

## Urban regeneration and sustainable development: A bibliometric analysis in the Romanian context

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**Abstract. Objective:** This study aims to identify conceptual relationships and thematic convergences between sustainable urban development, sustainable urbanization and urban regeneration in the specific context of Romania. The importance of integrating these concepts in the transition process toward a sustainable urban model highlights the risk that the current fragmentation of research constitutes a significant obstacle to the definition of coherent and efficient public policy. Thus, the analysis aims to highlight both the degree of interconnection between the mentioned themes and the opportunities for consolidating an integrated approach in the national scientific literature. **Method:** The study uses bibliometric analysis based on data extracted from the Web of Science, using specific search criteria to identify reference publications. The selected set of articles was analyzed from the perspective of volume, thematic overlaps and temporal trends. The analysis focused on articles published in journals and conference proceedings, and the data were processed using VOSviewer software to identify keyword co-occurrence networks and thematic connections. **Result:** The analysis revealed the predominance of literature on sustainable urban development compared to urban regeneration and sustainable urbanization, highlighting limited overlaps between subthemes. Time trends indicate a sharp increase in academic interest over the last decade, starting in 2012 and culminating in 2023–2024, which could reflect a repositioning of the academic and institutional agenda in the face of current urban pressures. Even if the fragmentation of research is confirmed, with most studies addressing these concepts separately, emerging themes are outlined at the intersection of urban regeneration and sustainability, signaling an incipient convergence in the field. **Originality:** The originality of the approach lies in applying the method to capture the way in which the scientific literature in Romania integrates the three key concepts, offering new perspectives on the integration of sustainable urban development in Romania. At the same time, the Study contributes to a critical understanding of the degree of maturity of research on these topics, underlining the need for inter- and trans-disciplinary approaches that support the formulation of coherent urban policies, adapted to local realities. Thus, the present study advances a pertinent analytical framework for exploring how Romanian scholarly literature reflects the articulation of urban regeneration and sustainable

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*development concepts, highlighting thematic discontinuities and potential points of convergence, with a view to grounding coherent research directions and informing the development of urban policies adapted to the national context.*

**Keywords:** *sustainable urban development, sustainable urbanization urban regeneration bibliometric analysis, Romania*

**JEL classification:** *Q01, O18, R58, C89*

## 1. Introduction

Integrated approaches are fundamental to responding to contemporary urban challenges, promoting a more sustainable future for urban communities. Thus, concepts such as **sustainable urban development, urban regeneration** are becoming increasingly common, and integrated approaches are fundamental to responding to contemporary urban challenges, promoting a more sustainable future for urban communities. Implementing these concepts can lead to healthier, fairer and more resilient cities.

- **Sustainable urban development** – is a concept based on the planning and development of cities in a way that protects natural resources, reduces carbon emissions and ensures the economic and social well-being of communities, which highlights the need for a balance between economic development and environmental preservation. Starting with climate change mitigation and the development of integrated urban places, sustainable urban development also implies access for all citizens to local opportunities and resources through the use of efficient and healthy modes of mobility, involving minimal financial and environmental costs and ensuring high resilience to disruptive events. Inclusive development can be considered the main component for ensuring long-term sustainability, promoting equity, common prosperity and strengthening civil society in cities (Institute for Transportation & Development Policy, n.d.).
- **Sustainable urbanization** – refers to the process of urban growth that respects the principles of sustainability, ensuring accessibility, energy efficiency and green infrastructure, with the aim of avoiding the uncontrolled expansion of cities and promoting a healthy urban environment (LevelUpIAS, 2023).
- **Urban regeneration, also referred to as urban renewal or reconstruction**, refers to the processes by which degraded urban areas are revitalized, including the renovation of buildings, the improvement of infrastructure, and the creation of quality public spaces, with the objective of revitalizing communities and improving residents' quality of life. Urban regeneration promises physical, material, or spatial solutions to social and economic problems (Castree et al., 2013).
- **Integrated solutions to support sustainable urban development** – involve multidimensional and collaborative approaches to address urban development challenges, which may include sustainable transport strategies, energy efficiency policy development, the promotion of the circular economy, and community involvement in decision-making (UN environment programme, n.d.).

