

SUSTAINABILITY AND GREEN PRODUCTS: A BIBLIOMETRIC ANALYSIS

**Kotigari Reddi Swaroop, Department of Entrepreneurship Education
Entrepreneurship Development Institute of India, Ahmedabad
Amritkant Mishra, Department of Entrepreneurship Education
Entrepreneurship Development Institute of India, Ahmedabad
Nithin K. N, Department of Entrepreneurship Education
Entrepreneurship Development Institute of India, Ahmedabad
Repalle Giddaiah, Department of Management Studies
NALSAR University of Law – Hyderabad, Telangana**

ABSTRACT

Due to rising concern toward the environment, growing consumer knowledge and global trend towards sustainable development, research interest in sustainability and green product studies have grown rapidly. Despite the growing volume of studies in this area, the existing knowledge on publication trends, prominent authors, collaborations, and trending topic themes are limited. This paper intended to offer a thorough bibliometric analysis of sustainability and green product studies from 2005 to 2023. Using a quantitative bibliometric research design, 621 documents were downloaded from the Web of Science database using relative keywords, after applying the filters of subject categories, document type and language. Based on the criteria, 617 research documents were collected and analyzed using the Bibliometrix R. It identified the leading authors, top journals, most influential countries, main collaborators and networks, critical papers, and current research clusters in the area of sustainability and green product study. This study concluded that sustainability and green product research is a thriving interdisciplinary field, with lots of promising prospects for researcher, academia, policy-makers, and practitioners and it reveals potential areas for future research in green business and sustainable consumption behavior.

Keywords: Sustainability, Green Products, Bibliometric Analysis, Sustainable Consumption.

INTRODUCTION

The concept of sustainability has developed into a central value in the 21st century as it defines our interaction with the environment, the society and the economy. It transcends environmental issues, to represent a holistic agenda that is compared to a three-legged stool. Environmental sustainability aims to conserve natural resources and resolve problems such as climatic change, social sustainability aims to promote equity and wellbeing and economic sustainability aims to have a resilient economy within environmental and social contexts (Abad-Segura & González-Zamar, 2019). The United Nations Sustainable Development Goals (SDGs) and Intergovernmental Plan on Climate Change (IPCC) focus on urgency, and it provides a roadmap to global challenges. Sustainability has practical advantages, such as resilience, the improvement of quality of life, and sustained economic success (Tella & Aisha Olabooye, 2014). Nevertheless, it is associated with challenges, including the balancing of the three pillars, the development of behavioural change, and enhancing international collaboration on such topics as climate change. Sustainability is our guide in the twists and turns of our days to guide us to a greater future (Fitriah, 2021; Patel et al., 2022).

Green Products and Sustainability

According to the Brundtland Commission (1987), the idea of sustainability is a guiding principle that guides any effort that seeks to focus on the long-term wellbeing of our planet, its people, and their economies (Yan & Zhang, 2019; Zhang, Yu & Zheng, 2016). Sustainability has 3 pillars which are interrelated; environmental sustainability, social sustainability and economic sustainability. In this context the environmentally friendly products or green products are also significant. Green products are an example of sustainability (UNEP, 2021) in that they have reduced effects on the environment during its life cycle. These products will reduce the impacts of the traditional products on the environment (Nithin & Mahajanashetti, 2025). Even the reports, e.g. the ones of the IPCC (IPCC, 2021), indicate that actions must be taken to counteract the expanding climate crisis. Green products present the solutions through minimizing the use of resources, encouraging the use of energy and reducing emissions which are important measures in addressing environmental issues (Goyal & Kumar, 2020). Besides environmental effects, green products have contributed to a high degree of social sustainability through prioritizing the life of the individuals and communities. A lot of these products are produced on the basis of materials that are not harmful to the health of people, which results in the high quality of living and the enhancement of the sense of well-being (as it is stated by the World Health Organization in 2016). This is in line with the aspect of sustainability that dwells on fairness, equality and access to necessities such as clean water, education and healthcare besides economic opportunities (Zhang et al., 2014). Green products are illustrations of these values because they offer more friendly products to the environment (White & Thomas, 2021).

