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Regenerative Urban Futures: A Framework for Sustainable City Renewal

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Abstract

Rapid global urbanization necessitates a shift towards more sustainable urban development models. Regenerative approaches, which aim to create net-positive social and ecological outcomes, offer a promising alternative yet often lack practical implementation frameworks for urban renewal. This study addresses this critical gap by exploring how future thinking methodologies can be integrated with regenerative principles. The primary objective was to develop a structured, sustainable, regenerative framework applicable to urban transformation projects. A systematic literature review methodology underpinned this work; 101 relevant publications, sourced from the Scopus and Dimensions databases, were analyzed to synthesize foundational concepts and practices.

The analysis confirmed that effective regenerative urban renewal requires moving beyond simple harm reduction towards active restoration of social-ecological systems and enhanced resilience. Key findings indicate the necessity of integrating deep place understanding ("story of place"), systemic analysis, strategic foresight techniques, and participatory community engagement processes. The developed framework operationalizes these findings, outlining core principles and actionable steps for practitioners. This research provides a theoretically grounded yet practical tool for urban planners, designers, and policymakers. By bridging regenerative theory and practice through a futures-informed lens, the framework offers a novel pathway to foster more resilient, equitable, and thriving urban environments.

Keywords: Regenerative Sustainability, Urban Renewal, Futures Thinking, Sustainable Framework, Strategic Foresight, Urban Resilience, Community Engagement, Regenerative Development, Story of Place, Systemic Design.

1 Introduction

The escalating concentration of the global population in urban centers, anticipated to reach 70% by mid-century (Bucci-Ancapi et al., 2025; Mohan et al., 2020), places immense pressure on planetary systems. This highlights the inadequacy of conventional sustainability efforts, often focused solely on minimizing negative impacts. In response, regenerative approaches are gaining traction, proposing a paradigm shift towards creating net-positive contributions to the social and ecological systems cities depend upon (Loza-Adaui, 2024). This perspective necessitates holistic strategies that actively enhance ecosystem health and community well-being, recognizing their inherent interconnectedness (Alves et al., 2022).

While the conceptual appeal of applying regenerative principles to urban development is growing (Camrass, 2021), a significant challenge remains in translating these ideals into actionable strategies for existing urban environments. The core problem this study addresses is the lack of practical, operational frameworks specifically designed to integrate regenerative goals with forward-looking methodologies within the complexities of urban renewal projects. Current practices often fail to systematically incorporate long-term perspectives and future uncertainties when attempting regenerative transformations. This gap hinders the effective implementation of regenerative principles beyond theoretical discussions or isolated pilot projects.

Integrating methodologies from future thinking and strategic foresight presents a promising avenue to overcome this implementation gap. These tools can equip planners, designers, and communities to explore potential future trajectories, anticipate challenges, and co-create pathways towards desired regenerative outcomes (Field et al., 2024). By fostering a deeper understanding of place-based dynamics across different time horizons, future thinking can enrich the foundation for regenerative action. Therefore, the purpose of this study is to develop a novel framework that synthesizes regenerative principles with future thinking tools, specifically tailored to guide sustainable urban renewal. This research seeks to provide a structured approach where one currently does not exist.

To achieve this purpose, the study focuses on the following specific aims:

1. To examine how methods rooted in future thinking can enhance the development of a nuanced “story of place,” thereby providing a robust grounding for shaping regenerative urban futures.
2. To identify and synthesize the core principles and structural elements necessary for a framework that effectively guides the application of regenerative future thinking in practical urban renewal contexts.

Through analysis and synthesis addressing these questions, this research aims to offer a tangible sustainable regenerative framework, contributing valuable insights for practitioners and policymakers engaged in navigating urban transformations towards more resilient and life-affirming futures.

2 Materials & Methods

This study employed a systematic literature review (SLR) approach to investigate the integration of future thinking within regenerative urban practices. The methodology adhered to the principles outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) to ensure a rigorous and transparent process for identifying, selecting, and synthesizing relevant scholarly works. This systematic approach was chosen for its suitability in mapping the existing knowledge landscape across the interdisciplinary fields relevant to the research questions.

2.1 Literature Search Strategy

A comprehensive search for relevant publications was conducted using the Scopus and Dimensions databases. These databases were selected due to their broad coverage of peer-reviewed literature spanning crucial fields such as urban planning, environmental science, sustainability studies, and future research. The search strategy involved developing specific search strings using Boolean operators (AND, OR) combined with keywords clustered around three core concepts: regenerative approaches (e.g., “regenerative design,” “regenerative development,” “urban regeneration”), futures thinking (e.g., “futures studies,” “strategic foresight,” “scenario planning”), and the urban context (e.g., “urban renewal,” “sustainable cities,” “urban environments”). Keywords related to potentially enabling technologies mentioned in preliminary scoping (e.g., “AI,” “blockchain,” “urban digital twins,” “IoT” combined with “sustainability” or “urban”) were also incorporated to capture technologically-focused applications within the domain of the regenerative future.

