# Mapping Sustainable Innovation in Latin America: Scientific Production and Regional Trends

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***Abstract*– This study presents a bibliometric review of the scientific production on sustainable innovation in Latin America during the period 1993–2025. Drawing on data from Scopus and Web of Science, a total of 664 peer-reviewed documents were analyzed to identify trends in publication output, regional disparities, patterns of international collaboration, and thematic structures. The findings reveal a marked increase in publication activity over the past decade, with Brazil and Mexico emerging as the primary contributors to the field. However, notable asymmetries persist both in terms of national research capacity and the distribution of collaborative networks across the region. Moreover, keyword analysis indicates a strong thematic concentration around environmental sustainability, renewable energy, and the strategic role of BRICS countries, reflecting the growing influence of Global South perspectives. Strategic thematic mapping further identifies emerging research areas, including green finance and agribusiness sustainability, which are gaining visibility but remain underdeveloped. Nonetheless, the analysis also exposes a fragmented conceptual landscape, characterized by limited integration across thematic clusters and disciplines. This fragmentation underscores the need to promote greater regional integration, foster interdisciplinary research, and enhance the inclusion of underrepresented countries and research topics. In sum, this review contributes to a deeper understanding of the evolution, structure, and thematic orientation of sustainable innovation research in Latin America. Furthermore, it offers strategic insights to inform future academic inquiry and guide policy alignment toward more inclusive and regionally grounded sustainability agendas.***

***Keywords*-- Sustainable innovation; Latin America; Bibliometric; Thematic mapping; Research collaboration; BRICS.**

## I. INTRODUCTION

Innovation plays a pivotal role in advancing sustainability, particularly in regions confronted with pronounced environmental and socioeconomic challenges. In the Latin American context, the imperative to transition toward more sustainable development models has prompted governments, the private sector, and academic communities to explore strategies in which innovation contributes not only to economic growth, but also to social inclusion and ecological resilience. This convergence—commonly referred to as sustainable innovation—is gaining increasing relevance in policy agendas and academic discourse alike [1-7].

Several studies have attempted to map global and regional research trends at the intersection of sustainability and innovation. For instance, [8] conducted a global scientometric analysis of sustainable development research, while [9] examined bibliometric patterns of sustainable innovation from a worldwide perspective. Other reviews have addressed specific thematic domains, such as corporate social responsibility [10], the circular economy [11] [12], or sustainability in higher education within the Latin American region [13] [14]. While these contributions are valuable, they tend to adopt a global scope or address Latin America only peripherally, thereby neglecting the internal diversity of the region and persistent asymmetries in scientific production.

Despite the increasing relevance of sustainable innovation, a fundamental question remains: How has scientific production on this topic evolved in Latin America, and to what extent does it capture the diversity of the region, collaboration patterns, and emerging research priorities? Previous studies have yet to offer a systematic, comparative, and thematically nuanced overview of this landscape. In order to fill this gap, the present bibliometric review examines 664 peer-reviewed publications indexed in Scopus and Web of Science between 1993 and 2025. Unlike the systematic review [15], which focused solely on Spanish-language studies addressing sustainable entrepreneurship in Scopus and Scielo, this study adopts a broader perspective—both linguistically and thematically—by analyzing the field of sustainable innovation, mapping regional trends, collaboration networks, and thematic structures across Latin America.

This approach enables a comprehensive mapping of publication trends, collaboration networks, thematic structures, and regional disparities, providing valuable insights into the evolution of sustainable innovation research in Latin America and informing future strategies for researchers, decision-makers, and institutions.

## II. METHODOLOGY

The present review was conducted using a transparent and reproducible protocol, adhering to the PRISMA guidelines for systematic reviews [16]. The methodological process included the formulation of search strategies, the selection of relevant documents, and the preparation of the final dataset for

bibliometric analysis. The following subsections provide a detailed description of each stage.

*A. Data Sources and Search Strategy*

The data were obtained from two of the most prominent and widely recognized scientific databases: Scopus and Web of Science (WoS). These platforms were selected based on their extensive coverage of peer-reviewed literature and their compatibility with leading bibliometric analysis tools, which ensures the comprehensiveness and reliability of the data retrieved.

The search strategy was designed to capture the scientific production related to sustainable innovation within the Latin American context. For this purpose, the search equation was structured around two thematic groups:

**Group 1 – Sustainable Innovation Terms:** *("sustainable innovation" OR "eco-innovation" OR "green innovation" OR "responsible innovation" OR "environmental innovation" OR "sustainable technology" OR "clean technology")*

**Group 2 – Latin America and Countries in the Region:** *("Latin America" OR "South America" OR "Central America" OR Argentina OR Bolivia OR Brazil OR Chile OR Colombia OR "Costa Rica" OR Cuba OR "Dominican Republic" OR Ecuador OR "El Salvador" OR Guatemala OR Honduras OR Mexico OR Nicaragua OR Panama OR Paraguay OR Peru OR Uruguay OR Venezuela OR Haiti)*

In Scopus, the search was performed within the fields of title, abstract, and keywords (TITLE-ABS-KEY), while in Web of Science, the search was applied to the topic field, which includes the title, abstract, author keywords, and Keywords Plus.

