INASJIF
INDONESIAN SCIENTIFIC JOURNAL OF ISLAMIC FINANCE

Volume 4, Number 2, June 2026, pp. 289-319
ISSN Print: 2964-5263 | ISSN Online: 2962-0937
Homepage: https://journal.uinsi.ac.id/index.php/INASJIF/index
Email: inasjifuinsi@gmail.com

GREEN INNOVATION MARKETING: A BIBLIOMETRIC ANALYSIS OF SCOPUS-INDEXED RESEARCH (2012–2025)

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Article History

Received:
10th Maret 2026

Accepted:
20th Mei 2026

Published:
26th June 2026

Abstract

This study presents a bibliometric mapping of green innovation marketing research indexed in Scopus from 2012 to 2025, based on a curated corpus of 47 journal articles published in 35 sources. Using a combined performance analysis (productivity and citation indicators) and science mapping approach (keyword co-occurrence and thematic mapping), the study reports a strong publication expansion with a compound annual growth rate (CAGR) of 17.35%. The corpus is recent (average document age 3.21 years) and moderately influential (mean citations per document 26.45), indicating an active and consolidating research stream. Source analysis shows a "core–long tail" structure, where a small set of journals, most notably Sustainability (Switzerland) and the Journal of Cleaner Production, contribute a substantial share of publications and citations. The thematic map identifies two dominant motor themes (marketing–sustainable development–

commerce and innovation–green economy–economic growth), highlighting the field's dual emphasis on market mechanisms and sustainable development outcomes. Overall, this bibliometric synthesis clarifies the field's knowledge structure, identifies its most influential publication outlets, and surfaces high-centrality themes that can guide future theory-building and empirical research in green innovation marketing.

Keywords: *Green Innovation Marketing, Green Innovation, Green Marketing, Green Marketing Innovation, Bibliometric Analysis, Scopus, Vosviewer, Bibliometrix/Biblioshiny*

A. INTRODUCTION

Businesses are being forced to reconsider how they create, generate, and convey value due to increased environmental challenges and quickening sustainability transitions. In this regard, green innovation, often referred to as ecologically focused product and process innovation, has emerged as a tactical means of enhancing environmental results and bolstering competitive advantage at the same time. Investments in green products and green process innovation have long been linked to superior competitive positioning, according to empirical evidence, suggesting that "going green" is not only compliance-driven but also strategically relevant for businesses looking to differentiate themselves and improve performance (Chen et al., 2006).

However, innovation by itself is rarely enough to make a difference. The ability of stakeholders, particularly consumers, to identify, accept, and trust green technologies is critical to their commercial success. This draws attention to how marketing shapes the perception, legitimacy, and spread of sustainability-focused products. Consumer perceptions (such as green trust, green satisfaction, and green brand image) are crucial in determining preference and adoption, especially in emerging markets where environmental awareness may be uneven, and information asymmetry may be high, according to research on green brands and green customer value creation (Mourad & Serag Eldin Ahmed, 2012).

Marketing literature progressively shifted from tactical "eco-claims" to more strategic and capability-based viewpoints as the sustainability agenda developed. The idea of green marketing orientation (GMO), which presents green marketing as an organization-wide approach rather than a collection of discrete promotional initiatives, is a significant advancement. According to GMO, for green marketing to be credible and successful, it must be strategically embedded (values, long-term commitments) and tactically applied (programs, practices, execution). This stream offers an organized perspective for comprehending how businesses balance environmental responsibility with market focus (Papadas et al., 2017).

The discrepancy between symbolic environmental communication and substantive

environmental performance, or the credibility gap caused by greenwashing, is a recurring problem. Greenwashing has the potential to undermine consumer trust, skew competitiveness, and diminish the credibility of green markets. While systematic reviews have mapped conceptual forms and measurement approaches to greenwashing, highlighting its complexity and ongoing relevance in sustainability communication, scholarship has looked at the organizational and institutional drivers that can encourage inflated or deceptive green claims (de Freitas Netto et al., 2020; Delmas & Burbano, 2011). This tension makes "green innovation marketing" particularly important: marketing must not only promote green innovations but also provide verifiable signals that reduce skepticism and strengthen trust.

As businesses experiment with novel marketing techniques, channels, and market-facing practices that support environmental policies, a closely linked construct—green marketing innovation—has become more visible within operations and strategy-adjacent sustainability studies. Research indicates that green marketing innovation can function as a contingent mechanism that enhances the conversion of internal green activities (such as green supply chain management and green innovation) into environmental performance, suggesting that marketing capabilities can influence whether green innovation yields quantifiable sustainability outcomes (Roh et al., 2022).

The literature linking green innovation and marketing is still dispersed over several areas (marketing, supply chain, strategy, innovation management, sustainability, and organizational behavior), despite its quick expansion. The terms "green innovation marketing," "green marketing orientation," "eco-innovation marketing," and "green marketing innovation" are occasionally employed inconsistently, and the contexts, units of study (businesses, customers, supply chains), and theoretical underpinnings of empirical investigations differ greatly. GMO-related research, for instance, demonstrates how market-oriented green capabilities can boost green performance and innovation in MSME settings, highlighting the multi-level and cross-functional phenomenon (Tjahjadi et al., 2020). The result is a knowledge base that is large but not always easy to synthesize into a coherent research map.

This is the exact point at which bibliometric analysis becomes useful. By measuring publication growth, identifying important sources, authors, institutions, and nations, and revealing intellectual and thematic structures through citation-based and keyword-based networks, bibliometrics facilitates an open and repeatable mapping of a study field. In order to characterize how a field develops and where future chances lie, modern guidelines encourage combining science mapping (co-citation, bibliographic coupling, co-word/co-occurrence) with performance analysis

(productivity and influence) (Chiroma et al., 2024). By analyzing how keywords co-occur across documents, fundamental techniques like co-word analysis further facilitate the identification of conceptual connections and emergent themes (Callon et al., 1991).

Methodologically, popular programs like VOSviewer and bibliometrix/biblioshiny in R offer reliable methods for science mapping, visualization, and grouping of bibliometric networks. While VOSviewer supports large-scale bibliometric mapping with robust visualization capabilities for co-authorship, co-citation, and keyword co-occurrence structures, bibliometrix enables end-to-end bibliometric pipelines (data cleaning, descriptive indicators, thematic mapping, and collaboration networks) (Aria & Cuccurullo, 2017; van Eck & Waltman, 2010). Furthermore, even when the objective is mapping rather than effect-size synthesis, transparent reporting practices, which are frequently in line with systematic-review standards like PRISMA, can improve the clarity of database search, screening reasoning, and inclusion decisions (Page et al., 2021).

In light of this, the goal of this study, "Green Innovation Marketing: A Bibliometric Analysis of Scopus-Indexed Research (2012–2025)," is to: (i) profile the growth trajectory and primary contributors of Scopus-indexed research that connects green innovation and marketing; (ii) identify the most influential journals, authors, documents, and collaboration patterns; and (iii) use science-mapping techniques to uncover the conceptual structure, core themes, clusters, and emerging topics in the field. The study focuses on the years 2012–2025, which is a timely window to comprehend consolidation and new horizons. During this time, green innovation transitioned from niche practice to mainstream strategy across industries, and sustainability marketing grew more institutionalized.

There are two anticipated contributions. In theory, the bibliometric map might help scholars better position future research by illuminating the connections (or lack thereof) between concepts like GMOs, green marketing innovation, eco-innovation diffusion, and greenwashing-related credibility debates. In order to lower the danger of greenwashing while enhancing adoption outcomes, managers can be guided by practical insights on thematic evolution toward credible "innovation-to-market" paths that align marketing orientation, innovation capabilities, and governance procedures. To put it briefly, the goal of this bibliometric analysis is to create a navigable knowledge structure for both research and application from a quickly growing yet dispersed body of literature.

B. LITERATURE REVIEW

Green innovation marketing can be framed as the strategic integration of strategic green marketing orientation (SGMO), green marketing innovation, and green innovation (e.g., green product/process innovation) to deliver market value while improving sustainability outcomes. From an upper echelon's perspective, SGMO is shaped by top decision-makers' values and identities, meaning managerial characteristics can systematically influence how strongly firms embed environmental priorities into marketing strategy (Casidy et al., 2024; Tan et al., 2025). In parallel, a Natural Resource-Based View (NRBV) logic positions green innovation and green marketing innovation as strategic capabilities that can translate into competitive advantage and measurable performance outcomes (Appiah & Essuman, 2024; Cheng et al., 2024). Finally, signaling theory explains why sustainability claims must be credible and verifiable, because information asymmetry creates opportunities for greenwashing that can undermine trust and weaken marketing effectiveness (Isac et al., 2025; Vangeli, 2023).