2.2 Study Screening and Selection

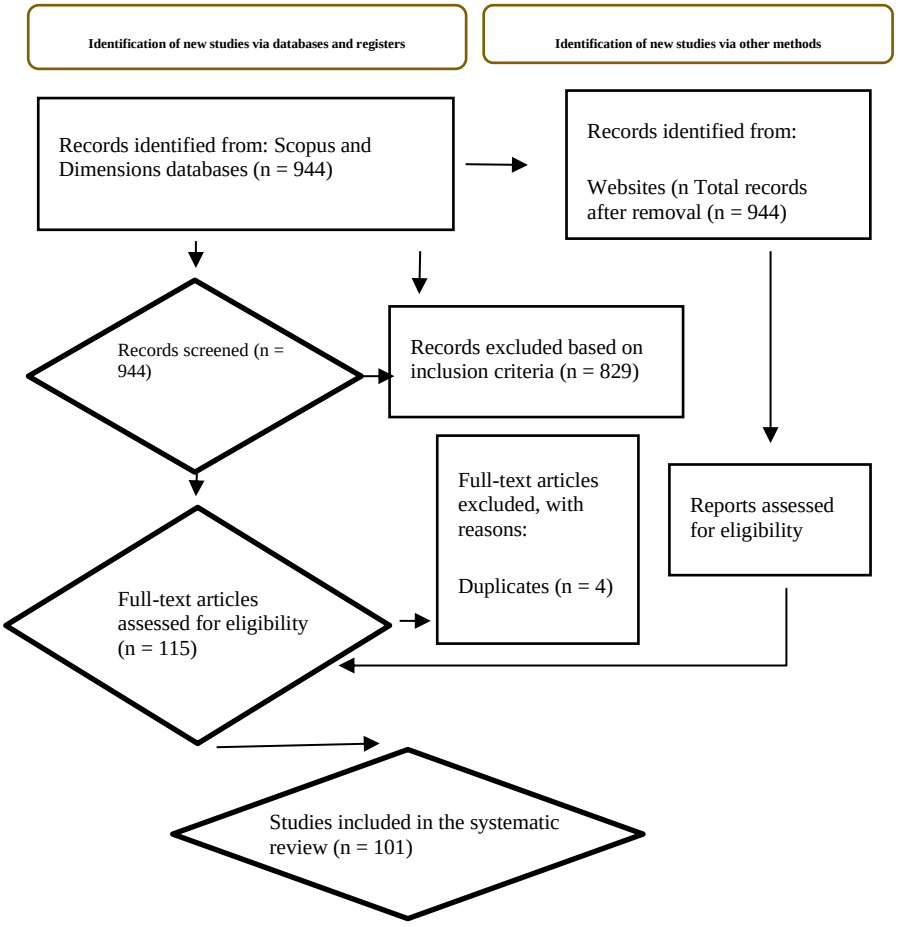
The initial database search yielded 944 articles. A multi-stage screening process was implemented to identify studies directly pertinent to the research aims. First, titles and abstracts were reviewed against predefined inclusion and exclusion criteria. Studies were included if they: (a) investigated regenerative principles within an urban setting; (b) examined the application of future thinking, foresight, or related prospective methodologies; (c) addressed the intersection of these concepts in urban planning, design, development, or policy; or (d) discussed relevant technological applications promoting regenerative outcomes. Exclusion criteria included: (a) studies focused exclusively on non-urban (rural, greenfield) contexts; (b) purely theoretical works lacking practical application or empirical grounding; (c) publications not available in English; and (d) non-research articles such as book reviews or editorials.

Following the initial title/abstract screening, the full texts of potentially relevant articles were retrieved and assessed against the same criteria for final inclusion. This process, detailed in the PRISMA flow diagram (Figure 1), resulted in 115 articles proceeding to full-text review. After removing four duplicate entries identified during this stage, a final corpus of 101 articles was retained for data extraction and analysis.

2.3 Data Extraction

Data from the final set of 101 included articles were systematically extracted using a predefined template. This form captured key information relevant to the research questions, including study objectives, methodologies employed, principal findings and conclusions, specific context (e.g., geographic location, urban typology), details on future thinking methods utilized, descriptions of any regenerative frameworks proposed or discussed, practical implications highlighted, technological innovations mentioned (including application areas and reported outcomes), and details pertinent to subsequent data analysis.

Figure 1: PRISMA flow diagram representing the screening and final inclusion of studies.



2.4 Data Analysis

The analysis of the data extracted from the 101 selected articles proceeded through two complementary stages: quantitative bibliometric mapping followed by qualitative content synthesis, culminating in the framework development.

2.4.1 Bibliometric Mapping of the Research Landscape

To gain a quantitative overview of the intellectual structure and publication trends within the collected literature, a bibliometric analysis was conducted. The 'bibliometrix' package (Aria & Cuccurullo, 2017) within the R statistical software environment (version 4.5.2) was utilized for this purpose. This stage aimed to objectively identify key characteristics of the research field by mapping thematic clusters, which is analyzing the co-occurrence of keywords to reveal dominant research themes and their interconnections. Identifying influential works by assessing citation patterns to pinpoint highly impactful publications and potential seminal contributions. Ultimately, examining collaboration networks by mapping co-authorship patterns to understand the structure of research groups working in this area.

The outputs from this quantitative stage, including visualizations like thematic maps and statistical summaries of keyword frequencies, provided a structured context and informed the subsequent qualitative interpretation.

2.4.2 Qualitative Synthesis and Framework Construction

Building upon the patterns revealed by the bibliometric mapping, a qualitative synthesis of the content extracted from the 101 articles was performed. This interpretive process served as the foundation for constructing the proposed Sustainable Regenerative Framework. The development followed an iterative refinement approach involving several key activities like extracting core concepts, which entails identifying and collating recurring ideas, principles, operational strategies, enabling factors (including specific technologies), and challenges discussed in the literature regarding the nexus of future thinking and regenerative urbanism. Integrating diverse insights, which is weaving together the identified concepts, linking theoretical propositions found in the literature with reported practical applications and outcomes. The prominent themes highlighted by the bibliometric analysis helped to structure this synthesis and prioritize key areas.

Subsequently, defining the framework architecture entails organizing the synthesized findings into a coherent structure. This involved establishing the core components, essential principles, and logical flow needed to guide the application of future thinking towards regenerative urban goals. The development of practical guidance is done by translating the synthesized knowledge into actionable recommendations and guiding questions designed for use by urban practitioners, planners, and policymakers. This focused on converting conceptual understanding into operational steps. Ultimately, there was validation against source literature by continuously cross-referencing the emerging framework elements against the evidence base within the 101 reviewed articles. This ensured the final framework was robustly grounded in existing research while offering a novel, synthesized perspective.

3 Results

This section presents the findings derived from the systematic literature review (SLR) and subsequent bibliometric analysis of 101 selected articles investigating the intersection of futures thinking and regenerative urban practices. The results encompass publication trends, key research contributors, thematic structures, the principal regenerative concepts identified in the literature, and the core components identified for the proposed framework.

3.1 Bibliometric Analysis Findings

3.1.1 Publication Trends

Analysis of annual scientific production showed a marked increase in publications on regenerative futures and ecological restoration topics, particularly from 2021 onward. The number of articles grew from 15 in 2021 to 40 by 2024 (Table 1). Mean total citations per article (MeanTCperArt) were highest for single publications in 2017 and 2018, while more recent years showed lower averages (Table 1). Mean total citations per year (MeanTCperYear) followed a similar pattern (Table 1).

Table 1: Annual scientific production and average citations.

Year	MeanTCperArt	N	MeanTCperYear	CitableYears
2012	14	1	1	14
2017	216	1	24	9
2018	251	1	31.38	8
2019	34.67	3	4.95	7
2020	27.5	4	4.58	6
2021	42.27	15	8.45	5
2022	25.18	17	6.3	4
2023	10.41	27	3.47	3
2024	2.1	40	1.05	2
2025	0	6	0	1

3.1.2 Author Contributions and Influence

Author metrics analysis (Figure 2) identified J.G. Lundgren and J.A. Andersson with the highest total citations (TC) within the dataset. N. Bocken had the highest number of publications (NP) within the dataset, particularly from 2023. The distribution of authors and their first publication years (PY_start) pointed towards an interdisciplinary field (Figure 2).