The initial search retrieved a total of 689 documents from Scopus and 272 from Web of Science, amounting to 961 records. Following the removal of 224 duplicate entries, the final dataset consisted of 737 unique documents, which were subsequently subjected to the screening and analysis processes. A visual summary of the data selection process, including identification, screening, and inclusion of documents, is provided in Figure 1, the PRISMA flow diagram.

It is important to note that the 1993–2025 time range was not predefined but reflects the earliest year in which relevant documents were retrieved in Scopus and Web of Science, allowing a comprehensive observation of the evolution of the field. This starting point, one year after the 1992 Rio Earth Summit, provides context for the dissemination of the sustainability agenda and the observed trajectory.

*B. Inclusion and Exclusion Criteria*

In order to ensure the relevance and scientific rigor of the documents analyzed, a set of specific inclusion and exclusion criteria was applied following the initial retrieval of records. The initial dataset, consisting of 737 unique documents after the removal of 224 duplicates, underwent a screening process based on document type. The following publication types were excluded due to their limited empirical content, lack of methodological contributions, or absence of peer review: Short surveys (n = 1), Review articles (n = 38), Notes (n = 2), Errata (n = 6), Editorial materials and editorials (n = 5), Conference reviews (n = 10), Books (n = 11).

In total, 73 documents were excluded during this phase. The exclusion process is illustrated in Figure 1, which presents the PRISMA flow diagram detailing the stages of identification, screening, and inclusion of records.

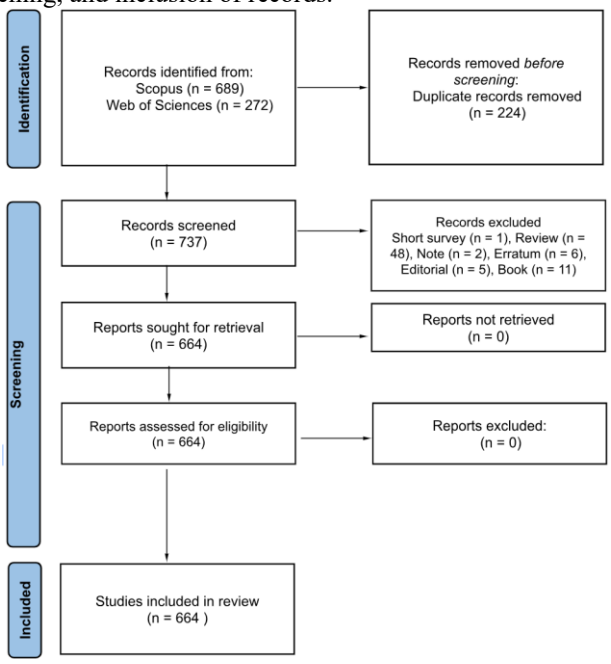


*Figure 1: PRISMA Flowchart*

After this screening, a total of 664 documents were retained for complete analysis. These comprised the following types of contributions:

- Articles (n = 519): Peer-reviewed journal articles representing the core of validated scientific production.
- Conference papers (n = 92): Contributions presented at academic conferences, often reflecting emerging trends and ongoing research.
- Book chapters (n = 44): Peer-reviewed chapters providing in-depth conceptual and regional insights.
- Proceedings papers (n = 3): Articles published in conference proceedings with a formal academic structure.
- Early access articles (n = 6): Recently accepted and peer-reviewed papers awaiting final issue assignment.

The application of these inclusion criteria ensured the construction of a robust and diverse dataset, encompassing consolidated and emerging academic contributions.

### C. Screening and Selection Process

The screening process is visually presented in Figure 1. Following the integration of records retrieved from Scopus and Web of Science, a total of 224 duplicate entries were identified and removed, resulting in a dataset of 737 unique documents.

Subsequently, these records were screened based on document type and thematic relevance. As detailed in the previous subsection, 73 documents were excluded for not fulfilling the predefined inclusion criteria. The remaining 664 documents underwent full-text assessment and were incorporated into the final dataset for analysis.

No further exclusions were required based on language, as the objective was to capture a comprehensive and representative overview of the scientific production in the region.