The concepts of sustainable urban development, sustainable urbanization, and urban regeneration are interconnected. Current urban development is often insufficient in terms of the concept of a sustainable city, which implies a focus on sustainability. Thus, balancing the needs of a growing population with the conservation of natural resources and the environment leads to sustainable urban development. At the same time, urban regeneration can be seen as an aspect of sustainable urban development, which aims to transform degraded areas in a way that respects the principles of sustainability.

Integrated solutions are the binder between these concepts, combining the principles of urban regeneration with those of sustainable development and urbanization. Urban regeneration projects can include both energy efficiency and green transport elements as well as interconnected green space elements to create a more sustainable urban environment. Thus, integrated approaches can be considered essential to address the complex problems of modern cities.

The introduction of the concepts: *sustainable urban development*, *sustainable urbanization* and *urban regeneration*, in the context of Romania reflects an adaptation to the challenges and opportunities faced by Romanian cities in the transition to a modern and responsible urban development model. The choice of these themes responds to specific needs and contexts, each having a distinct contribution to the sustainable development of the urban environment.

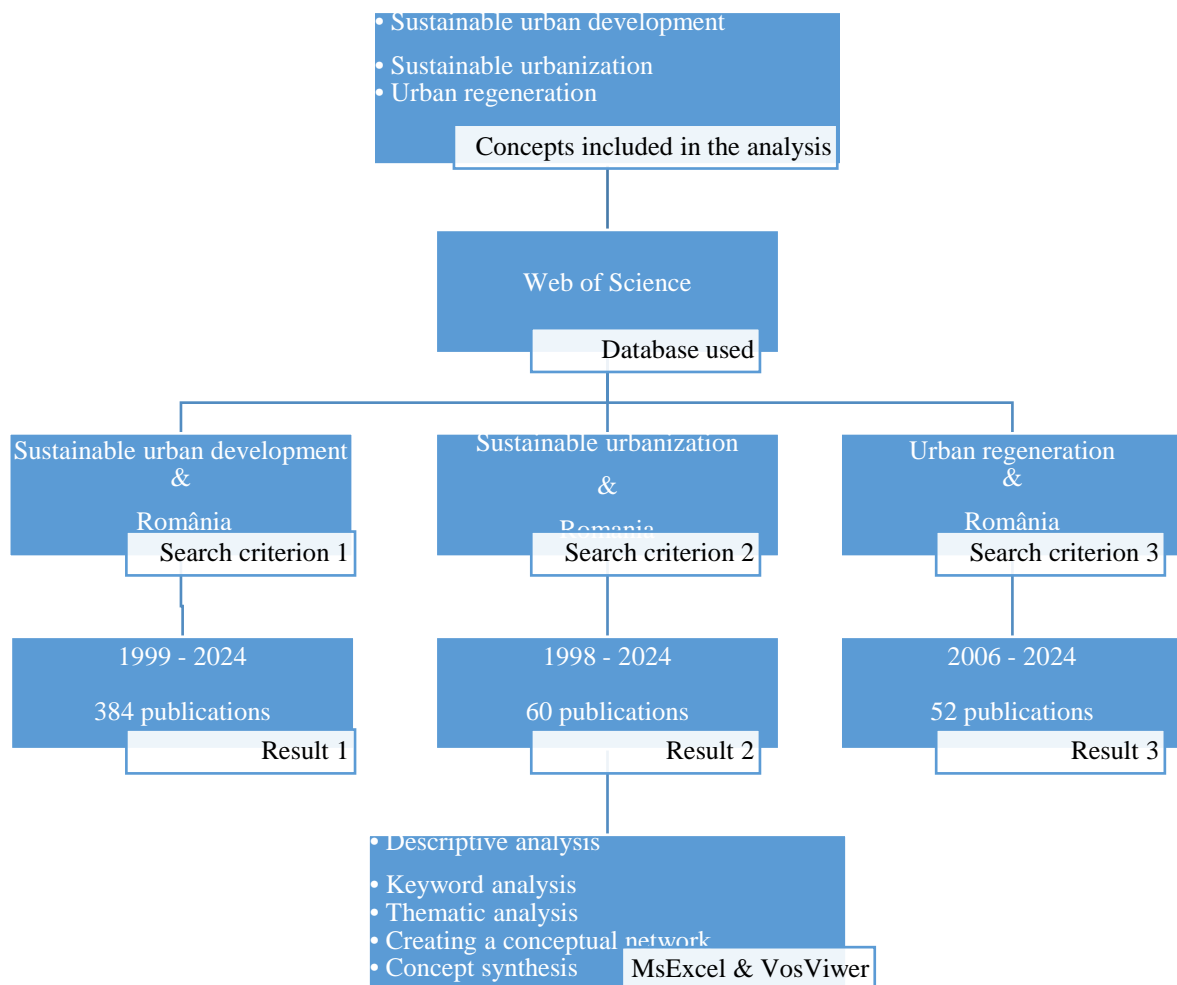
To determine the degree of convergence between these concepts and identify opportunities for closer integration, which would support the transition of Romanian cities toward a model of smart and sustainable urban development, bibliometric analysis will be used. This method allows the identification and quantification of academic articles that address specific themes, thus highlighting the main research trends, thematic frequencies and the degree of overlap between the studied themes.