Green products are also adopted leading to economic sustainability. When they are introduced into the market, they trigger innovation, create employment, and drive the market growth of the green product industry (UNEP, 2021). Sustainability is crucial in this economic aspect of ensuring the success and stability of the economy and the businesses in the long run (Zhang, Zhang & Managi, 2019). Green products can steer the economic activity within the parameters laid by environmental and social restrictions by encouraging responsible consumption and production, which are in line with sustainable development principles. To sum up, green products are the concrete realizations of the principles of sustainability, which deals with interdependent global issues of today (Valencia et al., 2018). They provide a complex solution, which is in line with the United Nations Sustainable Development Goals (SDGs) (UN, 2015) and they offer a good direction towards a strong, fair, and successful future. With the world still struggling to solve the intricate problems of the 21st century, green product promotion and adoption remain important aspects of our joint destination to a sustainable world. Bibliometric analysis was used to review sustainability and green products, sustainable consumer behaviour, environmentally conscious consumer behaviour research, green supply chain management, innovations, information and communications technology (ICT), and green products awareness (Tseng, Tan, & Siriban-Manalang, 2013). The researchers used meta-analysis as a research method to examine the factors and consequences of sustainability and eco-friendly products. The issue of sustainability and green products has gained significance in the sphere of research. With this in mind, the literature review is essential to determine the advancements in the topic of research. The aim of this research paper is to give a comprehensive bibliometric review of the knowledge of the Sustainability and Green Products knowledge (Lingyan et al., 2023). Through a literature review and analysis, we are going to illuminate the academic environment of this vital area, determine the trends and themes, and reveal gaps in knowledge that can be the subject of

research. The study will engage a voluminous number of academic sources including articles, conference papers, theses, and other published sources to create a comprehensive bibliometric database. With the use of advanced bibliometric tools and data analysis tools assess the tendencies in the amount of publications and to assess the most relevant and mentioned ones, significant authors and organisations that impact the discipline (Xu et al., 2018).

Research Questions

1. During the past years, what have been the main research developments in the fields of sustainability and green products?
2. Which journals have published the most research on green products and sustainability, and which ones have the highest impact factor?
3. Who are the most prolific authors in the field of green products and sustainability, and what are their most cited publications?
4. Which terms are most frequently used in studies about sustainability and green products, and how have they changed over time?
5. What is the geographical distribution of research on green products and sustainability? Are there regional differences in research focus and productivity?
6. How has the volume of research on green products and sustainability changed over time, and is there a correlation with major global events or policy developments?
7. Which academic institutions are at the forefront of research impact and production in the fields of sustainability and green products?
8. Are there emerging subtopics within green products and sustainability research, and what is the trajectory of their growth?
9. What are the most cited papers in the field of green products and sustainability, and what do they reveal about the seminal contributions to this area of study?

RESEARCH METHODOLOGY

The database has identification is the first step in analysis, and then data is gathered using the search technique (Figure 1).