SGMO is expected to strengthen a firm's willingness to redesign its marketing mix (product, pricing, communication, and channels) around environmental value propositions, thereby enabling green marketing innovation as a capability-building pathway (Casidy et al., 2024; Tan et al., 2025). When SGMO is strong, firms are more likely to experiment with greener market offerings and communications, which supports the emergence of green product innovation and other substantive innovation outputs (Appiah & Essuman, 2024; Cheng et al., 2024). This mechanism is especially relevant for SMEs, where internal drivers (managerial values/identity) can act as "activation energy" that converts environmental intentions into market-facing strategic action (Casidy et al., 2024; Tan et al., 2025). At the same time, boundary conditions such as stakeholder pressure, perceived risk, and perceived competitive advantage can amplify or dampen how far SGMO actually translates into performance-relevant outcomes (Tan et al., 2025; Vangeli, 2023).

Empirically, green innovation is repeatedly linked to improvements in both environmental performance and financial performance, consistent with the idea that sustainability-oriented innovation can produce value when it is capability-based rather than symbolic (Cheng et al., 2024; Yao et al., 2019). Importantly, the type of green innovation matters: prevention-oriented innovation is often theorized to yield stronger joint returns than end-of-pipe control because it reduces waste at the source and can improve efficiency-based competitiveness (Cheng et al., 2024; Zhang et al., 2025). A time-horizon view is also necessary, because green innovation benefits may appear differently across short-term, transitional, and long-term windows as capabilities mature

and market legitimacy accumulates (Cheng et al., 2024; Zhang et al., 2025). Moreover, evidence suggests that the quality/substance of green innovation can condition financial outcomes, reinforcing the argument that "real" innovation (not merely claims) is what sustains performance advantages (Vangeli, 2023; Yao et al., 2019).

A key marketing pathway from green innovation marketing to outcomes operates through intangible assets such as green trust and green reputation, because stakeholders reward credible sustainability behavior with stronger purchase intentions and support (Isac et al., 2025; Tan et al., 2025). However, greenwashing disrupts this pathway by increasing skepticism and eroding trust, which weakens the conversion of SGMO and green marketing innovation into market and performance outcomes (Isac et al., 2025; Vangeli, 2023). The moderating role of environmental knowledge is theoretically consistent with this, because better-informed audiences are more capable of detecting misleading claims and thus impose higher reputational penalties on greenwashing (Isac et al., 2025; Vangeli, 2023). Therefore, research increasingly emphasizes verifiable sustainability communication and transparency as strategic signals to protect trust and secure the returns of green innovation marketing strategies (Appiah & Essuman, 2024; Vangeli, 2023).

C. RESEARCH METHODOLOGY

This study maps the evolution, intellectual framework, and thematic makeup of green innovation marketing scholarship using a bibliometric research design. By integrating performance analysis (productivity and influence) with scientific mapping (network-based structures like co-authorship and co-word/keyword co-occurrence), bibliometrics can be used to synthesize rapidly expanding and conceptually dispersed subjects (Donthu et al., 2021; Zupic & Čater, 2015).

Scopus, a popular bibliographic database that offers structured metadata (such as authors, affiliations, sources, keywords, citations, and DOI), is where the dataset was obtained. Because Scopus offers rich, standardized fields for science mapping and facilitates repeatable searches, it is often used in bibliometric research in business and management (Donthu et al., 2021; Zupic & Čater, 2015). The review, which spans the years 2012–2025, supports the finding that green innovation marketing has significantly increased over the past ten years. Every record in the final dataset is an English-language journal article (Document Type = Article).

The retrieval logic was developed to capture the junction of green/sustainability, innovation, and marketing utilizing title/abstract/keyword-based searching, followed by relevance screening, in order to reduce topical noise (e.g., engineering/chemistry publications employing

"green" in non-marketing contexts).

According to this reasoning, a Scopus Advanced Search string can be created as a core intersection (Keywords, Abstract, and Title): TITLE-ABS-KEY "green marketing" AND "green innovation." (The final curated set of 47 Scopus-indexed journal articles, which serves as the analytical corpus for this paper, is already reflected in your exported dataset.) Transparent screening improves reproducibility even when bibliometric studies are not systematic reviews. The selection process identified, screened, and finalized records using a logic inspired by PRISMA (provided via a flow diagram when submitted to a journal) (Page et al., 2021).

Inclusion criteria:

1. Indexed in Scopus.
2. Published between 2012 and 2025.
3. Document type: *Article*.
4. Focuses on marketing-relevant mechanisms/constructs connected to green innovation (e.g., green marketing, green marketing innovation, and marketing orientation related to green innovation, market outcomes such as brand/performance/purchase intention).

Exclusion criteria:

1. Uses "green" primarily in technical/chemical/materials meanings without marketing relevance.
2. Non-article document types (e.g., conference papers, editorials).
3. Records lacking essential metadata for bibliometric analysis (e.g., missing year or source).

The following metadata were taken from the Scopus CSV export:

1. Bibliographic: title, year, source title, volume/issue/pages
2. Authorship: author names, author IDs, affiliations
3. Impact: Scopus "cited by" counts (used as citation-based indicators)
4. Conceptual terms: author keywords and index keywords
5. Persistent identifiers: DOI

To lessen fragmentation brought on by variations in spelling and style, keyword and entity harmonization was carried out before science mapping:

1. Keyword normalization: lowercasing and unifying near-synonyms/variants (e.g., "eco-innovation" vs "ecoinnovation"; "behaviour" vs "behavior").
2. De-duplication: checking for repeated records (none remained in the final dataset).
3. Source name consistency: ensuring consistent journal/source titles across records.

Because small discrepancies can skew network architecture and cluster detection, such cleaning is a routine step advised in bibliometric procedures (Aria & Cuccurullo, 2017; Donthu et al., 2021).

Performance analysis was conducted to describe productivity and influence patterns:

1. Annual scientific production (publications per year) and growth rate.
2. Source productivity (articles per journal/source).
3. Citation indicators: total citations, citations per document, and dataset h-index.

These metrics are consistent with commonly used bibliometric standards in business research (Donthu et al., 2021; Zupic & Čater, 2015).

Co-authorship was examined at two levels to investigate knowledge creation mechanisms:

1. Author collaboration (co-authorship patterns).
2. International collaboration, derived from affiliation-country information when available in the metadata (articles with affiliations spanning more than one country).

This study uses co-word (keyword co-occurrence) analysis, mostly based on author keywords, to reveal the conceptual structure of the area. By looking at how often terms appear together in documents, co-word analysis finds thematic connections and reveals clusters of topics and their connections (Callon et al., 1991).

Network construction:

1. Nodes: author keywords
2. Edges: co-occurrence links between keywords within the same document
3. Thresholding: a minimum-occurrence threshold (commonly ≥2) is applied to focus the network on stable, field-relevant concepts rather than one-off terms.

There are two widely used (and appropriate) technologies for generating reliable, publishable bibliometric data.:

1. Bibliometrix / Biblioshiny (R) for descriptive indicators, thematic mapping, and structured bibliometric pipelines (Aria & Cuccurullo, 2017).
2. VOSviewer for network visualization and clustering (co-occurrence) using well-established mapping techniques (van Eck & Waltman, 2010).

Unified principles for bibliometric networks serve as the foundation for VOS-style mapping and clustering techniques used in clustering and visualization (Waltman et al., 2010).