## 2. Methodology

According to OECD (2002), "bibliometric research is the statistical analysis of books, articles or other publications to measure the "production" of individuals/research teams, institutions and countries, to identify national and international networks and to map the development of new (multidisciplinary) fields of science and technology".

The stages of bibliometric analysis are presented in Figure 1, and the distribution of publications according to the selection criterion and their type, in Table 1.

**Figure 1. Bibliometric analysis stages**



Source: adapted from Macías Ruano et al. (2021).

The definition of the key terms included in the analysis allows the formulation of the 3 search criteria on the Web of Science platform (WoS). Regarding the chronological limits for the publications included in the analysis, it is observed that for the first two search criteria (sustainable urban development & Romania and sustainable urbanization & Romania) the "debut" year is 1999 and 1998, respectively, while for the third criterion (urban regeneration & Romania) the year of the first publication is 2006.

In subsequent analyses, only articles published in journals and those published in conference proceedings will be considered. Thus, according to the WoS selections for the first criterion, 384 articles are selected, 60 articles for criterion 2, and 52 articles for criterion 3. For Criterion 1, of the 387 documents initially identified, 384 were included in the analysis. The difference is explained by the fact that three publications (dated 1999, 2016, and 2021) are double-indexed, being classified both as journal articles and as conference papers; these were counted only once to avoid data duplication. Similarly, for Criterion 3, of the 53 documents initially retrieved, only 52 were considered in the final analysis, due to the exclusion of one duplicate entry (from 2016) during the validation process.

**Table 1. Distribution of publications by search criteria and document type**

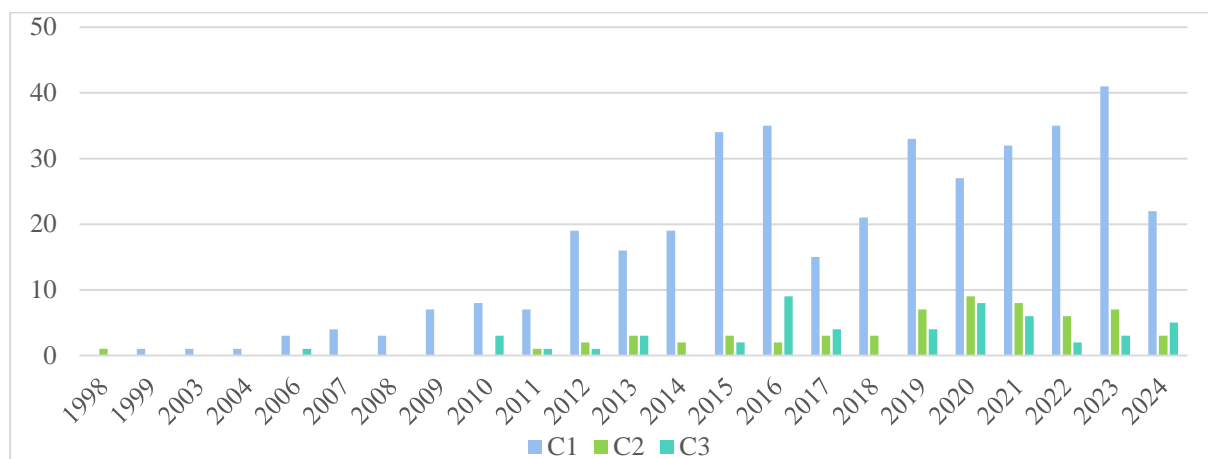
Document type \ Criterion search	Criterion 1	Criterion 2	Criterion 3
	Sustainable urban development & Romania	Sustainable urbanization & Romania	Urban regeneration & Romania
Journal article*	260	49	34
Conference article*	127	11	19
Book chapter	3		
Article Review	8		1
Early access	3	2	2
Publication withdrawn	1		1