### D. Data Cleaning and Preprocessing

Following the selection of the 664 documents, the dataset was exported and processed using RStudio (v4.3.1) with the Bibliometrix R-package and its graphical interface Biblioshiny [17]. These tools facilitated a comprehensive bibliometric analysis, including performance indicators, collaboration networks, thematic evolution, and keyword co-occurrence mapping.

Before analysis, a thorough data cleaning process was conducted to enhance the accuracy and interpretability of the results. This process included:

- Standardization of metadata fields, such as authors, affiliations, sources, and keywords, to reduce inconsistencies caused by variations in spelling or formatting between databases.
- Harmonization of document types, ensuring consistency in the classification of articles, conference papers, and book chapters according to the inclusion criteria.
- Keyword filtering, aimed at refining the conceptual structure analysis. A large number of generic, redundant, or overly broad terms were removed, either because they were already part of the search equation or because they added noise to the co-occurrence analysis.

The following terms were excluded from the keyword set: *adoption, analysis, applications, approach, behavior, case studies, case study, challenges, clean technology, clean technologies, context, data, decision-making, design, development, diffusion of innovation, eco-innovation, effects, efficiency, environmental innovation, evaluation, evaluation framework, future, framework, frameworks, green innovation, impact, implications, indicators, innovation, innovation policy, insights, interventions, knowledge, knowledge transfer, management, mechanisms, model, models, outcomes, performance, performance indicators, perspective, policy, policies, practices, responsible innovation, results, review, stakeholders, strategy, strategies, sustainable development, sustainable innovation, sustainable technology, sustainable technologies, sustainability, system, systems, technology, technologies, technological innovation, tools, tools and techniques, trends, validation, variables, latin america, sustainable, environment, environmental, energy, green, article, countries, drivers, growth, impacts, implementation, capability, panel.*

This filtering step was essential to avoid redundancy, eliminate conceptual noise, and ensure that the resulting clusters and thematic maps truly reflect specific and meaningful research trends.

This methodological approach ensured a rigorous and consistent selection, processing, and preparation of the dataset for bibliometric analysis. The following section presents the main findings derived from the 664 selected documents, highlighting trends in scientific production, regional contributions, and thematic evolution across Latin America.

## III. RESULTS

### A. Scientific Production Over Time

The scientific output on sustainable innovation in Latin America has experienced a marked increase over the past three decades, as illustrated in Figure 2. The temporal analysis of the 664 documents reveals a prolonged period of low publication volume between 1993 and 2009, during which the annual output fluctuated between 1 and 5 articles, with only sporadic peaks—such as in 1998, when 7 articles were published.

A sustained upward trend begins to emerge around 2010, characterized by a gradual increase in the number of publications. This growth becomes more pronounced from 2015 onwards, when the annual output exceeds 20 publications for the first time. Moreover, the expansion intensifies considerably between 2018 and 2023, culminating in a peak of 99 articles in 2023, followed closely by 96 publications in 2024.

Although the data for 2025 only reflects publications up to July, the year has already registered 69 documents, suggesting that it is on course to maintain—or potentially surpass—the levels observed in previous years.

Furthermore, the cumulative curve (black line in Figure 2) clearly illustrates the exponential growth in scientific production, particularly over the last decade. This trend reflects a growing academic interest in sustainable innovation within the region, driven by increasing environmental awareness, enhanced international research funding, and the strengthening of regional sustainability policies and agendas.