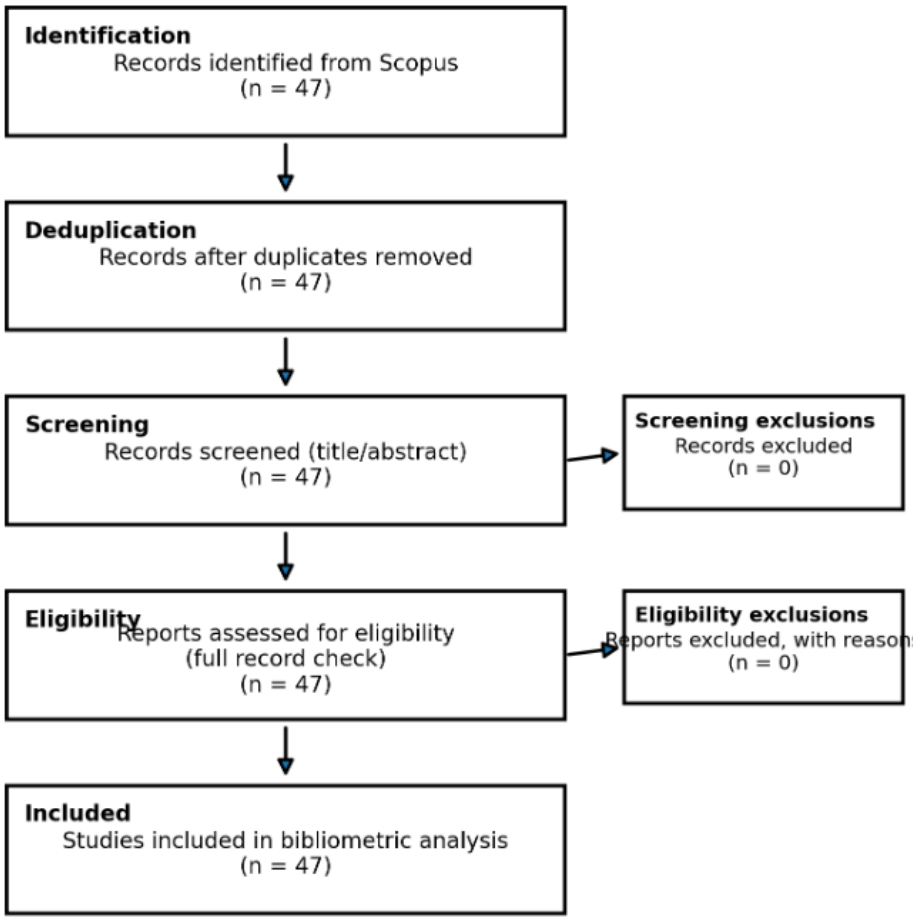
Full counting or fractional counting can be used to build bibliometric networks, which may provide distinct structural outcomes. While fractional counting can be used as a robustness check

to lessen inflation from highly multi-authored articles, complete counting is frequently employed for interpretability in small-to-moderate datasets like this one (Perianes-Rodriguez et al., 2016).

To enhance reliability and transparency:

1. The exact dataset (Scopus CSV export) is treated as the source of truth.
2. The paper reports the search logic, inclusion criteria, time window, and document type restrictions.
3. Keyword harmonization rules are documented (recommended as an appendix: a short thesaurus list of merged terms).
4. A PRISMA-style flow diagram is used to show the record selection steps, improving clarity and replicability for reviewers (Page et al., 2021).

PRISMA-style flow diagram (Scopus; 2012–2025)
Green Innovation Marketing



Notes: Counts reflect the final Scopus export provided (journal articles only). If you also tracked broader initial hits before applying filters, you can replace n-values accordingly.

D. RESULT AND DISCUSSION

Results

Main Information

The bibliometric dataset, which includes 47 Scopus-indexed publications published in 35 sources (journals, books, etc.), spans the years 2012–2025. Publications in this field have clearly increased over the observed period, as evidenced by the stated annual growth rate of 17.35%. The average age of the documents in the corpus is 3.21 years, making it very recent. This indicates that more recent contributions dominate the intellectual evolution of green innovation marketing (as represented by this dataset), which is compatible with an emerging or quickly consolidating research stream.

The average number of citations per document in the collection is 26.45. Although this shows significant visibility and influence at the field level, it should be read with caution because a small number of highly cited publications can inflate mean citations, particularly in a subject that is expanding (the distribution is not given in the attached summary). There are 194 Author's Keywords (DE) and 133 Keywords Plus (ID) in the dataset. This suggests roughly the following when normalized by the number of papers (n = 47):

1. 4.13 author keywords for each document (194/47), and
2. Each document has 2.83 Keywords Plus (133/47).

As is common in multidisciplinary fields, these values show significant conceptual breadth, suggesting that the subject is explained using a variety of terminologies and sometimes overlapping notions.

The dataset shows that publication in this field is quite collaborative, with 188 authors, 0 single-authored publications, and 6.3 co-authors per document. There is also international cooperation, as evidenced by the 27.66% international co-authorships, or roughly 13 documents (27.66% × 47 ≈ 13) with writers from many nations.

Table 1. Core indicators of the analysed corpus

Core bibliometric indicators for the green innovation marketing dataset (Scopus, n = 47).

Indicator	Value
Timespan	2012–2025
Documents	47
Sources	35
Compound annual growth rate (CAGR)	17.35%
Average document age (years, ref=2025)	3.21

Mean citations per document	26.45
Median citations per document	9
Maximum citations (single article)	178
h-index (within dataset)	16
Single-authored documents	5
Multi-authored documents	42
International co-authored documents	15 (31.9%)

Figure 1 illustrates how, from 2012 to 2025, green innovation marketing research (Scopus-indexed articles in your dataset) increases in a non-linear but significantly rising direction. Three distinct phases can be identified in the trajectory:

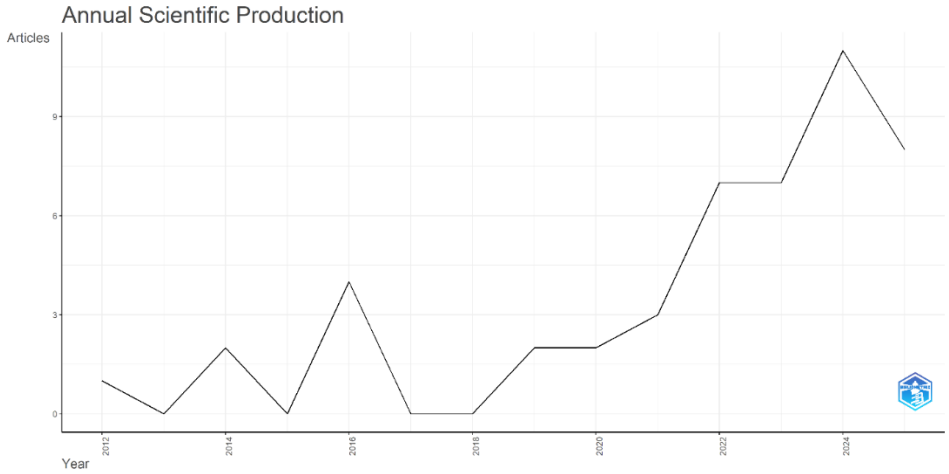


Figure 1. Annual Scientific Production

1. Phase of nascent/sporadic activity (2012–2018)

The output is sporadic and extremely low. There have been no publications for a number of years, suggesting that the subject has not yet established a steady stream of study.

2. Phase of emergence (2019–2021)

Publications start to appear regularly and get more frequent with time. The shift from sporadic contributions to a more ongoing research interest occurs throughout this time.

3. Phase of acceleration (2022–2025)

After 2021, the growth is most noticeable. Production increases dramatically in 2022 and stays high through 2025, indicating that the field has entered a phase of rapid expansion.

Peak and current shift:

1. 2024 has the greatest number of publications (11 articles), which indicates the greatest concentration of scientific activity throughout the series.

2. The output drops to 8 pieces in 2025. Since the level is still significantly higher than the pre-2022 baseline, the result alone should be read as a brief decline rather than a reversal.

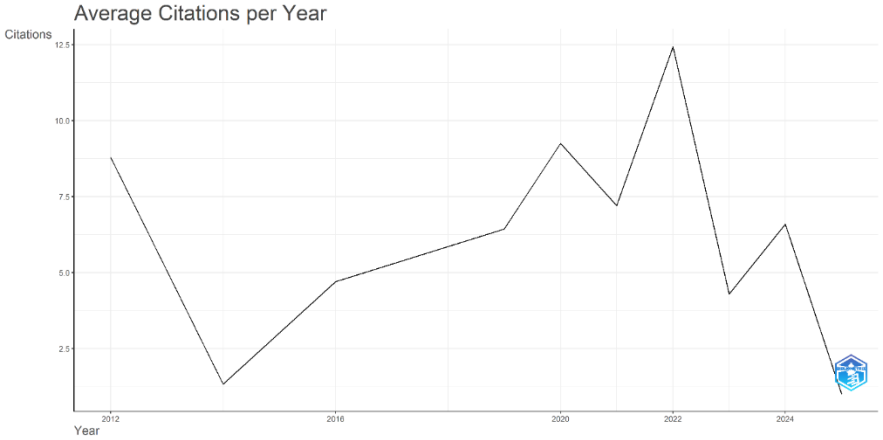


Figure 2. Average Citations per Year

The "Average Citations per Year" graph demonstrates that the average number of citations per article (depending on year of publication) varies (increasing and declining significantly), with some noticeable peaks. This pattern is prevalent in developing disciplines since the average number of citations per year is very sensitive to two factors: (1) the age of the publication (citation window) and (2) the number of articles published each year.

The main phases that appear on the chart:

1. Early period: high, then sharp drop (around 2012-2014)
   a. 2012 shows a relatively high average of citations (about close to 9 citations on average).
   b. After that, there was a very sharp decline until it reached a low point around 2014 (about 1–2 citations on average).

Significance of findings: In the early phases, the average citations appear high (either because the initial article is more "referenced" or because the number of publications per year is still small, so the average is easily pushed up). Then 2014 appears to be a "weak" point in terms of average citations.