\* Criterion 1: Three documents are indexed both as journal articles and as conference papers. A total of 384 unique documents were considered to avoid duplication Criterion 3: One document was identified as a duplicate (indexed both as a journal article and a conference paper) and was excluded during validation. A total of 52 unique documents were considered in the final analysis.

Source: authors' own processing.

Regarding the temporal analysis, it indicates an increased interest in the concept of *sustainable urban development* starting with 2012, with the maximum number of articles being recorded in 2024. This fact may suggest possible changes in public policies/strategies in this field. At the same time, identifying the factors that determined the limitation of research regarding the concepts of *sustainable urbanization* and *urban regeneration* in the Romanian context may constitute a future research topic. It would also be interesting to identify the economic, social or political factors that determined the significant fluctuations in the number of publications in certain periods (Figure 2).

**Figure 2. Distribution of the number of articles according to the search criterion**



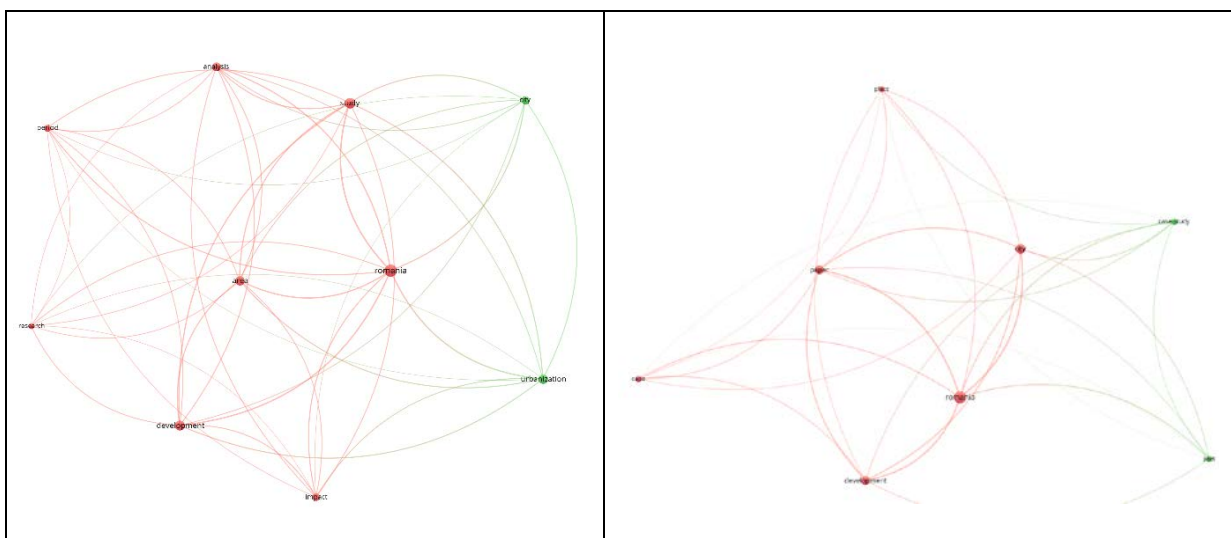
Source: authors' own processing.



disparities between urban settlements by coordinating the three essential dimensions: built space, socioeconomic territory and urban governance requires integrated urban planning (Ristea et al., 2010).