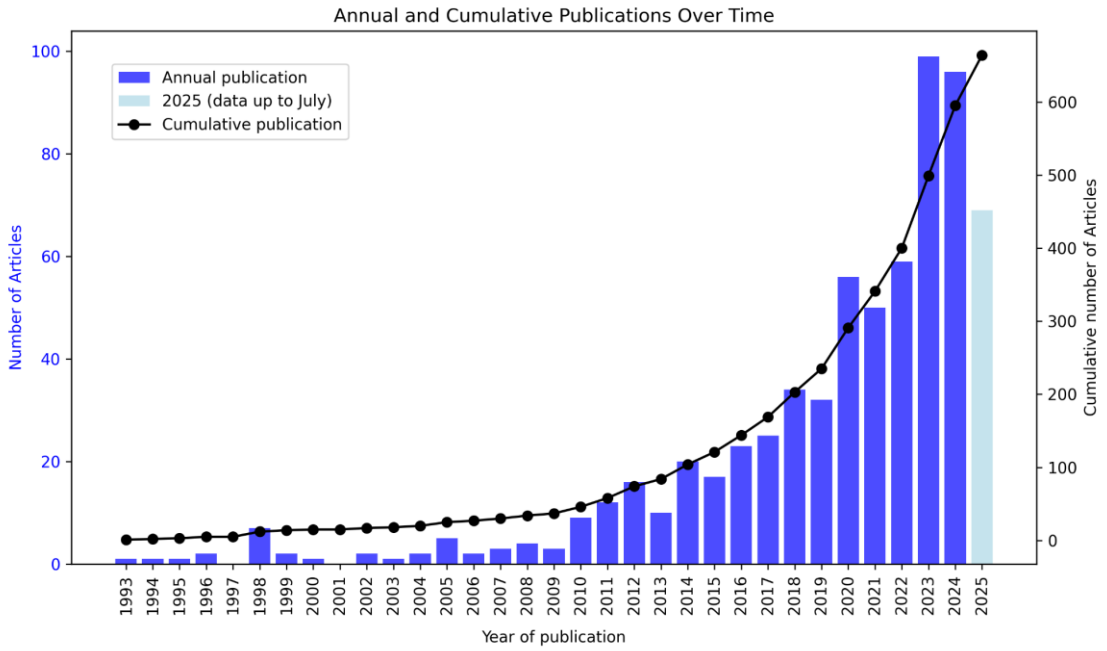


*Figure 2: Production Over Time*

## B. *Geographical Distribution of Scientific Output*

The regional distribution of scientific production on sustainable innovation in Latin America reveals a highly concentrated pattern, dominated by a few countries. As illustrated in Figure 3, Brazil emerges as the principal contributor, with 369 publications, representing more than half of the entire dataset analyzed (55.5%). Its leading role may be attributed to its research infrastructure, national funding schemes, and its integration into international environmental agendas.

Mexico ranks second with 144 documents, followed by Colombia (98), Chile (42), Peru (39), and Ecuador (33), forming a group of mid-level contributors. These countries demonstrate growing engagement in sustainable innovation, supported by regional research networks and policy-driven agendas focused on green development.

Argentina, despite its academic tradition, shows a comparatively lower output with 15 publications, while countries such as Venezuela (4) and Uruguay (2) appear with limited presence. Central American nations and the Caribbean—such as Cuba (8), Costa Rica (2), the Dominican Republic (1), and Nicaragua (2)—also show relatively modest scientific production.

The choropleth map in Figure 3 visually reinforces these disparities, with darker shades concentrated in Brazil and Mexico, and lighter tones across the remaining countries. This geographic asymmetry highlights existing gaps in research capacity, as well as opportunities to promote more inclusive and collaborative scientific development across the Latin American region.

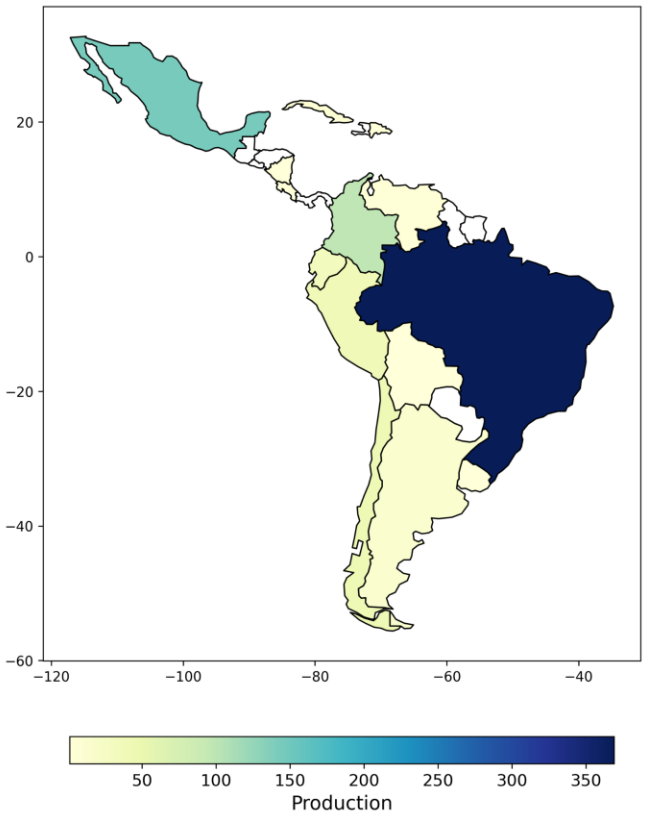


*Figure 3: Geographic Distribution in Latin America*

### C. Geographical Distribution of Scientific Output

In addition to leading in overall publication volume, Brazil also occupies a central position within international research collaboration networks on sustainable innovation, as depicted in Figure 4. The network visualization clearly illustrates that Brazil functions as the most interconnected country, acting as a pivotal hub that facilitates collaboration between both regional and extra-regional partners. Prominent co-authorship links include those with Mexico, Spain, the United States, Germany, France, and Portugal, which reflect the active engagement of Brazil in global scientific initiatives.