2. Gradual recovery and upside (around 2015/2016 - 2019)
   a. After the low point of 2014, the chart shows a gradual recovery and rise.
   b. Around 2016, the average citation was seen in the range of 4–5.
   c. By 2019, the average increased again and was in the 6+ range.

Significance of findings: This period indicates an "initial stabilization,", i.e. publications in those years began to receive more consistent citation attention.

3. Intermediate peaks (around 2020) and further rises (until 2022 peaks)
   a. 2020 shows a fairly high average of citations (around 9).

b. 2021 was down slightly (about 7).

c. 2022 was the highest peak in the entire series, around 12.5 on average.

Significance of the findings: The spike in 2022 suggests that the year's works were gaining attention very quickly (or that there were "outliers" that were so widely cited that they pushed the annual average up significantly).

4. Post-peak decline and "citation lag" effects in recent years (2023 - 2025)

a. 2023 fell sharply (around 4–5).

b. 2024 is back up (about 6–7).

c. 2025 drops to very low (about ~1).

Significance of the findings: The decline in 2025 is almost certainly strongly influenced by citation lag (the most recent article has not had enough time to cite), so the average citation per year of publication is usually low in the most recent year.

Sources

The "Most Relevant Sources" graph shows the 10 most relevant journals in your dataset, along with the number of documents published in each source. In general, the pattern seen is moderate concentration in a few major journals, while the rest is scattered across many journals with small contributions (1–2 documents).

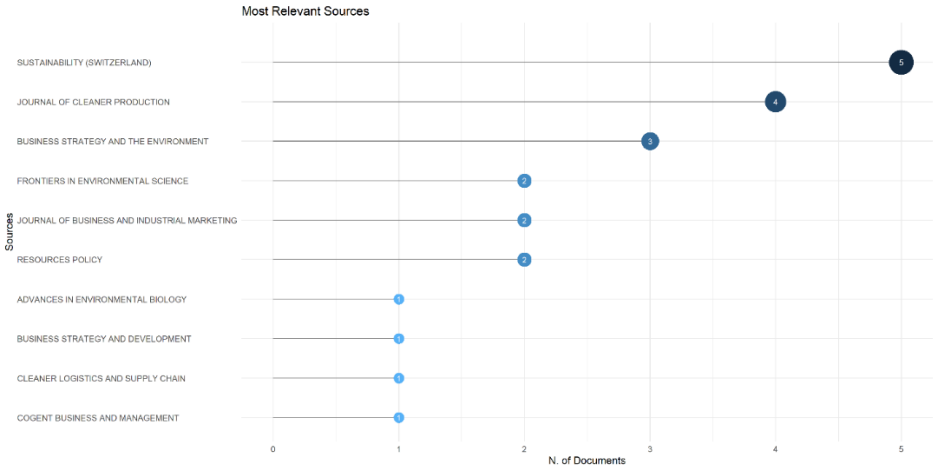


Figure 3. Most Relevant Sources

Here are the top 10 sources and the number of documents exactly as shown in the graph:

Table 2. Most Productive Sources

Ranking	Source	N. of Documents
1	*Sustainability (Switzerland)*	5
2	*Journal of Cleaner Production*	4

3	*Business Strategy and the Environment*	3
4	*Frontiers in Environmental Science*	2
5	*Journal of Business and Industrial Marketing*	2
6	*Resources Policy*	2
7	*Advances in Environmental Biology*	1
8	*Business Strategy and Development*	1
9	*Cleaner Logistics and Supply Chain*	1
10	*Cogent Business and Management*	1

If calculated only from the 10 journals that appear in the graph, the total number of documents in this group is: 5 + 4 + 3 + 2 + 2 + 2 + 1 + 1 + 1 + 1 = 22 documents (Top-10 sources)

Of the 22 documents:

1. The top two journals (Sustainability and Journal of Cleaner Production) contributed 9 documents: approximately 40.9% of the documents in the Top 10 (9/22).
2. The top 3 journals (plus Business Strategy and the Environment) contributed 12 documents: approximately 54.5% of the documents in the Top 10 (12/22).

The graph also shows a "long-tail" pattern:

1. There are 3 journals with a contribution of 2 documents.
2. There are 4 journals with a contribution of 1 document.

This means that, in addition to a few dominant outlets, publications are also scattered across many other sources with small volumes, indicating that this field/topic is interdisciplinary and not yet concentrated in a single journal community.

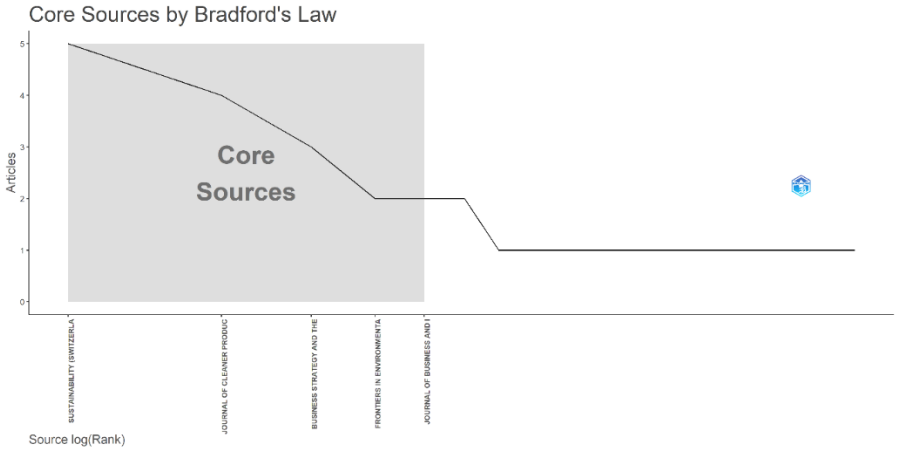


Figure 4. Bradford's Law

The "Core Sources by Bradford's Law" graph shows how publications in your dataset are concentrated in a small number of core sources, then spread to other journals with lower productivity. This pattern is consistent with the principle of Bradford's Law, namely: in a field of research, most articles usually come from a small group of core journals, while the rest are spread across a wider "zone" of journals (more journals, but each journal's contribution is small).

According to Bradford's Law, the dataset's publication output is concentrated in a few key journals. Five sources make up the core zone: Journal of Cleaner Production (4), Business Strategy and the Environment (3), Frontiers in Environmental Science (2), Journal of Business and Industrial Marketing (2), and Sustainability (Switzerland) (5 articles). The productivity drastically drops to about one article per journal after these primary sources, confirming the topic's dispersion across several channels and showing a clear long-tail distribution.

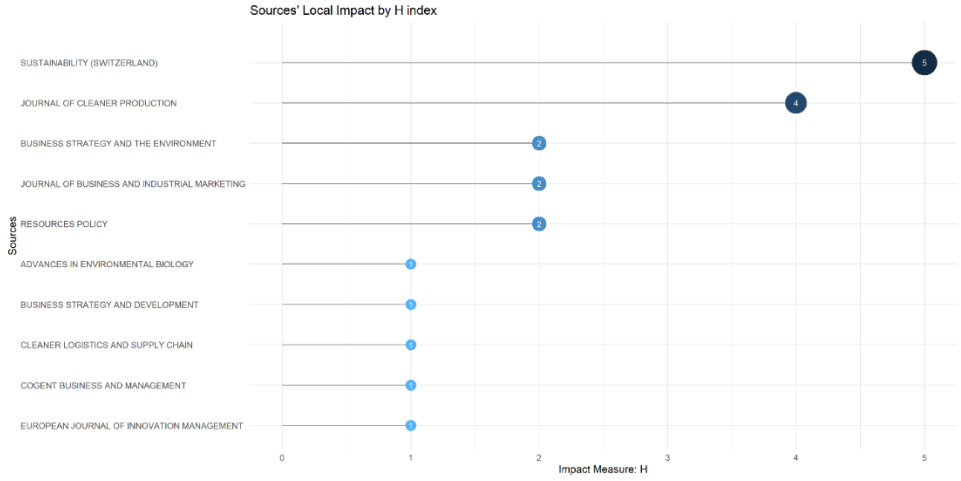


Figure 5. Sources' Local Impact by H-index

The "Sources' Local Impact by H-index" graph displays the local impact of each journal in your dataset using the H-index at the source level. In this context, "local H-index" means within the corpus of articles analyzed, a journal has an H value if it has H articles, each of which has received ≥ H citations (citations are counted within your corpus/scope of bibliometric analysis). Thus, this metric measures the strength of a journal's impact within the dataset, not the overall global impact of the journal.