- **Sustainable urbanization** – specifically addresses the expansion of cities, but also the increase in urban population density in a sustainable manner. Similar to the global approach, Romania is facing rapid urbanization in certain regions and, implicitly, a migration from rural to urban areas. Also, the migration of villagers to urban areas, in addition to the introduction of new techniques and technologies for working the land, involves major structural changes in the rolling areas (Dumitru et al., 2023; Hadad, 2019). 60 articles were identified for criterion 2, of which 31 are common with the first search criterion, which may mean that urban expansion and densification are addressed separately from the general approach regarding sustainable urban development (Figure 4, Figure 5).

**Figure 4. The interconnected network of concepts of sustainable urbanization & Romania and urban regeneration & Romania**



Source: authors' own processing using VOSviewer

By including sustainable urbanization as a theme, the need to develop urban spaces that respond to both economic and environmental requirements is emphasized, thus creating resilient and energy-efficient cities (Botezat et al., 2020).

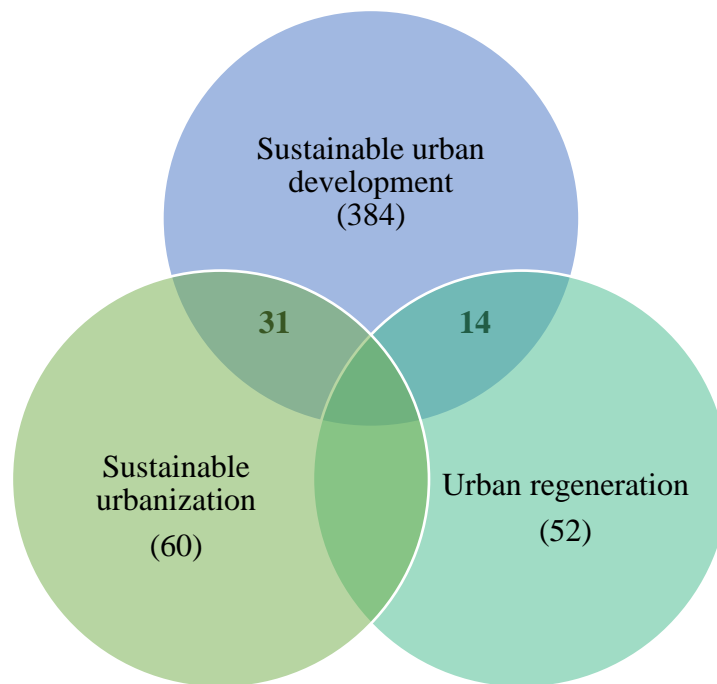
- **Urban regeneration** – is a critical component in the revitalization and rehabilitation of degraded urban areas, a major problem in post-industrial cities in Romania, where many areas require investment and interventions (former industrial areas, neglected housing estates, unfinished and abandoned buildings etc.). Urban regeneration promotes the reintegration of these spaces into the active structure of cities, contributing to increasing the attractiveness and quality of life in these areas and preventing excessive expansion of urban areas. Through regeneration, the aim is not only to improve the built environment, but also to encourage social cohesion and local economic development, an example being the integration of cultural policies defined at local or global level, in urban regeneration strategies (Moldovan, 2024). The bibliometric analysis, based on the articles identified following the application of the three search criteria, shows that this concept is rarely associated with *sustainable urban development* (14 common articles) and *sustainable urbanization*, in the Romanian context (Figure 4, Figure 5).

These three concepts are, therefore, fundamental to guiding Romanian cities towards a smart and sustainable development model, ensuring both resource conservation and an urban infrastructure adapted to the current and future needs of communities.

The analysis of the results obtained after applying the three search criteria shows 31 articles that address common themes to the first 2 criteria suggesting a strong link between sustainable urban development and urbanization processes. At the same time, the 14 articles common between Criterion 1 (*sustainable urban development*) and Criterion 2 (*urban regeneration*) in the Romanian context indicate that a significant part of the research focuses on urban regeneration in the context of sustainable urban development.

The lack of common articles between sustainable urbanization and urban regeneration suggests that these two fields have different approaches, without a direct link between them, in this context, at least in the research published in WoS (Figure 5).

**Figure 5. Thematic overlap of the results of the three search criteria**



Source: authors' own processing

The analysis of keywords, using the frequency with which they appear in the articles, but also based on the conceptual network – which shows the interconnection between them, allows the identification of links between the three concepts in the context of research in Romania (Figure 6).