Moreover, Mexico emerges as another key actor within the network, maintaining robust collaborative ties not only with Brazil but also with the United States, Spain, and Colombia. Within South America, countries such as Colombia, Chile, Argentina, and Peru form a moderately cohesive cluster, characterized by intermediate levels of internal connectivity. By contrast, Ecuador and Venezuela appear more peripherally integrated, with limited links to the core network.

Additionally, the color-coded clusters in the visualization highlight the density and geography of collaborative ties. A light blue European cluster reveals significant engagement with Latin American countries, while a purple Asian cluster—led by China—and a red group including India, Poland, and Hungary, reflect the increasingly global scope of the research field. Nonetheless, specific countries, such as South Africa and Sweden, are positioned on the periphery, participating primarily through isolated bilateral collaborations.


*Figure 4: International Collaboration Network*

This collaborative landscape underscores the role of Brazil as a central node and international reference point in sustainable innovation research. However, it also exposes persistent gaps and asymmetries in regional scientific cooperation, which may hinder the equitable dissemination and development of sustainable innovation knowledge across less-connected or lower-capacity countries. The thematic focus and intellectual structure of this collaborative output will be further explored in the next section, which examines keyword co-occurrence patterns, thematic clusters, and emerging research trends.

### D. Keyword Analysis and Thematic Structure

The conceptual landscape of scientific production on sustainable innovation in Latin America is elucidated through the analysis of author keywords and Keywords Plus. This dual approach facilitates the identification of dominant research topics, emerging themes, and patterns of conceptual association within the field. The analysis is supported by three visual representations: a word cloud of author keywords (Figure 5), a word cloud of Keywords Plus (Figure 6), and a keyword co-occurrence network (Figure 7).


*Figure 5: Word Cloud of Author Keywords*

As shown in Figure 5 and Figure 6, there is a clear predominance of terms related to energy and sustainability. Notable examples include *renewable energy, environmental sustainability, climate change, energy efficiency, and natural resources*. These recurring terms indicate a strong focus on ecological transitions, the decarbonization of energy systems, and sustainable resource management. Additionally, the frequent appearance of Brazil in both visualizations highlights its dual role—previously discussed—as a leading contributor in terms of scientific output and as a recurrent thematic reference in the literature.


*Figure 6: Word Cloud of Keywords Plus*

Moreover, one of the most salient patterns across all three visualizations is the consistent presence of the term BRICS. In

Figure 5, BRICS appears alongside related terms such as *green finance, ecological footprint, renewable energy consumption, and green innovations*. Similarly, in Figure 6, all five BRICS countries—Brazil, Russia, India, China, and South Africa—are prominently featured. This convergence reinforces the geopolitical and economic relevance of this bloc in discussions of sustainable innovation. Their simultaneous prominence in both word clouds underscores a dual emphasis on national case studies and macro-regional perspectives.

Furthermore, the keyword co-occurrence network, shown in Figure 7, offers a more structured view of the relationships among key concepts. The central node, *renewable energy*, is densely connected to *environmental sustainability, energy transition,* and *natural resources*, forming a thematic nucleus that reflects mainstream ecological and technological concerns. Surrounding this core, additional clusters emerge with distinctive directions:

- A red cluster, anchored in Brazil, connects to terms such as *industry, manufacturing, eco-design, competitiveness,* and *biofuels*, pointing to a focus on industrial transformation and circular economy strategies within the Brazilian context.
- A blue cluster, centered on BRICS, links with terms like *green technology, green growth, ecological footprint,* and *fintech*, suggesting increasing scholarly attention to financial mechanisms and macroeconomic dimensions of sustainability.

Additionally, peripheral yet conceptually relevant nodes—such as climate change, carbon neutrality, carbon emissions, and open innovation—reflect emerging areas of interest that, while less central, contribute to the thematic expansion of the field.

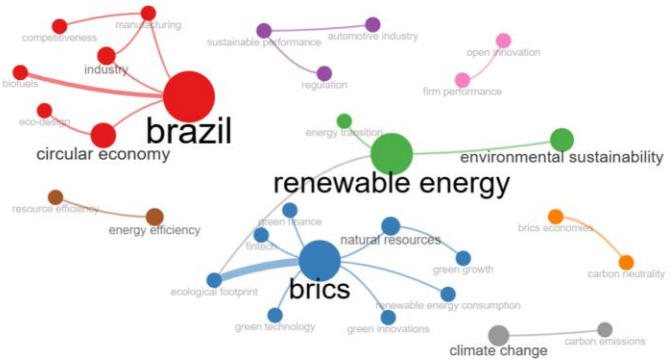


*Figure 7: Co-occurrence Network of Author Keywords*

In sum, these three visualizations converge in revealing a coherent conceptual structure predominantly grounded in environmental and technological themes. Both Brazil and the BRICS group stand out as central actors not only in terms of publication volume but also in shaping the intellectual discourse. This thematic convergence lays the groundwork for a more in-depth strategic analysis of the structure and evolution of the field, which will be addressed in the following section.