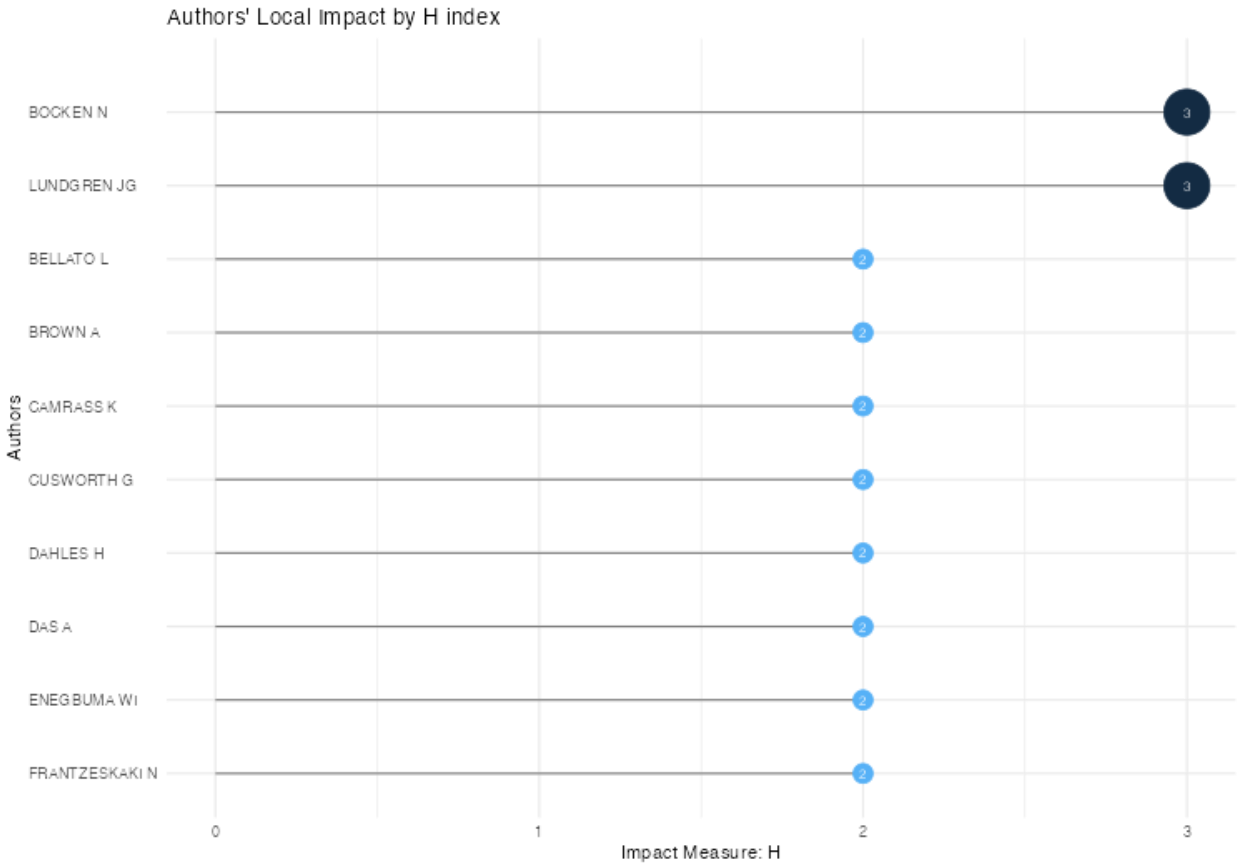


Figure 2: Bibliometric analysis of publication sources in regenerative futures research. This figure offers a detailed breakdown of the publication sources that have significantly contributed to the field of regenerative futures research.

Source: Data compiled by the author from the Scopus database were analyzed using the R package “bibliometrix”.

3.1.3 Emerging Research Themes

Temporal analysis of keywords (Figure 3) found “regenerative agriculture” to be the most frequent term (19 occurrences, median year 2023). “Regenerative futures” appeared earlier

(median year 2022). Terms including "regenerative business," "business models," and "regenerative tourism" showed more recent emergence (primarily 2023 onwards) (Figure 3).