Here are the sources with the highest document contributions in the table:

Table 3. Source Impact

Rank	Source	NP (Documents)	TC (Total Citations)	h-index	g-index	m-index	PY_start
1	Sustainability (Switzerland)	5	147	5	5	0.833	2020
2	Journal of Cleaner Production	4	452	4	4	0.400	2016
3	Business Strategy and the Environment	3	42	2	3	0.667	2023
4	Journal of Business and Industrial Marketing	2	91	2	2	0.286	2019
5	Resources Policy	2	29	2	2	0.500	2022
6	Frontiers in Environmental Science	2	5	1	2	0.333	2023

The Source Impact table summarizes the performance of each journal in the bibliometric corpus. The NP column shows the number of articles published in that journal, while TC shows the total citations received by articles from that journal in the dataset. The h-index indicator describes the consistency of citation impact (for example, h=5 means that there are 5 articles from that journal that have each been cited at least 5 times), while the g-index is more sensitive to highly cited articles. The m-index column normalizes the h-index against the time since PY start (the first year the journal appeared in the corpus), thus reflecting the relative speed of impact. In general, the table shows that Sustainability (Switzerland) and Journal of Cleaner Production are the most dominant outlets (productive and impactful), while most other journals follow a long-tail pattern (generally only 1 article with an h-index of 1).

Authors

Based on Lotka's Law table, the productivity of authors in the corpus shows a highly skewed pattern: the vast majority of authors contribute only one document, while only a few are highly productive (forming a long tail). Total authors counted: 188 authors.

Table 4. Lotka's Law

The document was written	Number of authors	Proportion of authors
1	150	79.8%
2	20	10.6%
3	4	2.1%
4	4	2.1%
5	3	1.6%
6	2	1.1%
7	2	1.1%
11	1	0.5%
12	1	0.5%
14	1	0.5%

90.4% of authors wrote only 1–2 documents (79.8% wrote 1 document; 10.6% wrote 2 documents). Only 9.6% of authors wrote ≥3 documents (18 out of 188). Authors with very high productivity are rare: only 1.6% wrote ≥10 documents (3 out of 188; each wrote 11, 12, and 14 documents, respectively). The curve in the graph shows a very sharp decline from 1 to 2 documents, then approaches zero at high productivity, a characteristic of the Lotka distribution (long-tail) in scientific productivity in this corpus.

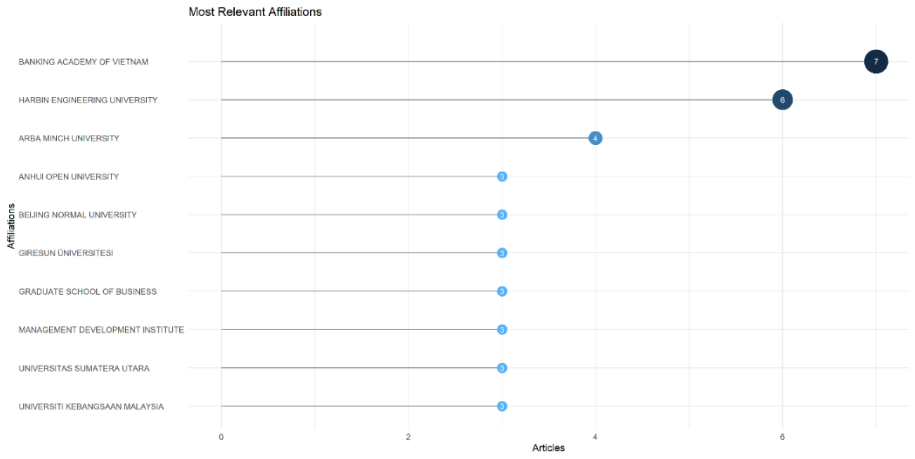


Figure 6. Most Relevant Affiliations

The "Most Relevant Affiliations" graph displays the 10 most productive affiliations in your dataset, measured by the number of articles associated with each institution. The pattern shows a concentration of output at the top two institutions, followed by a middle group and a long tail.

The top two affiliates (Banking Academy of Vietnam and Harbin Engineering University) are the main contributors with 7 and 6 articles, respectively, and are clearly dominant over the others. There is one mid-level affiliate (Arba Minch University) with 4 articles. The majority of affiliates in the Top-10 are at the 3-article level, indicating a relatively even distribution of contributions in the "long tail" group after the top two institutions.

The Affiliations' Production over Time graph shows the cumulative trend (the line never goes down, only up and then flattens) of the number of articles per affiliation throughout 2012–2025. In general, the contribution of new institutions appears to be significant after 2019, with several affiliations becoming "key drivers" in the most recent period.

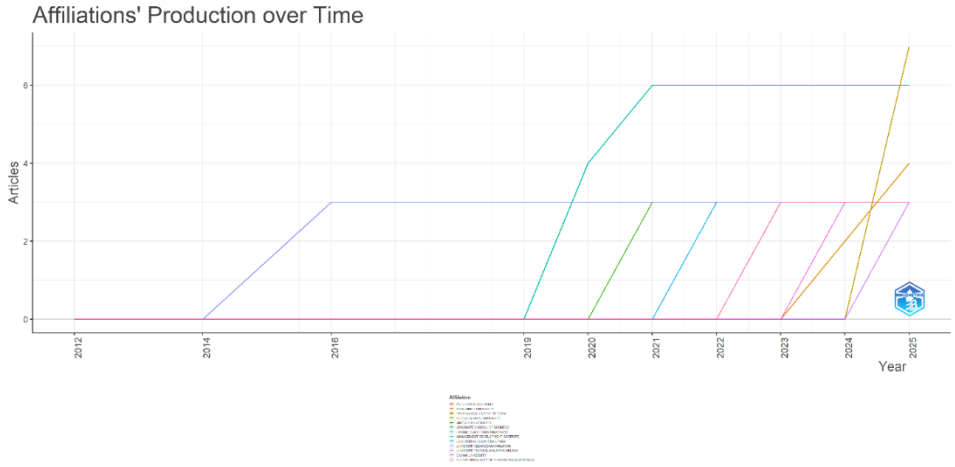


Figure 7. Affiliations' Production over time

Universiti Kebangsaan Malaysia (UKM) appeared earliest: production began to appear in 2014 and reached 3 articles in 2016, then remained stable (flat) until 2025. Harbin Engineering University was the most consistent contributor during the growth phase: it began to increase around 2019, rose rapidly to 4 articles (around 2021), then reached 6 articles in 2022 and remained at 6 until 2025. The Banking Academy of Vietnam showed the sharpest surge at the end of the period: the line rose steeply from 2024 to 2025, reaching 7 articles in 2025 (indicating a very strong acceleration in publication in the final year). Arba Minch University showed a gradual increase in the final phase: it began to appear around 2023 and increased to 4 articles in 2025.

Several other affiliates (e.g., Beijing Normal University, Giresun University, University of North Sumatra, and several other institutions in the legend) show a similar pattern: entering in

2020–2024 and then rising rapidly to a plateau of around 3 articles in 2021–2025. Several lines at the 3-article level appear to overlap because many affiliates stopped at the same number.

Overall, affiliate production in this corpus shows an "early single core and late acceleration" structure: one early stable affiliate (UKM), followed by post-2019 institutional acceleration led by Harbin Engineering University, and a very prominent peak in acceleration in the last year from the Banking Academy of Vietnam.

The Country Production table contains 24 countries with a total of 139 occurrences (Freq). This means that the Freq number represents how often a country appears in the dataset (for example, as an affiliation/contributor to an article), so the total can be greater than the number of articles if many publications involve multiple countries.

The top four countries account for the largest share of occurrences:

Table 5. Four Top Country Productions

Ranking	Country	Freq	Share of the total
1	China	41	29.5%
2	India	21	15.1%
3	Malaysia	18	12.9%
4	Indonesia	10	7.2%

The top four countries accounted for 64.7% of total occurrences (90/139). After the top four, the next contributions declined quite sharply: Ethiopia (6), Turkey (5), South Korea (4), UK (4), USA (4), Iran (3), Jordan (3), Pakistan (3). When accumulated, the top 10 countries accounted for about 83.5% of total occurrences (based on cumulative figures up to Iran).

The "long tail" distribution is clear: 7 countries appear only once: Chile, Ghana, Italy, Lithuania, New Zealand, South Africa, United Arab Emirates. 5 countries appear twice: Poland, Saudi Arabia, Canada, Morocco, Egypt. This shows that although the largest contributions are concentrated in a few major countries, the dataset still reflects the involvement of many other countries on a smaller scale.

Overall, country production in the dataset shows a high concentration in China–India, Malaysia–Indonesia, followed by a middle group (Ethiopia/Turkey/South Korea/UK/USA), and the rest forming a long tail (many countries with a frequency of 1–2).