## *E. Thematic Evolution and Strategic Mapping*

The strategic thematic map generated using Biblioshiny offers a two-dimensional representation of the intellectual structure of the field, organizing thematic clusters according to their centrality (i.e., their relevance and connectivity within the research field) and density (i.e., the degree of internal development and specialization). As illustrated in Figure 8, the themes are distributed across four quadrants: motor themes, basic themes, niche themes, and emerging or declining themes—each providing insight into the maturity, integration, and evolution of specific areas of research.

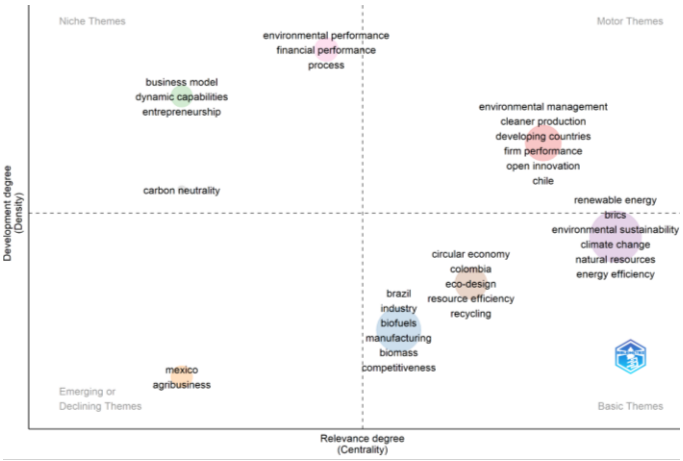


*Figure 8: Thematic Map of Author Keywords*

- Motor Themes (Upper-right quadrant)

This quadrant comprises the central themes that actively drive the evolution of the field. Examples such as *environmental management, cleaner production,* and *developing countries* underscore the importance of sustainability practices in industrial systems and emerging economies. Moreover, the inclusion of *open innovation* and *firm performance* suggests a growing intersection between environmental sustainability and corporate competitiveness. Notably, the country of Chile also appears in this quadrant, reflecting its increasing investment in innovation policies and environmental governance.

- Basic Themes (Lower-right quadrant)

Basic themes are highly central but less developed, indicating foundational areas with broad relevance yet significant potential for further theoretical advancement. This quadrant includes key concepts such as *renewable energy, environmental sustainability, climate change, natural resources,* and *energy efficiency*. The presence of *BRICS* reinforces the importance of this geopolitical group in shaping the regional sustainability discourse. Furthermore, the conceptual proximity of these terms aligns with previous findings in the keyword analysis, confirming their status as anchoring pillars in the field's knowledge structure.

- Niche Themes (Upper-left quadrant)

This quadrant contains themes that are internally well-developed but exhibit low centrality, suggesting specialized areas with limited integration into the broader research network. Terms such as *business model, dynamic capabilities,* and *entrepreneurship* populate this space, reflecting a focus on firm-level strategic management and innovation. Although these themes are conceptually robust, their relative isolation indicates a disconnection from the dominant sustainability narratives in the region.

- Emerging or Declining Themes (Lower-left quadrant)

The terms located in this quadrant are characterized by low centrality and density, typically representing either emerging research frontiers or declining areas of interest. In this case, a small cluster formed by *Mexico* and *agribusiness* may suggest localized or underexplored research lines. Additionally, *carbon neutrality*—though located nearer to the center—remains within a low-density zone, implying growing but still insufficiently developed academic attention to decarbonization strategies in the Latin American context.

Additionally, a dense grouping of terms related to national contexts and policy-oriented themes—such as *Brazil*, *Colombia*, *eco-design, circular economy,* and *resource efficiency*—is located near the boundary between the basic and emerging quadrants. This positioning suggests that while these topics are broadly recognized, they still present ample opportunities for deeper empirical investigation and theoretical articulation.

In sum, Figure 8 underscores the consolidation of environmental and technological themes, the conceptual depth but marginality of firm-level innovation topics, and the incipient development of research lines related to *carbon governance* and *agribusiness*. This thematic structure serves as a valuable roadmap for identifying areas where future research may pursue greater integration, specialization, or strategic reorientation.

## IV. DISCUSSION

### *A. Main Findings*

The results presented in the previous section provide a comprehensive and multidimensional overview of the scientific landscape surrounding sustainable innovation in Latin America. The identified patterns reflect both consolidated research areas and significant asymmetries that reveal underlying geopolitical, institutional, and thematic dynamics within the region.