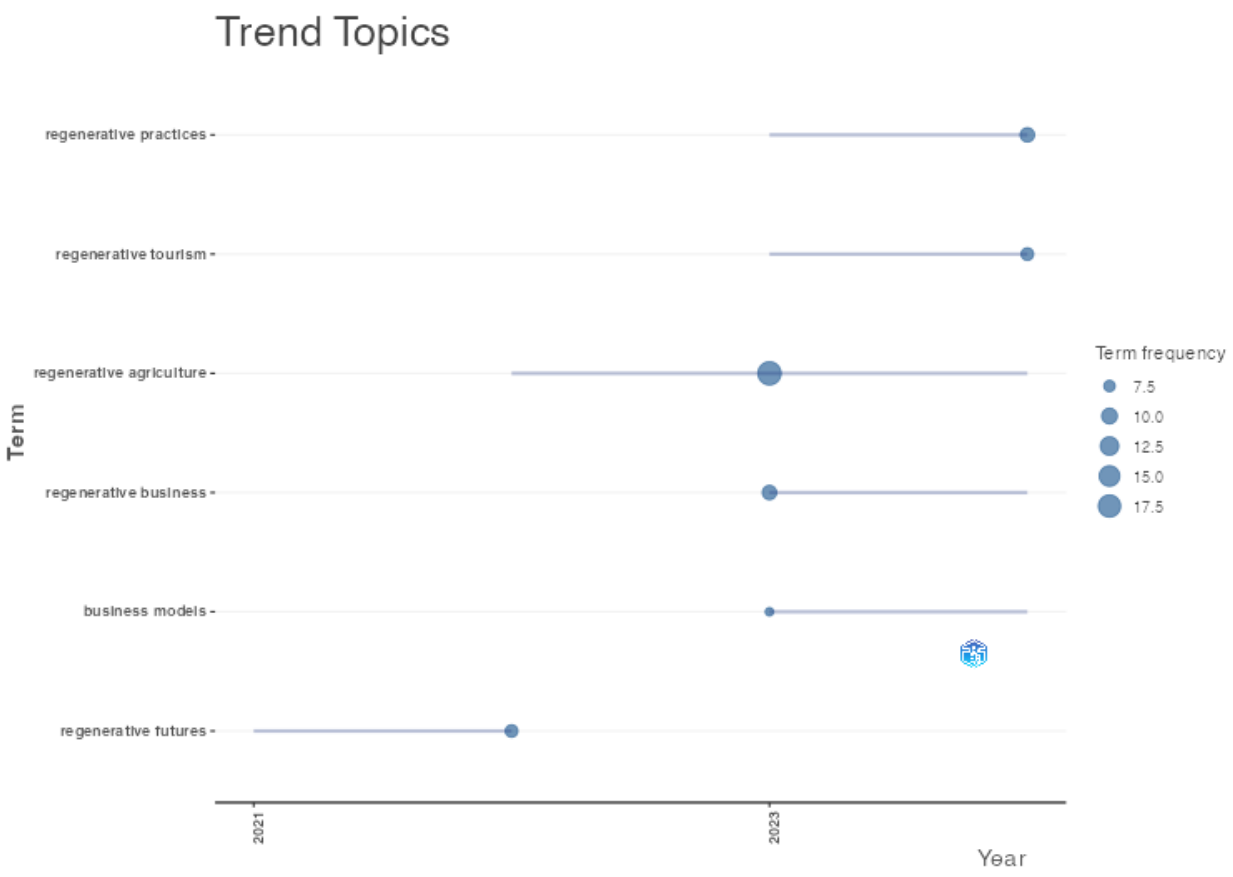


Figure 3: Temporal and thematic analysis of regenerative futures research trends. This figure presents a comprehensive overview of the key topics contributing to regenerative futures research, along with their frequency and temporal distribution.

Source: Data compiled by the author from the Scopus database were analyzed using the R package "bibliometrix".

3.1.4 Geographic Distribution of Research

Analysis of publication origins (Figure 4) revealed the United States had the highest article volume (16 articles, 13.9%), predominantly single-country publications (SCP). Australia followed (14 articles, 12.2%), with a combination of SCP and multi-country publications (MCP). India and the Netherlands each contributed 8 articles (7%). Several countries, including Austria, Brazil, and Canada, showed high MCP rates (Figure 4).

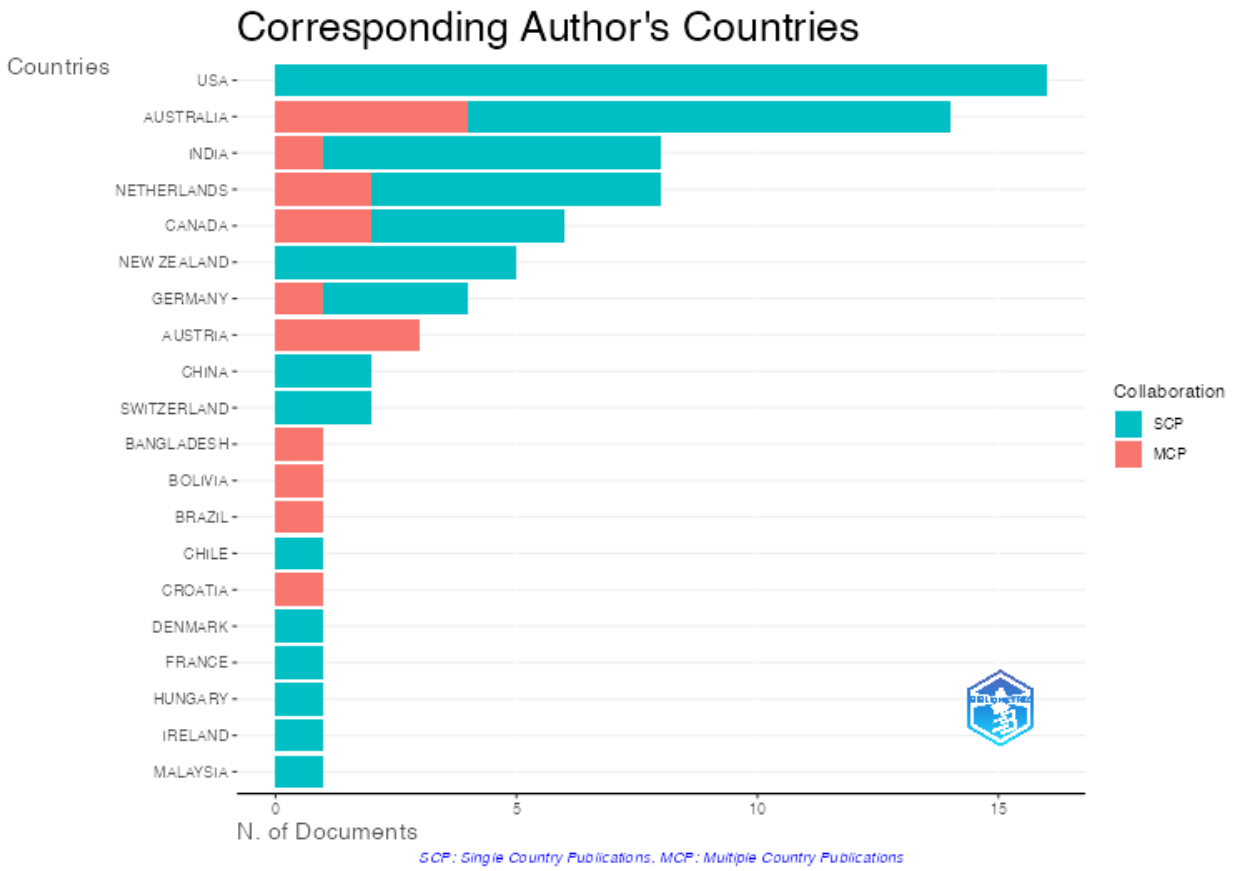


Figure 4: Geographic distribution of research on regenerative futures. This figure presents a comprehensive overview of the global research landscape in regenerative futures, highlighting the contributions of various countries.

Source: Data compiled by the author from the Scopus database were analyzed using the R package "bibliometrix".

3.1.5 Thematic Structure

Thematic mapping using co-occurrence network analysis (Figure 5) identified four main research clusters labelled: "regenerative tourism," "business models," "findings provide," and "regenerative practices." The "regenerative practices" cluster contained the highest frequency terms (e.g., "regenerative practices," "regenerative agriculture"), while the "business models" cluster included terms like "circular economy" and "sustainable development" (Figure 5).