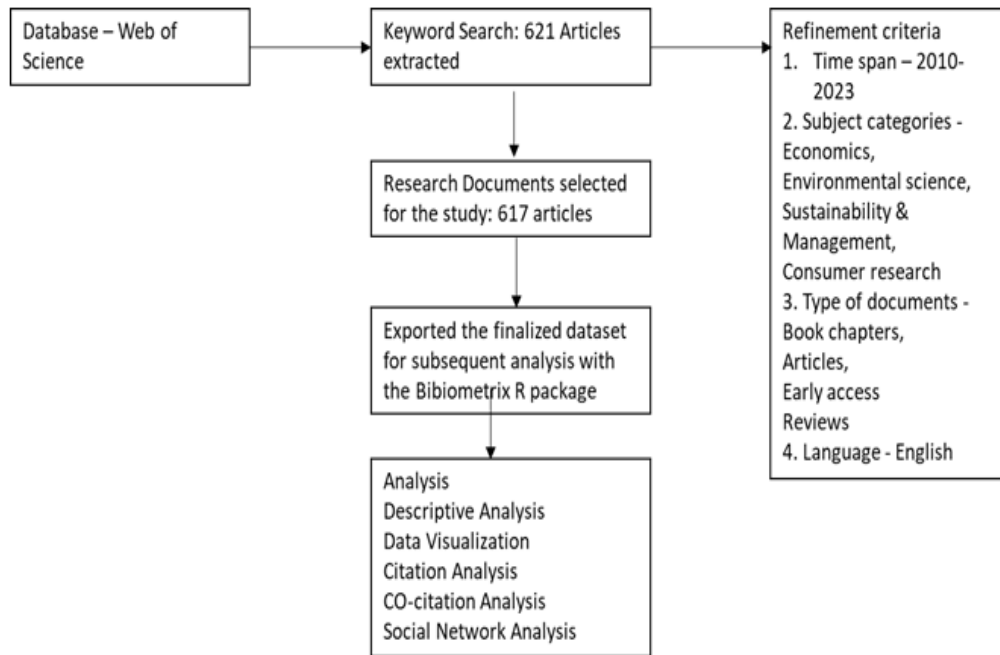


FIGURE 1
FLOWCHART SHOWING THE SELECTION OF DOCUMENTS FOR BIBLIOMETRIC ANALYSIS

The data required for the study was collected after identifying and selecting a suitable database (Figure 1). To create the dataset, a careful search query was conducted using an optimal mix of multiple keywords (Desai et al., 2023). Once the dataset that met the prescribed inclusion and exclusion criteria was determined, it was analysed using software tools (Smith & Eschenfelder, 2013). In the first phase, a descriptive analysis of the data was carried out, focusing on the sources, documents and authors. Subsequently, the data was processed using reduction methods such as principal component analysis and multiple correspondence analysis (de Carvalho et al., 2017). This was accomplished by creating network maps that improved the visualisation of the conceptual, intellectual and social structures within the data. The study has similarities with the phased research on sustainability and green products. These phases are explained in more detail below:

Database Selection

For the bibliometric analysis, a structured representation of the indexed articles in the database is essential. Data were retrieved from the Clarivate Analytics Web of Science (WoS) database as it covers articles, classifies journals and is compatible with R-Studio's Bibliometric programme. (Rodriguez-Ruiz, Almodóvar, & Nguyen, 2019) pointed out that the majority of research uses the WoS database for bibliometric analysis as it includes highly regarded journals in a variety of categories while excluding journals that are not scientific. Their Journal Citation Report (JCR) is a commonly used indicator of influence in the scientific world (Kapoor, Dlabay & Hughes, 2014).

Getting Data Ready for Analysis

On September 28, 2023, data in plain text format was downloaded from WoS in order to comply with software requirements. Based on the search criteria, which included "Green

Products" AND "Sustainability" in the title, abstract, or keyword list, a shortlist of documents was created. The following keywords were used in the search strategy: ("Green Products") AND ("Sustainability").

Keywords for the Search Strategy

("sustainability") AND ("green products") Improved by: SCIENTIFIC WEB CATEGORIES: (Business, Marketing, Economics, Management, Social Sciences, Interdisciplinary Perspectives, Multidisciplinary, Humanities, Multidisciplinary Perspectives) AND the type of documents (Review, Proceeding Paper, Book Chapter, Early Access, Article, etc.) AND Languages Spoken: English Duration: all years accessible, e.g., September 28, 2023; 2005–2023 SCI-Expanded, SSCI, A and HCI, CPCI-SSH, BKCI-SSH, and ESCI are the indexes.

Choice of Time Period

The data included all papers published between 2005-September 28, 2023, in order to identify trends and viewpoints in the field of sustainability connected to green products. This ensured that important work was included in the analysis.

Choosing Subject Areas

Several social sciences, psychology, business and management, business Sustainability, and economics were among the criteria used to narrow down the search. There were 700 things in this stage.

Choice of Document Types

To further refine the data, proceeding papers were removed, which results in 650 documents including book chapters, articles, reviews, and early access for additional examination.