As illustrated in Figure 2, the exponential growth in scientific output since 2010—particularly between 2018 and 2023—suggests an increasing prioritization of sustainability-related topics in regional research agendas. This upward trend likely corresponds to growing global concern over environmental degradation, the intensification of international funding mechanisms, and the implementation of national policies aimed at facilitating green transitions. Nevertheless, the modest publication volume observed during the earlier period (1993–2009) underscores a delayed and gradual incorporation of sustainable innovation as a core focus within Latin American scientific production.

A relevant aspect is that the first record identified in 1993 coincides with the period immediately following the 1992 Rio Earth Summit, a milestone that consolidated sustainability as a priority on the international agenda. Although the selection of the time span was not defined based on this event, the coincidence reinforces the interpretation that the initial production in Latin America was influenced by the global dissemination of the guidelines established in Rio, which promoted the integration of sustainability into public policies, academic programs, and research agendas.

The geographical distribution shown in Figure 3 further emphasizes the concentration of output in a limited number of countries, most notably Brazil, which alone accounts for over 55% of all publications. Mexico and Colombia follow at a significant distance, while several nations—particularly in Central America and the Caribbean—remain peripheral in terms of research activity. These disparities reflect enduring inequalities in research capacity, funding allocation, and institutional infrastructure, which in turn constrain the development of a truly regional and cohesive knowledge ecosystem in the field.

The prominent position of Brazil can be attributed to its research and innovation promotion policies, particularly through agencies such as the Financiadora de Estudos e Projetos (FINEP) and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), which have fostered scientific production related to sustainability. In the case of Mexico, its proximity and economic integration with North America have facilitated the adoption of programs oriented toward industrial and energy sustainability, resulting in a higher volume of publications. In contrast, countries with a more limited presence in regional production face structural constraints, including institutional weakness, low investment in science and technology, and greater reliance on international cooperation, which contributes to persistent disparities in the development of research on sustainable innovation.

Despite these imbalances, the international collaboration network depicted in Figure 4 reveals the strategic role of Brazil in linking Latin American research with global scientific circuits. Notably, Brazil maintains robust partnerships with European countries (Spain, Portugal, France, Germany), North America (United States, Canada), and Asia (China, India). Mexico and Colombia also exhibit significant levels of connectivity. However, many countries remain weakly

integrated into these networks, highlighting untapped opportunities to strengthen South–South collaboration, which remains underdeveloped in comparison to the more established North–South partnerships.

The keyword-based conceptual analysis (Figures 5–7) confirms that the field is primarily structured around environmental and technological dimensions. The centrality of terms such as renewable energy, climate change, and environmental sustainability points to a consolidated research agenda aligned with global sustainability imperatives. Additionally, the recurrent appearance of Brazil and BRICS—both in the word clouds and the co-occurrence network—underscores the relevance of macro-regional and geopolitical perspectives in shaping the discourse. The consistent presence of all BRICS countries in Figure 6 further indicates a growing body of comparative studies and a strengthening of Global South epistemologies within the literature.

However, the co-occurrence network (Figure 7) also reveals a fragmented conceptual structure, with thematic clusters organized around distinct domains: environmental governance (renewable energy, natural resources), industrial transformation (eco-design, biofuels), and financial instruments (green finance, ecological footprint). This fragmentation suggests that, although the field is conceptually rich, it may still lack a unifying theoretical framework that systematically integrates these dimensions.

The strategic thematic map (Figure 8) offers additional insights into the degree of maturity and interconnection among the various research lines. Motor themes such as environmental management and cleaner production represent well-established areas with high levels of development and influence, while basic themes like renewable energy and climate change maintain broad relevance but exhibit potential for more profound theoretical and empirical elaboration. Conversely, the marginal positioning of agribusiness, carbon neutrality, and Mexico within the emerging/declining quadrant points to underexplored topics that warrant greater academic attention, particularly given their socioeconomic and environmental relevance for the region.

Furthermore, niche themes such as business models and dynamic capabilities reflect ongoing efforts to integrate sustainability with innovation and strategic management at the firm level. Nonetheless, their peripheral placement in the thematic map suggests limited articulation with the broader sustainability discourse in Latin America. This disconnection may stem from insufficient interdisciplinary collaboration between environmental sciences and business-oriented fields.

In summary, the findings indicate that research on sustainable innovation in Latin America is expanding in scope and output. However, it remains characterized by geographical concentration, thematic fragmentation, and constrained regional integration. Addressing these gaps will require coordinated efforts to foster inclusive research agendas, promote cross-country and interdisciplinary collaboration, and align local research priorities with the broader challenges posed by global sustainability transitions.