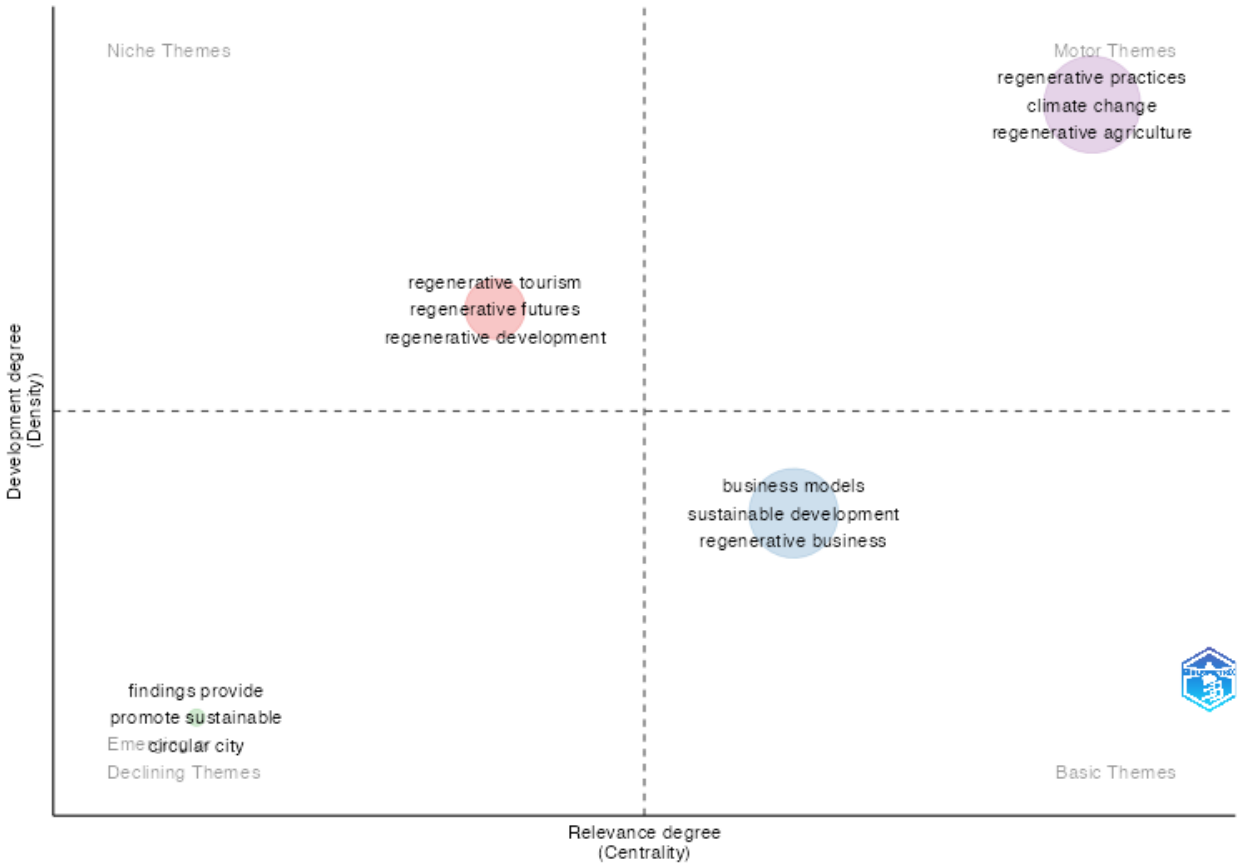


Figure 5: Conceptual network of regenerative futures research, themes and interconnections. This figure presents a comprehensive visual representation of the key themes, concepts, and their interrelationships within the field of regenerative future research.

Source: Data compiled by the author from the Scopus database were analyzed using the R package "bibliometrix".

3.1.6 Concept Interconnections

Further co-occurrence analysis (Figure 6) showed relationships between concepts. "Regenerative approaches" exhibited high betweenness centrality, connecting clusters related to the "built environment" / "supply chain" and "regenerative agriculture" / "climate change." Word frequency visualization (Figure 7) confirmed the high frequency of "regenerative practices" and "regenerative agriculture," alongside terms like "soil health," "climate change," "business models," "circular economy," "food systems," and "built environment."

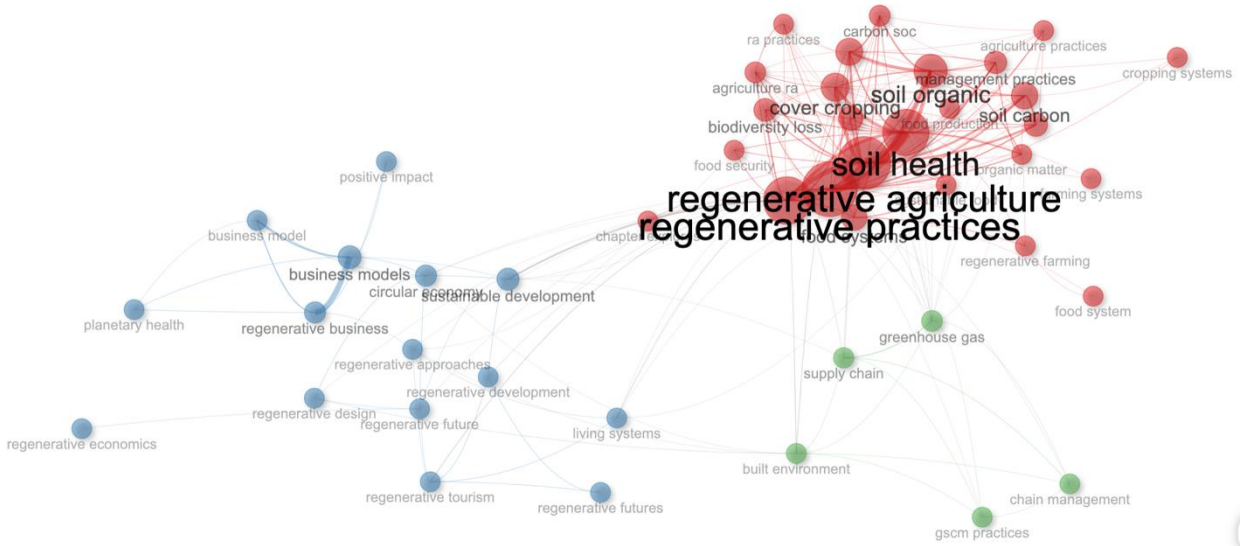


Figure 6: Interconnected Themes in Regenerative Futures Research: A Co-occurrence Network Visualization. This figure presents a complex network diagram illustrating the relationships and connections between key concepts in the field of regenerative futures research.