Among the keywords of the analyzed articles, resulting from applying the three search criteria, those with the highest presence are:

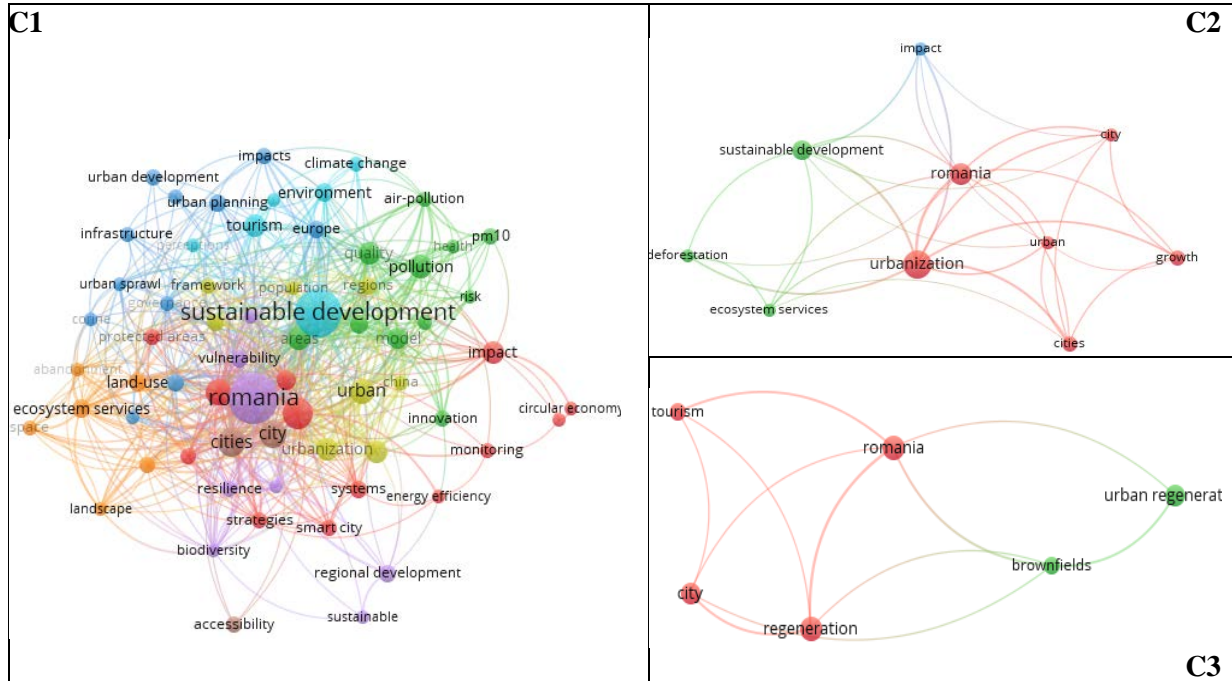
- C1: "Romania", "*sustainable development*", "*sustainability*", "*cities*" and "*city*" (Benedek, 2023; Boda et al., 2015; Sirodov et al., 2015; Tara, 2016).

Romania's sustainable development efforts highlight the interaction between cities, sustainability and the role of urban settlements in achieving the Sustainable Development Goals (SDGs). In this context, Benedek (2023) highlights the fact that large and medium-sized cities, with the exception of some peri-urban areas, in Romania register high values of the Sustainable Development Index associated with minimal associated financial risks. At the same time, in the current international context, the results of the study highlight the underestimation of geopolitical factors in defining the SDGs. In contrast, small cities and rural areas face challenges that can lead to lower living standards, which requires adapted policies to improve sustainable performance (Sirodov et al., 2015).

As solutions, on the one hand Boda et al. (2015) consider that modern geographic tools contribute significantly to urban planning and disaster prevention, thus supporting sustainable

resource management, and on the other hand, decentralization and territorial reforms offer opportunities for increasing economic and administrative efficiency (Tara, 2016).