### *B. Limitations*

While this bibliometric review offers valuable insights into the scientific production and thematic configuration of sustainable innovation research in Latin America, several methodological limitations must be acknowledged to contextualize the findings appropriately.

First, the analysis was limited to two major academic databases, Scopus and Web of Science. Although both platforms provide extensive and high-quality metadata, they do not index all regionally relevant journals, particularly those published in Spanish or Portuguese and hosted on platforms such as SciELO or RedALyC. Consequently, this may have resulted in the underrepresentation of locally significant research outputs.

Second, despite the absence of explicit language-based exclusion criteria, the dataset is predominantly composed of English-language publications. This linguistic imbalance may introduce a bias favoring internationally visible research, thereby overlooking studies with substantial regional impact that are published in local languages.

Third, the analysis relies exclusively on metadata retrieved from the selected databases, including keywords, author affiliations, and publication types. However, such metadata may present inconsistencies or incomplete records, which could compromise the accuracy of visualizations such as keyword co-occurrence networks and collaboration maps.

Fourth, during the data cleaning phase, a significant number of generic or redundant keywords were manually excluded to improve the interpretability of the thematic analysis. While this step was methodologically justified, it may have inadvertently removed terms that are contextually relevant within specific studies or subfields.

Finally, the data for the year 2025 includes publications only up to July, which limits its comparability with complete annual records. Hence, any interpretation of temporal trends involving 2025 should be approached with caution and considered provisional.

Recognizing these limitations is essential for a critical interpretation of the results and for informing future bibliometric studies. Subsequent research efforts should consider the inclusion of additional databases, multilingual

sources, and improved data harmonization techniques to achieve a more comprehensive and regionally inclusive assessment of scientific production.

### C. Future Perspectives

Building upon the findings and acknowledging the identified limitations, several future directions can be proposed to advance research on sustainable innovation in Latin America.

First, there is a clear need to strengthen intra-regional collaboration, particularly among countries with lower research capacity. Encouraging South–South partnerships and fostering regional funding mechanisms could contribute to reducing the current asymmetries in scientific production and connectivity.

Second, future studies should bridge the thematic fragmentation observed in this review. Interdisciplinary research that connects environmental sustainability with innovation management, green finance, and public policy will be essential to building more integrated and actionable knowledge frameworks.

Third, emerging and underdeveloped topics—such as *carbon neutrality, agribusiness sustainability,* and *green financial instruments*—deserve more scholarly attention. Their advancement could benefit from comparative and collaborative approaches, particularly with countries in other Global South blocs, such as the *BRICS*, which have already shown conceptual and geopolitical relevance in the field. Exploring interregional dynamics—for example, between Latin America and Asia or Africa—may enrich perspectives and foster more globally informed solutions.

Fourth, the methodological scope of bibliometric research could be expanded by integrating alternative databases (e.g., SciELO, RedALyC) and adopting advanced analytical tools, such as topic modeling or machine learning techniques, to detect latent trends and conceptual shifts.

Finally, to promote a more inclusive and plural scientific ecosystem, it is important to ensure that research published in local languages and from underrepresented institutions is adequately indexed, analyzed, and valued. Doing so would contribute to a more representative and context-sensitive understanding of sustainable innovation across the Latin American region.

## V. CONCLUSIONS

This bibliometric review has systematically mapped the scientific landscape of sustainable innovation in Latin America, shedding light on both the progress achieved and the enduring challenges. The sustained increase in scholarly publications over the past decade reflects a growing institutional and academic commitment to addressing sustainability issues through innovation-driven approaches.

It is noteworthy that the onset of production identified in 1993 occurred in the immediate aftermath of the 1992 Rio Earth Summit, reinforcing the influence of international milestones on the early shaping of the sustainable innovation research agenda in Latin America.

Nonetheless, the analysis reveals persistent asymmetries within the region. Research output remains disproportionately concentrated in a limited number of countries, collaboration networks exhibit significant imbalances, and several thematically and contextually relevant topics—such as carbon neutrality, agribusiness, and inclusive development—continue to be underexplored.

Moreover, the conceptual structure of the field is primarily oriented around environmental and technological themes, with significant influence from geopolitical blocs such as the BRICS. These countries not only contribute substantially to the volume of scientific production but also emerge as conceptual anchors within the literature. This pattern underscores the increasing visibility and influence of Global South perspectives in shaping the discourse on sustainable innovation.

Hence, moving toward a more cohesive and impactful research ecosystem will require future studies to prioritize regional cooperation, foster interdisciplinary methodologies, and actively incorporate underrepresented countries and research topics. Such efforts are critical for constructing inclusive and context-sensitive knowledge systems capable of effectively addressing the complex and heterogeneous sustainability challenges facing Latin America.

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