Source: Data compiled by the author from the Scopus database were analyzed using the R package “bibliometrix”.

Figure 7: Conceptual landscape of regenerative futures research of a word frequency visualization. This figure presents a word cloud visualization that offers a compelling visual summary of the most frequently occurring terms in regenerative futures research.

Source: Data compiled by the author from the Scopus database were analyzed using the R package "bibliometrix".

3.2 Theoretical Framing and Key Regenerative Concepts Identified in the Literature

The systematic literature review identified a recurring set of core concepts associated with regenerative approaches across various domains. These concepts align strongly with theoretical perspectives viewing urban environments as complex socio-ecological systems (SES), where human and natural components are inextricably linked and co-evolved (Folke et al., 2010; Ostrom, 2009). Furthermore, understanding cities through the lens of Complexity Theory highlights their inherent non-linearity, emergent properties, and unpredictability, which challenge traditional, linear planning approaches (Batty, 2008; Portugali, 2011). Regenerative approaches, therefore, can be framed as attempts to navigate this complexity by enhancing the resilience, adaptive capacity, and overall health of urban SES, shifting focus from impact minimization towards actively contributing to the revitalization of these interconnected systems.

Among the key concepts identified within this theoretical context was Regenerative Agriculture. The literature described practices like cover cropping and no-till farming aimed at enhancing ecological functions within the agricultural SES, particularly soil health and biodiversity (Singh et al., 2023; Prairie et al., 2023). While often linked to benefits such as carbon sequestration, challenges regarding scalability and variable outcomes like inconsistent soil CO2 emission reductions were also reported (Boogades et al., 2025; Alexanderson et al., 2023), reflecting the complexities of managing ecological processes. This concept was noted to frequently overlap with agroecology and permaculture, sometimes extending to include crucial social equity goals within the food system SES (Fenster et al., 2021b).

In the business domain, Regenerative Business Models or Enterprises were identified as systemic approaches focused on creating positive multi-stakeholder value and contributing to ecological restoration, operating within the broader urban SES rather than solely through conventional profit motives (Drupsteen & Wakkee, 2024; Konietzko et al., 2023). Similarly, the concept of Regenerative Cities or Urbanism was found, representing a necessary holistic integration of social and ecological health improvements that acknowledges the complex adaptive nature of urban ecosystems, contrasting with standard socioeconomic revitalization efforts (Cusworth et al., 2021). Turning to education, the literature identified Regenerative Education as a pedagogical approach fostering the systems thinking, creativity, and understanding of human/non-human interconnectedness required for SES stewardship, sometimes involving reforms to include diverse perspectives like Indigenous knowledge (Buckton et al., 2024).

Further concepts identified include Regenerative Food Systems, described as integrated approaches addressing the complex interactions of production, waste, governance, and community engagement, often emphasizing food sovereignty within the SES (Loring et al., 2022); Regenerative Governance, involving alternative organizational structures reflecting principles like self-management suited to complex systems (Gervais et al., 2024); and Regenerative Tourism, identified as tourism aiming for positive contributions by integrating diverse knowledge forms (Gerke et al., 2023; Pearsons et al., 2024). Additionally, Regenerative Organizing was found as an approach aligning organizational practices with living system dynamics for resilience (Gordon et al., 2021), and Assisted Natural Regeneration was noted as a conservation practice focused on accelerating ecological recovery within specific ecosystem contexts (Fenster et al., 2021b).

An overarching concept identified was Regenerative Sustainability. This was described as focusing on restoring human-nature relationships through co-creative, place-based practices (Camrass, 2023), resonating strongly with Place Theory which underscores the importance of lived experience, specific local context, meaning, and attachment in shaping effective interventions (Tuan, 1977; Relph, 1976). Finally, beyond these specific concepts, the literature frequently noted several related factors critical for navigating SES complexity: the need to overcome obstructive, entrenched mechanistic worldviews (Alexanderson et al., 2023); the emphasized importance of integrating diverse knowledge systems, including local and Indigenous knowledge (Gordon et al., 2021; Ali, 2024); and the potential role of technologies like AI and digital twins in modelling, monitoring, or supporting regenerative practices (Kazimierczuk et al., 2023; Jordon et al., 2022; Bucci-Ancapi et al., 2025; Gammage et al., 2023; Fenster et al., 2021a). The proactive, goal-oriented nature of these regenerative concepts implicitly highlights the need for anticipatory capacities, a core theme in Future Studies to guide actions towards desired future states within complex, evolving systems (Poli, 2017).

3.3 Proposed Sustainable Regenerative Framework Components

Synthesizing insights from the bibliometric analysis and the qualitative review of concepts within the selected literature resulted in the development of a Sustainable Regenerative Framework. The core components identified as essential for integrating future thinking with regenerative urban practices are presented in Figure 8 and listed below:

