological balance. This theme encompasses aspects such as urban planning, integrating green infrastructure, and enhancing urban biodiversity. Research indicates that well-planned UGS can shape a compact and continuous urban spatial structure, improving the quality of the urban environment and residents' lives.

Secondly, it is about the health and well-being aspects. UGS contributes significantly to public health and well-being, aligning with SDG 3 (Good Health and Well-being). Studies show that access to green spaces is associated with various health benefits, including reduced stress, improved mental health, and increased physical activity. Papers focusing on the health impacts of UGS support this theme, highlighting the necessity for equitable access to green spaces in urban planning.

Next is the Climate Action and Environmental Protection. UGS supports SDG 13 (Climate Action) and SDG 15 (Life on Land) by mitigating climate change effects and protecting ecosystems. Green spaces help in carbon sequestration, reduce urban heat islands, and support biodiversity. Keywords related to climate change and environmental protection frequently appear in the literature, emphasising the role of UGS in ecological sustainability.

Fourth is the Social Equity and Inclusion. Aligning with SDG 10 (Reduced Inequality), UGS can promote social equity by providing accessible recreational areas for all socioeconomic groups. The literature highlights the importance of inclusive green space planning to ensure that benefits are equitably distributed across different urban populations.



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Fifth is urban resilience and Adaptation. The theme of urban resilience is prevalent, linking UGS with cities' capacity to adapt to environmental changes and shocks. This includes enhancing urban water systems, improving resource efficiency, and building resilience against climate-related impacts. The research underscores the need for integrated approaches to UGS that incorporate resilience planning and climate adaptation strategies.

## 5. DISCUSSIONS

This study uses bibliometric methods to systematically review the research progress on UGS and the SDGs, revealing the multi-dimensional correlation between the two. The results of the analysis show that the construction of UGS has a positive contribution to the realisation of multiple SDGs, reflected mainly in the following aspects: First, UGS improves the health and well-being of residents by improving the quality of the urban ecological environment, directly promoting SDGs 3 (health and well-being), and implementing SDGs11 (sustainable cities and communities). The literature shows that UGS can purify the air, regulate the microclimate, absorb rainwater, reduce noise, and provide residents with a healthy and pleasant living environment (Das et al., 2022; Matos et al., 2019). At the same time, UGS, as a place for residents to relax, visit, and exercise, positively improves physical and mental health (Scaioli et al., 2023; Vidal et al., 2021). Optimising UGS's spatial layout and improving accessibility can help promote health equity and alleviate environmental inequality (Yang et al., 2022).

Second, the construction of UGS helps to cope with climate change and promotes the realisation of SDG13 (climate action). Relevant studies have shown that UGS can alleviate the urban heat island effect and slow the impact of climate change by sequestering carbon, releasing oxygen, regulating microclimate and other ecological functions (Çınar et al., 2018; Yuan et al., 2024). Reasonable UGS layout and optimisation of urban form can reduce urban energy consumption and greenhouse gas emissions. In addition, the storage function of UGS in rainwater can also help improve the city's resilience to extreme weather (Wang & Foley, 2023). Finally, UGS is an essential spatial carrier for maintaining urban biodiversity and is crucial in achieving SDG15 (life on land). Many studies have shown that UGS maintain species diversity by providing habitats and are essential city biodiversity reservoirs (Damptey et al., 2022; Howes & Reynolds, 2021). Building an ecological network of UGS and strengthening the connectivity of green space areas can promote the migration and diffusion of species and improve the integrity of the urban ecosystem (He et al., 2023; Pauleit et al., 2020). In addition, UGS construction also provides a platform for promoting inclusive urban governance and the participation of diverse subjects, embodying the connotations of SDG16 (peace, justice, and strong institutions) and SDG17 (partnerships for the goals). Research shows that UGS, as urban public spaces, provide places for different groups to interact and participate in community affairs, which helps promote social inclusion and enhance social capital (Stoddart et al., 2021; Priess et al., 2021). The participation of multiple entities, such as the public, communities, enterprises, and social organisations, in UGS's planning, construction, and management can pool wisdom and efforts, coordinate conflicts of interest, and promote environmental justice (Patra et al., 2021).

However, some things could still be improved in current research on UGS and SDGs. First, the existing literature mainly focuses on analysing the contribution of UGS to individual SDGs. More attention must be paid to its

synergistic gain effect with multiple SDGs. The construction of UGS is a complex systematic project that often has a superimposed impact on various SDGs. It requires systematically analysing the coupling and mutual feedback relationships between different goals. Secondly, most studies use static methods, such as case analysis and statistical data, and lack dynamic evaluation methods, such as scenario simulation, making it difficult to accurately predict the impact of UGS on the SDGs at different spatial and temporal scales. In addition, existing research needs to pay more attention to the sustainable development of UGS themselves. Although UGS promotes the realisation of the SDGs, its construction also faces many challenges, such as land shortage and insufficient investment, and it is necessary to embed sustainable development concepts in planning, design, construction management, and other aspects (Van Zyl et al., 2021).

## 6. CONCLUSIONS

This study uses bibliometric methods to systematically analyse the relationship between UGS and the SDGs based on published literature from 2015 to 2024, revealing the contribution of UGS to multiple SDGs, which is reflected mainly in improving urban living environments, addressing climate change, and maintaining biodiversity. The research results show that the existing literature primarily focuses on the ecological benefits of UGS, and more consideration is still needed for its social and economic benefits. Although the SDGs have become an essential guideline for UGS planning, construction, and management, the discussion on the relationship between the two needs to be more in-depth in academic research and planning practice. It is necessary to strengthen the in-depth integration of the two and fill the main gaps. In addition, future research should further expand the analytical dimension, innovate research methods, and strengthen interdisciplinary collaboration to promote the role of UGS in achieving the SDGs and contributing to sustainable urban development.

As the comparative Analysis, the study compares the focus areas of UGS and SDG literature, revealing overlaps and distinct differences. While both fields emphasise sustainability and human well-being, UGS literature focuses more on urban design, population, and planning. In contrast, SDG literature incorporates broader aspects such as water supply, rural areas, and institutional frameworks. This comparative analysis highlights the unique contributions of UGS to specific urban challenges and the more comprehensive, integrative approach of SDG literature.

Hence, the implications for practice of this study suggest that urban planners and policymakers should prioritise the integration of UGS in urban development strategies to maximise their contribution to achieving the SDGs. Effective UGS planning requires a multidimensional approach that considers ecological, social, and economic factors, ensuring that green spaces are accessible, equitable, and resilient. This comprehensive approach can enhance the sustainability and livability of urban environments, aligning closely with the goals outlined in the 2030 Agenda for Sustainable Development.

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