**Figure 6. The interconnected network of keywords for sustainable urban development & Romania, sustainable urbanization & Romania, and urban regeneration & Romania**



Source: authors' own processing using VOSviewer

- C2: "urbanization", "Romania", "sustainable development", "cities" and "city" (Botezat et al., 2020; Megyesi & Péti, 2019; C. Popescu, 2020);

Considering the waves of urbanization in Romania since the early 2000s, complex processes and significant socio-economic transformations are identified, with implications for the sustainable development of cities and communities. The effects of administrative reforms from that period had a varied impact on the resilience of communities, thus accentuating the disparities between cities in developed counties and poor and isolated communes (Botezat et al., 2020). The increase in interurban inequalities, confirmed by land reform and urban economic transformations, resulting from the "back to the village" movement, underlines the urban transition marked by deindustrialization and the ruralization of the urban economy (C. Popescu, 2020). A similar situation is also found in cities and communes with a Hungarian majority, which present a heterogeneous level of development, with higher performance in the large cities of Székely, but lower in the small towns on the western border (Megyesi & Péti, 2019).

- C3: "Romania", "regeneration", "brownfield", "city", "urban regeneration" (Alpopi & Manole, 2013; Jigoria-Oprea & Popa, 2017; L. Popescu et al., 2020; Ristea et al., 2010).

Urban regeneration in Romania plays a key role in revitalizing cities, addressing issues related to industrial brownfields, commercial disparities and the restructuring of deprived areas. The reconversion of abandoned industrial areas along with the reduction of territorial imbalances are imperative for sustainable urban development (Alpopi & Manole, 2013; Jigoria-Oprea & Popa, 2017; L. Popescu et al., 2020; Ristea et al., 2010). At the same time, studies highlight the need for integrated strategies, the integrated approach, inspired by European Union policies, emphasizes the need for sustainable investments to improve the quality of life and the reconversion of abandoned areas into functional and attractive spaces.

The analysis of the conceptual diagram as well as the identification of the most frequent keywords show a connection between the topics addressed in the articles and their assignment to the

Sustainable Development Goals. Thus, the maximum number of articles, regardless of the search criterion, targets *O11 Sustainable Cities and Communities* and *O13 Climate Action*:

- C1: 186, respectively 131 articles;
- C2: 27, respectively 30 articles;
- C3: 31, respectively 18 articles.

#### 4. Conclusion

The results of the analysis in the Romanian context indicate a thematic fragmentation, with a limited number of studies integrating the concepts: sustainable urban development, sustainable urbanization and urban regeneration, which may highlight the need to identify common strategies to capitalize on the interdependence relationships between them. The results of the evolution of interest in research on these topics indicate a significant increase in 2023 (for the current year, publications were recorded for the period January - October), which may suggest a change in priorities in public policies and, implicitly, in research directions. Considering the significant impact of urbanization on the environment, sustainable urban development is considered an essential direction for transitioning to a green economy, especially in urban areas (Maricut et al., 2023). At the same time, in the context of European policy, especially through the European Green Deal, the concept of sustainable urbanization promotes a model of sustainable economic development in cities, integrating solutions for protecting ecosystems (Zaman et al., 2021) that contribute to the revitalization of urban areas through sustainable mobility solutions and ecological infrastructure (Gâf-Deac et al., 2021).

Although the three concepts are interconnected and essential to address the complex challenges of urbanization in Romania, the studies included in the research presentation emphasize sustainable urban development, which reflects responsible urban planning, efficient use of resources and social integration. The convergence between sustainable urban development and sustainable urbanization indicates a holistic approach to urbanization, in which both ecological and socio-economic development factors are considered, while regarding sustainable urban development and urban regeneration, the presence of common articles between them shows an emerging trend of integrating city revitalization. However, the low volume of publications may suggest that urban regeneration is still approached as a separate topic, without being fully integrated into the overall urban sustainability strategy. On the other hand, the absence of common articles for the topics of sustainable urbanization and urban regeneration indicates a distinct approach between the two concepts in the Romanian context. A possible cause may be the perception of sustainable urbanization as a phenomenon that mainly refers to the expansion and ecological planning of the city, while urban regeneration is considered a punctual intervention on degraded areas. This differentiation may represent a development space for future interdisciplinary research, in the Romanian context, that would integrate both concepts into a model of sustainable urban development.

**Authors' contribution:** *The authors contributed equally to the conception, design, analysis, and writing of this article.*

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