1. Holistic Assessment
2. Strategic Foresight
3. Regenerative Design
4. Adaptive Implementation

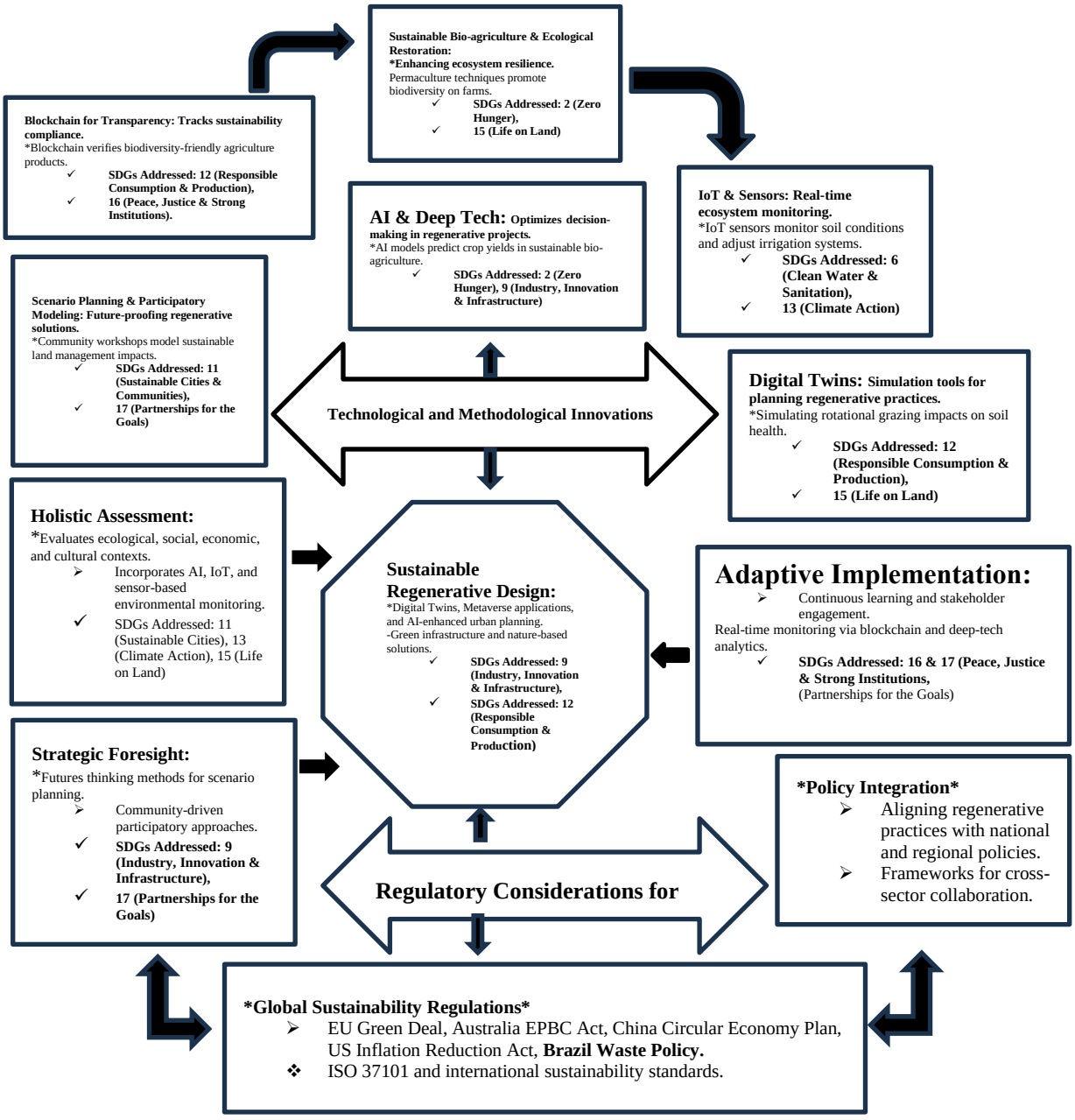


Figure 8: Integrated framework for regenerative urban development. This figure likely illustrates a comprehensive approach to urban sustainability.

3.4 Discussion

This study investigated how future thinking can enhance regenerative approaches in urban environments, aiming to develop a practical framework to bridge theory and application in urban renewal. The results, derived from a systematic review and bibliometric analysis of 101 articles, highlight a rapidly growing interdisciplinary field and provide the foundation for the proposed Sustainable Regenerative Framework presented in Figure 8.

3.4.1 Interpretation of Research Trends and Concepts

The marked increase in publications since 2021 (Table 1) suggests a significant and growing scholarly interest in moving beyond conventional sustainability towards regenerative paradigms that aim for net-positive impacts (Doherty et al., 2021; Loza-Adaui, 2024). The interdisciplinary nature of the field, evidenced by author affiliations (Figure 2) and the breadth of identified concepts (Section 3.2)-spanning agriculture, business, urbanism, education, tourism, and governance underscores the systemic nature of regenerative transformations. The prominence of ecological themes ("regenerative agriculture," "soil health," "climate change" - Figures 3 and 7) combined with the emergence of socio-economic applications ("regenerative business," "tourism" - Figure 3) indicates an expanding scope. However, the literature also points to persistent challenges, such as scaling practices effectively (Boogades et al., 2025) and overcoming limiting worldviews (Alexanderson et al., 2023). The varied geographic distribution of research (Figure 4) signals global relevance but also highlights opportunities for enhanced international collaboration and knowledge exchange. The potential for technologies like AI and digital twins to support these efforts was frequently noted across different applications (Kazimierczuk et al., 2023; Bucci-Ancapi et al., 2025; Fenster et al., 2021a).

3.4.2 Answering the Research Questions

RQ1: Contribution of Future Methods to "Story of Place": The findings support the proposition that future methods are valuable for developing the rich, multi-layered "story of place" needed for authentic regenerative action. By employing techniques such as historical trend analysis, scenario planning, systems modelling, and community foresight workshops (Berkhout, 2002; Yanaş, 2019), stakeholders can move beyond static, often narrowly focused urban assessments (Newman, 2020). These methods facilitate the exploration of path dependencies, uncertainties, and diverse perspectives including crucial local and Indigenous knowledge (Gordon et al., 2021; Ali, 2024; Wooltorton et al., 2022), thereby creating a more holistic understanding of the social-ecological system as a foundation for co-creating place-appropriate regenerative futures (Camrass, 2023).

RQ2: Principles for a Regenerative Futures Framework: The synthesis of the literature, informed by the bibliometric analysis (e.g., Figures 5, 7), revealed key principles for integrating future thinking into regenerative urban renewal. These underpin the proposed framework (Figure 8) and include: Systems Thinking, acknowledging the interconnectedness of urban ecological, social, and economic domains (Ali, 2024), reflected in concepts like food systems and circular economy; Anticipatory and Adaptive Approaches, utilizing foresight to navigate uncertainty and enabling iterative learning (Slawinski et al., 2021); Deep Stakeholder and Community

Engagement, ensuring projects are contextually relevant and foster co-ownership (Cusworth et al., 2021; Bucci-Ancapi et al., 2025); and Integration of Ecological Health, often through approaches like Nature-Based Solutions (Fenster et al., 2021a), linking the built environment with living systems (Figure 5).

3.5 The Sustainable Regenerative Framework Explained

The framework developed in this study (Figure 8) aims to operationalize these principles through four interconnected, iterative phases.

3.5.1 Holistic Assessment

This phase involves developing a deep, systemic understanding of the specific urban context. It integrates ecological, social, economic, and cultural dimensions, examining historical patterns, current dynamics, and potential future trajectories (Alves et al., 2022). Techniques may include multi-criteria analysis (Terra-Dos-Santos et al., 2023) and potentially leveraging real-time data from sensors or AI for environmental monitoring (Cappetz et al., 2024). The goal is to build the rich "story of place" necessary for context-specific action, aligning with SDGs like 11, 13, and 15 (Allen et al., 2024; Field et al., 2024; Hermans et al., 2023).