Documents

The "Most Globally Cited Documents" graph displays the 10 most cited documents globally. The pattern shows a concentration of citations on several "anchor" articles, with a clear gap from the next group. The top two articles (Kushwaha 2016 and Roh 2022) are nearly identical

in impact (178 vs. 177) and are far above other documents, indicating two main anchor papers in the corpus. After the third position (123 citations), citations drop to the middle group (89–87 citations) and then to the lower group (75–36 citations). Outlet dominance is also evident: of the 10 papers, 3 are from the Journal of Cleaner Production (Kushwaha 2016; Roh 2022; Huang 2024), marking the journal as one of the most influential sources for the topic in the dataset.

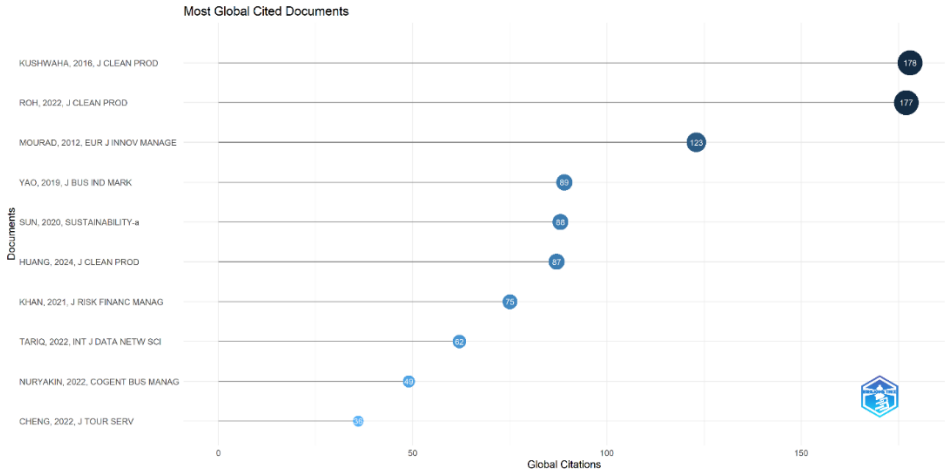


Figure 8. Most Global Cited Documents

Overall, the global citation structure in the dataset shows an uneven distribution: a small number of articles have very high citations (anchors), while the rest form a layer of medium to low impact, which illustrates the process of knowledge consolidation in several key works.

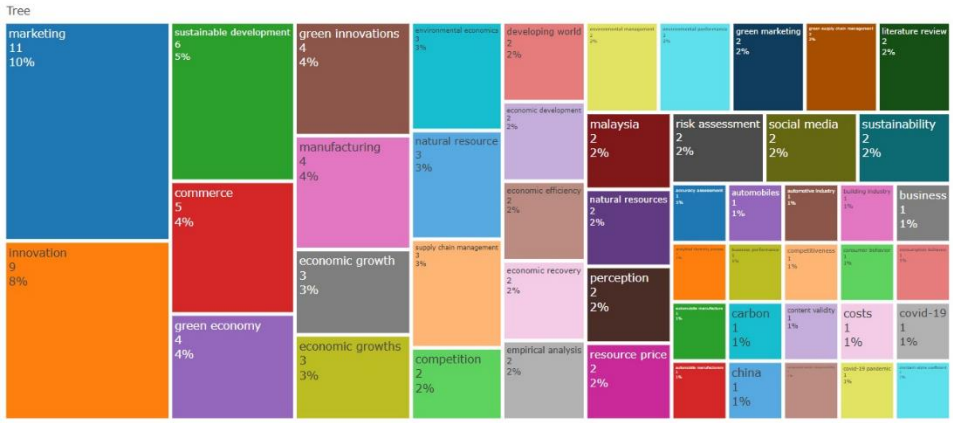


Figure 9. TreeMap

The TreeMap shows that the research themes in the corpus are mostly dominated by: marketing: 11 occurrences (10%), the largest/main term; innovation: 9 occurrences (8%), the second core theme; sustainable development: 6 occurrences (5%); and commerce: 5 occurrences (4%).

The middle group (4 occurrences each; 4%) includes green innovations, manufacturing, and the green economy. Next are terms with a small to medium contribution (generally 2–3

occurrences; 2–3%), for example, economic growth/economic growths, environmental economics, natural resource(s), supply chain management, as well as several context/issue terms such as Malaysia, risk assessment, social media, sustainability, green marketing, and literature review (generally 2; 2%). The corpus is strong in the slice (marketing-innovation) and expansion towards sustainable development / green economy/manufacturing/commerce.

Keyword dynamics indicate that the corpus is dominated by marketing (11; 10%) and innovation (9; 8%), followed by sustainable development (6; 5%) and commerce (5; 4%). The Trend Topics figure displays four trending topics along with their frequency of occurrence (freq) and a summary of their distribution by year of occurrence (year_q1, year_med, year_q3). The total frequency of these four topics is 31 occurrences.

Table 6. Trend Topic

Topic	Freq	Share (from 31)	Year Q1	Median (Year)	Year Q3
marketing	11	35.5%	2022	2023	2024
innovation	9	29.0%	2021	2023	2024
sustainable development	6	19.4%	2022	2023	2024
commerce	5	16.1%	2022	2022	2024

Marketing is the most dominant trending topic (11 occurrences; 35.5%), with activity centered around the median of 2023. Innovation ranks second (9; 29.0%) and is the earliest emerging topic (Q1 = 2021), but remains concentrated in 2023–2024 (median 2023; Q3 2024). Sustainable development contributes moderately (6; 19.4%) with a time pattern similar to marketing (Q1 2022; median 2023; Q3 2024). Commerce has the lowest frequency (5; 16.1%) but the earliest median time (2022), indicating that this topic "matured" faster than the other three topics (whose median is 2023). All four topics share Q3 = 2024, indicating that the emergence of these trending topics is concentrated in the most recent period of the corpus.

Conceptual Structure

The Co-occurrence Network diagram maps keyword relationships based on co-occurrence. Node size indicates dominance/frequency, while edges indicate the strength of relationships between terms. Visually, the network forms three main clusters and several connecting nodes.

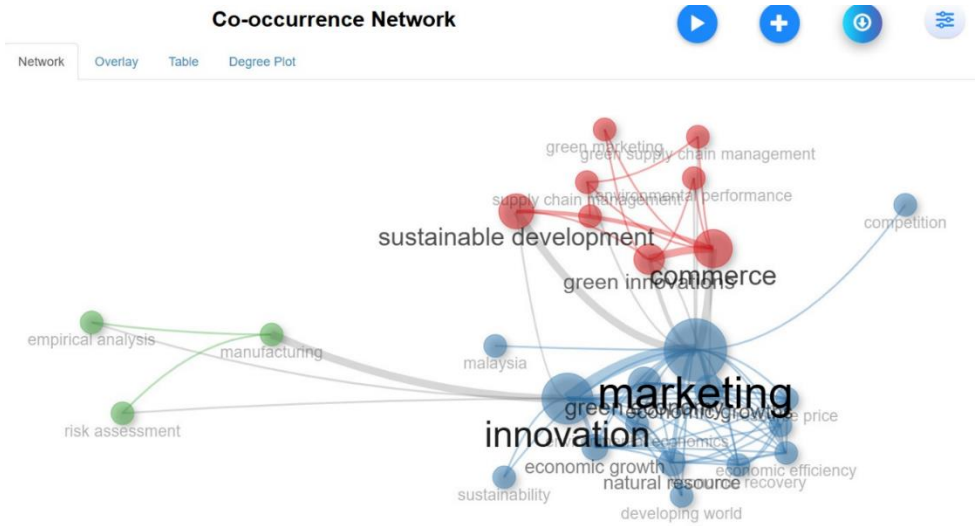


Figure 10. Co-occurrence Network

Marketing is the largest and most central node (the main hub of the network). Innovation is the second largest node and is very close to marketing, indicating the strongest link in the network. Commerce and sustainable development also appear large, forming strong sub-themes.

Visible cluster structure: Blue Cluster (core: marketing–innovation). Focused on marketing and innovation, with many economic/environmental terms attached and interconnected, such as growth, economics, green economy, natural resources, economic efficiency, and resource recovery, as well as regional contexts such as Malaysia and the general theme of sustainability. This cluster shows that the discourse of marketing innovation in the corpus is often positioned alongside issues of economic growth, efficiency, and resource management. Red Cluster (sustainable development–commerce–green innovations). Centered on sustainable development, commerce, and green innovations, as well as related terms: green marketing, green supply chain management, supply chain management, and environmental performance. This cluster indicates a strong focus on the link between sustainable development and commercialization/commerce and the implementation of green innovations through the perspective of supply chains and environmental performance. Green Cluster (manufacturing–empirical analysis–risk assessment). Prominent nodes: manufacturing, empirical analysis, and risk assessment. This cluster is relatively smaller and somewhat separate from the core, depicting a methodological/industrial (manufacturing) sub-theme that is connected but not as dense as the two main clusters.

The bold/prominent line from marketing innovation to sustainable development/commerce indicates the existence of bridging themes that connect two major currents: (1) marketing innovation/economy and (2) sustainable development, green innovations,

and supply chain. Competition appears as a peripheral node (separated on the right side) with limited connections; this theme is present but is not the focus of discussion in the corpus.

Keyword co-occurrence mapping shows that marketing and innovation are the most central nodes in a network that forms the field's core. Three primary clusters stand out:(i) a blue cluster that connects marketing and innovation with terms related to the economy and resources (such as economic growth, green economy, and natural resources); (ii) a red cluster that focuses on sustainable development, commerce, and green innovations related to supply chain and environmental performance; and (iii) a smaller green cluster that revolves around manufacturing, empirical analysis, and risk assessment. With sustainable development and commerce serving as significant adjacent hubs and rivalry remaining peripheral, the network indicates a strong synergy between marketing and innovation topics.

Thematic maps map themes based on two dimensions: centrality (relevance degree; X-axis) and density (development degree; Y-axis). Dotted lines divide themes into four quadrants: Niche, Motor, Basic, and Emerging/Declining.

1. Motor themes (high centrality and high density)

There are two main clusters in the Motor Themes quadrant (top right), indicating the most central and most mature/developed themes in the corpus:

a. (marketing – sustainable development – commerce): the largest and most central cluster, indicating that this is the main "driving force" of the discourse.
b. (innovation – green economy – economic growth): the second motor cluster; highly developed (high density) and also quite central.

2. Basic themes (high centrality and low density)

In the bottom-right quadrant (Basic Themes), there are no dominant large clusters. This indicates that the key themes in the corpus tend to be not only central but also sufficiently developed (shifting to motor themes).

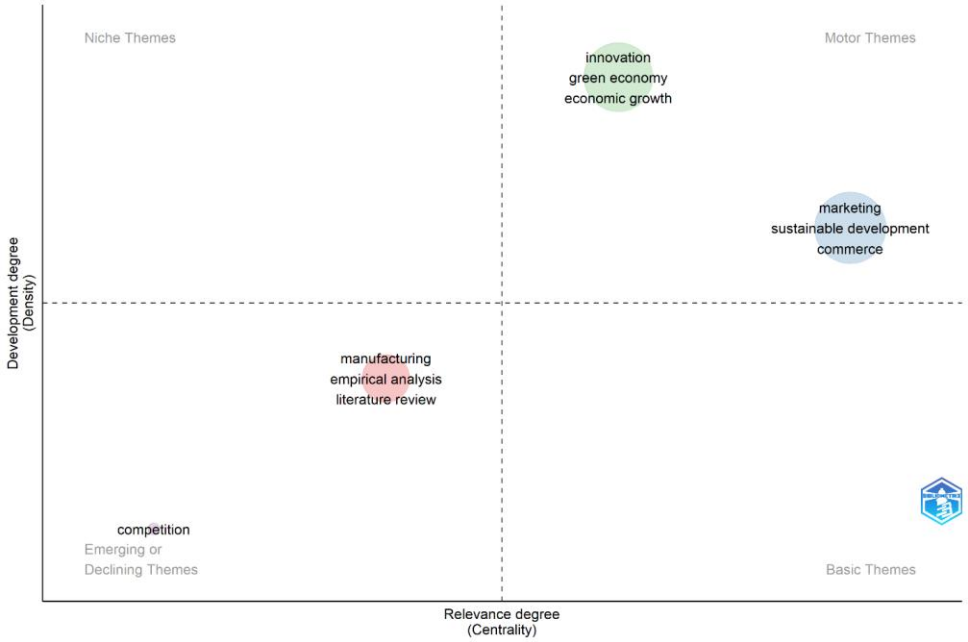


Figure 11. Thematic Map

3. Niche themes (low centrality and high density)

The upper-left quadrant (Niche Themes) does not show any prominent clusters on this map. This means that there are no themes that are highly "specialized and mature" but isolated from the main themes.

4. Transitional/localized themes (low density and medium centrality)

There is one cluster in the lower-middle area (near the left of the vertical line), namely, manufacturing, empirical analysis – literature review. This cluster has low to medium density and relatively lower centrality than the two motor themes, so it appears as a theme that is still limited in its connection to the center of discussion and has not developed as strongly as the motor themes.

5. Emerging or declining themes (low centrality and low density)

Competition is in the lower-left quadrant (Emerging or Declining Themes), indicating the most peripheral theme with the lowest level of development in the corpus (it could mean that it is just beginning to emerge or that it is no longer a focus).

High relevance and robust internal development are indicated by the thematic map's two main motor themes: (i) marketing–sustainable development–commerce, and (ii) innovation-green economy-economic growth. Competition is located in the emerging/declining quadrant, indicating peripheral and poorly developed attention in the dataset, while a smaller cluster (manufacturing-empirical analysis-literature review) appears as a less central and less developed subject.

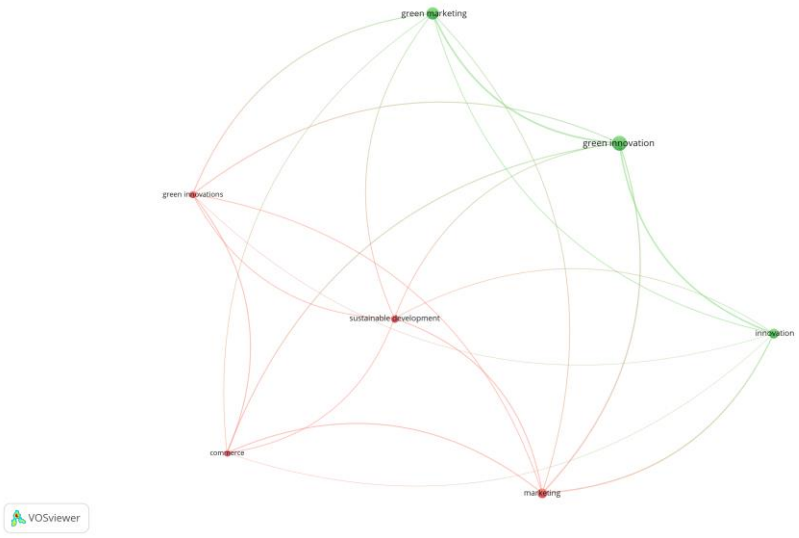


Figure 12. Keyword Network

The VOSviewer network map displays the co-occurrence of core keywords and forms two main clusters (marked in color), with several nodes acting as cross-cluster connectors. The Green Cluster (innovation-oriented/green-innovation core) focuses on green innovation, which is strongly linked to green marketing and innovation. The connections between nodes in this cluster appear dense (many lines), indicating that green innovation often appears alongside innovation and green marketing.

The Red Cluster (marketing–commerce–sustainable development core) centers on marketing and sustainable development and is related to commerce and green innovations (plural form). This cluster shows that the discourse of marketing in the corpus quite often goes hand in hand with commerce and sustainable development.

Green marketing appears to be a key connecting node: it is positioned at the top and has many connections to green innovation (green) while also connecting across to the themes of marketing/sustainable development (red). Marketing is also seen as an important node in the red cluster because it has several connections to other nodes (including innovation-related ones).

The strongest/most prominent relationship visually appears in the green marketing-green innovation-innovation pathway, indicating the integration of the "green" theme with innovation. On the other hand, the marketing-sustainable development-commerce pathway shows a focus on market application/implications and sustainable development. The existence of two similar terms (green innovation vs. green innovations) is seen as different nodes and is located in different clusters, indicating variations in keyword writing in the corpus (and this can affect network mapping).

Two primary keyword clusters are revealed by VOSviewer mapping. Green marketing and innovation are closely related to the first (green cluster), which is focused on green innovation. Marketing, sustainable development, and commerce are grouped together in the second (red) cluster, which also includes green technologies. Green marketing serves as a crucial link between the marketing–sustainability–commerce cluster and the innovation-focused cluster, demonstrating the dataset's thematic integration of green-oriented innovation and market/sustainability discourse.

Discussion

All of the records in the final dataset are English-language articles from 47 Scopus-indexed journals published between 2012 and 2025. With 170 authors, authors per document = 3.62, and international co-authorship ≈ 27.66%, the dataset is fundamentally collaborative (many authors per publication), suggesting that cross-border and multi-author research teams are increasingly addressing green innovation marketing. Using bibliometric tools such as Biblioshiny and science-mapping tools like VOSviewer, the approach is methodologically consistent with recognized bibliometric practice (Aria & Cuccurullo, 2017; van Eck & Waltman, 2010).