3.5.2 Strategic Foresight

This phase explicitly uses future thinking methods (e.g., scenario planning, horizon scanning, visioning) to explore possible futures, identify potential challenges and opportunities, and co-develop strategic directions (Yanaş, 2019). It emphasizes participatory approaches to include diverse community voices and knowledge (Wooltorton et al., 2022; Bucci-Ancapi et al., 2025), fostering innovation and shared goals aligned with SDGs 9 and 17 (Bishnoi et al., 2024; Inversini et al., 2023). The insights of influential authors identified (Figure 2) could inform this phase (La-Canne & Lundgren, 2018; Allen et al., 2024).

3.5.3 Regenerative Design

Moving from strategy to action, this phase focuses on designing interventions (e.g., infrastructure, buildings, programs, policies) based on regenerative principles. The aim is to create solutions that actively enhance ecological health, promote social well-being, and generate positive economic value within the specific context. Tools like digital twins for simulating design impacts (Oyefusi et al., 2024) or AI-enhanced planning (Jordon et al., 2022) could support this phase, aligning with SDGs 9 and 12 (Bag & Rahman, 2023; Emanuelsson et al., 2021).

3.5.4 Adaptive Implementation

This phase acknowledges the dynamic nature of urban systems and involves implementing designed interventions through flexible, iterative cycles (Mehmood et al., 2020; Hermans et al., 2023). It prioritizes real-time monitoring (Newman, 2020), continuous learning, stakeholder feedback loops (Haselsteiner et al., 2021), and adapting strategies based on observed outcomes and changing conditions (Slawinski et al., 2021). This phase necessitates strong governance structures and partnerships (SDGs 16, 17) and ensures alignment with relevant regulations and policies (Doherty et al., 2021; Gosnell et al., 2020; Hilson & Savaresi, 2024; Kulundu-Bolus, 2023; Field et al., 2024; Waddock et al., 2024).

3.6 Contribution and Context

This research contributes a novel framework that systematically integrates future thinking with regenerative principles, specifically tailored for urban renewal contexts. While foundational work exists in regenerative development (e.g., Fenster et al., 2021b) and urban future studies, this study addresses an identified gap by providing a structured, operational approach derived from a synthesis of recent literature (Section 3.2) and bibliometric trends (Section 3.1). It offers a pathway for moving from theoretical concepts towards practical application in complex urban settings. The framework's development, grounded in the systematic review methodology (Aria & Cuccurullo, 2017), reflects the growing scholarly momentum identified in this field (Table 1).

3.7 Comparison with Other Studies

The findings align with observations by Camrass (2021; 2023), who also noted the increasing focus on regenerative thinking in urban contexts and the need for systematic approaches. The emphasis on integrating local and Indigenous knowledge resonates with calls by Gordon et al. (2021) and others for more inclusive knowledge systems in sustainability transitions. The identified challenge of scaling regenerative practices (Boogades et al., 2025) confirms existing concerns about moving beyond niche applications. While many studies focus on specific regenerative concepts (e.g., regenerative agriculture - Giller et al., 2021; regenerative business - Konietzko et al., 2023), this framework attempts a novel synthesis specifically integrating futures thinking as an operational tool for urban renewal, addressing a gap noted by Camrass (2021) regarding the translation of principles into practical frameworks. Compared to more narrowly focused sustainability assessment tools, this framework explicitly incorporates foresight and adaptive management cycles.

3.8 Limitations of the Study

Several limitations should be considered when interpreting these findings. The SLR relied on two academic databases (Scopus, Dimensions) and English-language publications, potentially excluding relevant insights from other sources, languages, or grey literature. The framework

itself is conceptual, developed through literature synthesis, and requires empirical validation through real-world case studies to assess its practical effectiveness and context adaptability. The rapidly evolving nature of regenerative practices and associated technologies means the knowledge base is dynamic. Furthermore, the validity of forward-looking citations (e.g., 2025) should be carefully confirmed by the authors.

3.9 Implications and Future Research

The proposed Sustainable Regenerative Framework provides a potentially valuable tool for urban planners, policymakers, designers, and community groups seeking to implement transformative urban renewal projects, offering a structured process for incorporating long-term, systemic, and participatory perspectives. However, further work is necessary to build upon this initial synthesis and enhance its practical utility. Key directions for future research should prioritize conducting empirical case studies across diverse urban contexts and scales; this is essential to test, refine, and validate the framework's applicability and effectiveness in real-world settings.

Furthermore, deeper investigation is needed into the practical integration and ethical considerations of specific technologies, such as artificial intelligence (AI), digital twins, the Internet of Things (IoT), and blockchain, within each phase of the framework. Alongside technological considerations, future work should focus on developing robust metrics and evaluation methods capable of assessing the multi-dimensional (ecological, social, economic, and cultural) outcomes of projects guided by this framework. Relatedly, research should explore governance models and policy mechanisms that can best support the implementation of such an adaptive, futures-oriented approach. Finally, to capture a wider range of knowledge and practice, future systematic reviews could benefit from broadening the literature base through the inclusion of additional databases, publications in other languages, and non-academic sources like grey literature.

4 Conclusion

This study investigated the integration of future thinking methodologies with regenerative approaches to address the complexities of sustainable urban renewal. Through a rigorous literature assessment and bibliometric analysis, the study revealed the expanding importance and multidisciplinary character of regenerative concepts, as well as the crucial need for practical frameworks to guide their urban implementation.

The primary contribution of this work is the development of the Sustainable Regenerative Framework, comprising four interconnected phases: Holistic Assessment, Strategic Foresight, Regenerative Design, and Adaptive Implementation. This framework offers a theoretically grounded and actionable pathway for urban stakeholders to move beyond conventional sustainability practices towards actively fostering the health and vitality of interconnected social and ecological systems. While acknowledging the limitations inherent in a literature-based

synthesis and the need for empirical validation, this framework provides a structured approach to navigating urban transformations towards more resilient, equitable, and life-affirming futures. Continued research, practical application, critical reflection, and collaborative learning are essential to further advance the theory and practice of regenerative urbanism.

5 Conflict of Interest

The author declares that there are no conflicts of interest.

6 Author Contributions

Henry Efe Onomakpo Onomakpo conceived the study, performed the literature review, conducted the bibliometric analysis, developed the framework, and wrote the manuscript.

7 Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

8 Acknowledgments

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9 Data Availability Statement

The bibliometric data analyzed in this study originates from the Scopus and Dimensions databases. Due to the proprietary nature of these databases, direct access to the raw data is subject to individual subscription agreements with the respective database providers. However, the processed data, along with the analytical code used in this study (primarily utilizing the "bibliometrix" package in R, which can be assessed on https://cran.r-project.org/package=bibliometrix), is deposited on the publisher's website. The materials will remain archived permanently.

10 Reference

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