There has been a noticeable increase in the yearly production of science in recent years. The output is sparse in the early years (e.g., 2012: 1; 2014: 0), gradually emerges (e.g., 2016: 1-2), and then sharply increases after 2019, peaking around 2024 (12 papers) before 2025 (5 papers), which is anticipated to be incomplete because it is the most recent year. The average citations per year by publication year, or citation dynamics, show peaks and troughs typical of a developing field where averages are sensitive to small annual publication counts as well as the "citation window." The recent year's dramatic decline is consistent with citation lag, which is a common problem noted in bibliometric interpretation standards (Donthu et al., 2021). Recent papers have had little time to accumulate citations.

Source productivity follows a concentrated long-tail pattern: a small set of journals contributes repeatedly, while many outlets appear only once. In the top sources, the dataset is anchored by journals strongly associated with sustainability and environmental strategy, such as Sustainability (Switzerland) and Journal of Cleaner Production, alongside business-facing outlets like Journal of Business and Industrial Marketing. Within the corpus (local impact), Sustainability leads by h-index = 5 (NP=5; TC=147), while the Journal of Cleaner Production shows the strongest citation volume (NP=4; TC=452) and h-index = 4, highlighting it as a central impact channel for green innovation marketing research in this dataset. These patterns match the field's

substantive logic: research sits at the intersection of marketing, innovation, and sustainability governance, which naturally concentrates publication and citations in sustainability, environment, and strategy outlets (Khan et al., 2021).

Author productivity is highly skewed. Based on the Lotka table, 79.8% of authors wrote 1 paper and 10.6% wrote 2 papers, meaning 90.4% contributed only 1-2 papers; only a very small minority produced high counts (e.g., 11-14 papers). This indicates a field that is still consolidating: many scholars contribute occasionally from adjacent disciplines (innovation studies, sustainability, supply chain, and development economics), while a small group builds continuity and thematic leadership, typical in emerging interdisciplinary domains described in bibliometric synthesis work (Aria & Cuccurullo, 2017; Donthu et al., 2021).

The "Most Relevant Affiliations" results show a small set of institutions with repeated presence (e.g., Banking Academy of Vietnam (7); Harbin Engineering University (6); Arba Minch University (4)), followed by several institutions with smaller counts (often 3). This suggests institutional clustering around emerging-market contexts (e.g., Vietnam, China, Ethiopia/other developing-economy settings), consistent with the empirical orientation of highly cited works in this corpus that study green marketing/innovation performance under institutional and development conditions (Huang et al., 2024a; Yao et al., 2019).

The most globally cited documents in the dataset (as displayed) include:

1. Kushwaha (2016) with 178 citations, focusing on green initiatives and firm performance in an industry setting;
2. Roh (2022), with 177 citations, emphasizing structural links among firm green strategies, green supply chain management, and green marketing innovation;
3. Mourad (2012), with 123 citations, addresses green brand perception in an emerging market;
4. followed by topics connecting eco/green innovation to firm value, risk/finance, digital marketing/CSR, and sectoral sustainability. Substantively, these anchors imply that the field's "core logic" is not merely promotional communication but a capability/strategy-innovation/operations-performance/outcomes chain. This is especially visible in Roh et al. (2022), which explicitly ties green marketing innovation to broader organizational green strategy and supply chain mechanisms.

The literature frames green innovation marketing as (1) a marketing capability, (2) an innovation pathway, and (3) a sustainability-development instrument. The keyword trends demonstrate that marketing and innovation dominate cumulative term growth over time, with sustainable development and commerce also prominent. The treemap confirms this dominance:

marketing (11; 10%), innovation (9; 8%), sustainable development (6; 5%), and commerce (5; 4%), along with secondary themes like manufacturing, green innovations, and cleaner-production outlets (Kushwaha & Sharma, 2016; Roh et al., 2022; Yao et al., 2019).

The co-occurrence network indicates that marketing and innovation are often explored in tandem rather than separately, with key hubs (central nodes) relating to phrases like "sustainable development, commerce, and green innovations. Innovation + green economy + economic growth appears as a developed and influential theme, while marketing + sustainable development + commerce is positioned as a high-centrality cluster (field-shaping) in the thematic map. This suggests that research is increasingly treating green innovation marketing not only as a firm-level marketing topic but also as linked to broader economic-development outcomes. While "competition" appears as emerging/declining, suggesting that competitive dynamics are either newly forming as a subtopic or are losing attention relative to sustainability/innovation mechanisms, a smaller cluster (such as manufacturing/empirical analysis/literature review) suggests methodological consolidation.

Across the results, the corpus indicates three consistent directions:

1. Strategy-to-performance mechanisms dominate: highly cited anchors and core journals prioritize frameworks where green strategies and innovations translate into measurable outcomes (environmental performance, firm value, brand development). This is consistent with the prominence of the Journal of Cleaner Production and Sustainability as both productive and locally impactful outlets.
2. Emerging-market and developing-economy contexts are central: affiliations and influential documents repeatedly point to emerging markets (e.g., Vietnam) and developing-economy industries (e.g., sector studies), suggesting that institutional conditions and resource constraints are key boundary conditions for green innovation marketing effectiveness.
3. Integration with digital/CSR and supply chain perspectives is rising: the influential-citation list and keyword connections show expansion toward digital marketing/CSR and green supply chain–marketing innovation links (Tariq et al., 2022; Roh et al., 2022).

E. CONCLUSION

This bibliometric study maps the structure and evolution of green innovation marketing research using 47 Scopus-indexed journal articles from 2012 to 2025. It demonstrates that the field is rapidly expanding, interdisciplinary, and strongly focused on performance implications, marketing capabilities, and sustainability outcomes. A useful "navigation map" for scholars to

position new studies and for practitioners to create more successful green innovation marketing strategies is provided by the synthesized evidence (via prominent sources, highly referenced works, and theme clusters).

Limitation

Future extensions (e.g., adding Web of Science or applying deeper network metrics) may reveal additional structures or change the relative prominence of themes. Therefore, the results should be interpreted in light of the three stated constraints: reliance on Scopus alone, a single export snapshot, and science mapping that is primarily keyword-frequency and clustering-based.

Implication

First, rather than being viewed as discrete "green promotion" strategies, the map emphasizes that green innovation marketing is best understood as an integrative capacity bundle that connects (i) (i) green innovation activities, (ii) marketing-oriented capability development, and (iii) sustainability and market outcomes. This aligns with capability- and performance-oriented anchor studies that link green marketing innovation and tactics to quantifiable results (e.g., environmental performance and market-related outcomes). Second, the bibliometric structure shows that the intersection of marketing, innovation, and sustainable development is the intellectual center of gravity. This suggests that future theorizing should explicitly model boundary conditions (institutions, market maturity, and governance quality) that influence whether green innovation marketing becomes credible and value-creating in various contexts.

The study's primary takeaway for managers is that to translate environmental initiatives into competitive advantage and market performance, green marketing orientation and innovation capabilities must be developed collaboratively and then "activated" through supporting systems, risk management, supply-chain coordination, and credible signaling (such as labels and certifications). This is practically consistent with findings that supply-chain dynamics and green marketing innovation can serve as important channels through which green tactics enhance results. Since credibility is crucial to adoption and brand outcomes in green markets, particularly in emerging-market settings where information asymmetry can be higher, companies should treat green claims as verifiable market signals backed by quantifiable innovation inputs (product/process changes) and traceable operational evidence (e.g., audited environmental indicators).

In terms of methodology, the study shows that bibliometric mapping, when combined with productivity/impact indicators, science mapping, and transparent reporting standards, is a good way to bring disparate sustainability-marketing subjects together. To make thematic findings

less reliant on a single export snapshot, (i)) cross-database triangulation and (ii) additional network diagnostics (centrality and thematic evolution measures) would improve robustness for future replications.

Acknowledgement

The author gratefully acknowledges the many individuals and institutions whose assistance made this research possible. Particular appreciation is extended to academic supervisors and mentors for their thoughtful guidance, rigorous critique, and sustained encouragement throughout the study. Their scholarly expertise was instrumental in refining both the direction and the overall standard of this work. The author also recognizes the value of bibliographic resources and analytical tools that supported the bibliometric component of the research. In this regard, sincere thanks are due to Scopus for access to relevant publication data and to the developers of VOSviewer and bibliometrix/Biblioshiny for providing robust software that enabled systematic mapping, visualization, and interpretation of the literature.

Further thanks are offered to professional readers and reviewers who devoted time to evaluating earlier versions of the manuscript and providing constructive recommendations. The author is equally appreciative of colleagues and technical assistants who supported data handling, formatting, and document preparation. Finally, the author extends heartfelt gratitude to family and friends for their patience, understanding, and unwavering moral support during the completion of this research.

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