Language Choice

The shortlisted papers were filtered using language filter of English and had 617 items in the final dataset. The metadata of these publications such as titles, authors, abstracts and keywords was imported into Bibliophagy in the form of plain text data in order to further analyze them. A final dataset was composed of 617 documents (Figure 1) after duplication and format compatibility have been performed on data.

Bibliometric Tools Selection

The study applied bibliometric techniques in our search related to mapping science in an extensive context - a successful research instrument that helped to analyze scientific literature in the field of library and information science statistically and mathematically. Having been used in different forms previously, bibliometric studies are known to have insightful analysis of scholarly publications and include BibExcel, Publish or Perish (Jayantha and Oladinrin, 2019), CiteSpace, VOSviewer (Rialti et al., 2019), Pajek, and Gephi. In this analysis, we selected an open-source bibliometric R package, which is a project of (Aria & Cuccurullo, 2017) in the R programming language. Bibliometric R package was a good option because it is open-source and can be constantly updated and it easily integrates with other statistical R packages. Bibliometric is described as having an accessibility and

flexibility as opposed to proprietary software which is restricted in access (Yang, Zheng & Zhang, 2015). It can be applied in bibliometric analysis where it is very versatile in network analysis and descriptive analysis (Huston, 2010). In this study, Bibliophagy, a web-based program that is part of Bibliometric package, was utilized to analyse the data of convenience to non-programmers. It is a user-friendly tool that makes the analysis of scientific mapping easier as it combines the key functions of the Bibliometric package and it offers an automated process to examine the topic in depth (Singh & Dhir, 2019).

Data Analysis Organization

The data analysis process was split into two categories (1) Descriptive Analysis, which considers the bibliometric data and analyses the simple aspects of the dataset data including sources/journals, authors, and documents; and (2) Scientific Mapping, which involves the use of visualization methods like the network analysis, three-field diagrams, thematic maps, and knowledge structures to extend the analysis (Merigó & Yang, 2017). This specialization is demonstrated in the (Figure 2) and it gives a pictorial representation of analytical path taken in this study.

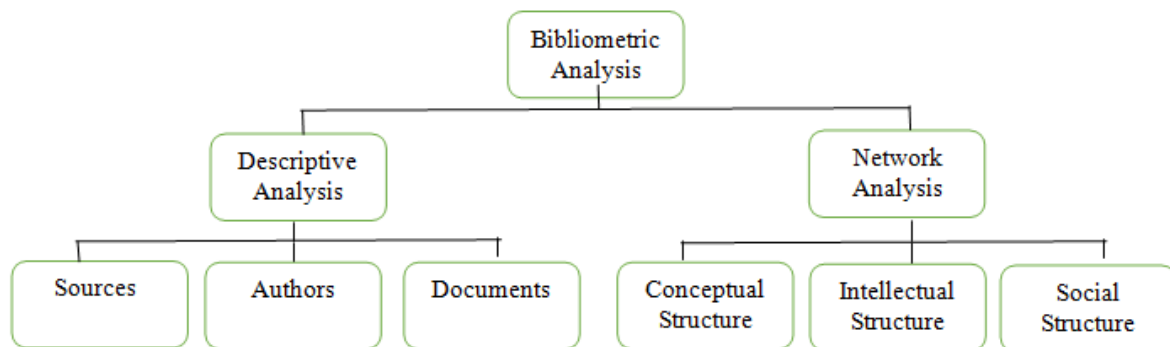


FIGURE 2
LEVEL OF BIBLIOMETRIC ANALYSIS

Descriptive Analysis: This dedicated section aims to explore various dimensions under consideration for analysis.

Data Set

A comprehensive overview of the bibliometric data frame is presented in Table 1, encapsulating 2,624 documents meticulously selected through a systematic search query on the WoS database. These documents span across 865 sources, reflecting an average citation score of 10.6. Each document boasts a co-authored index of 2.71, indicating substantial research activity in the past, characterized by fruitful collaboration among researchers (Huang et al., 2020).

Three-Field Plots

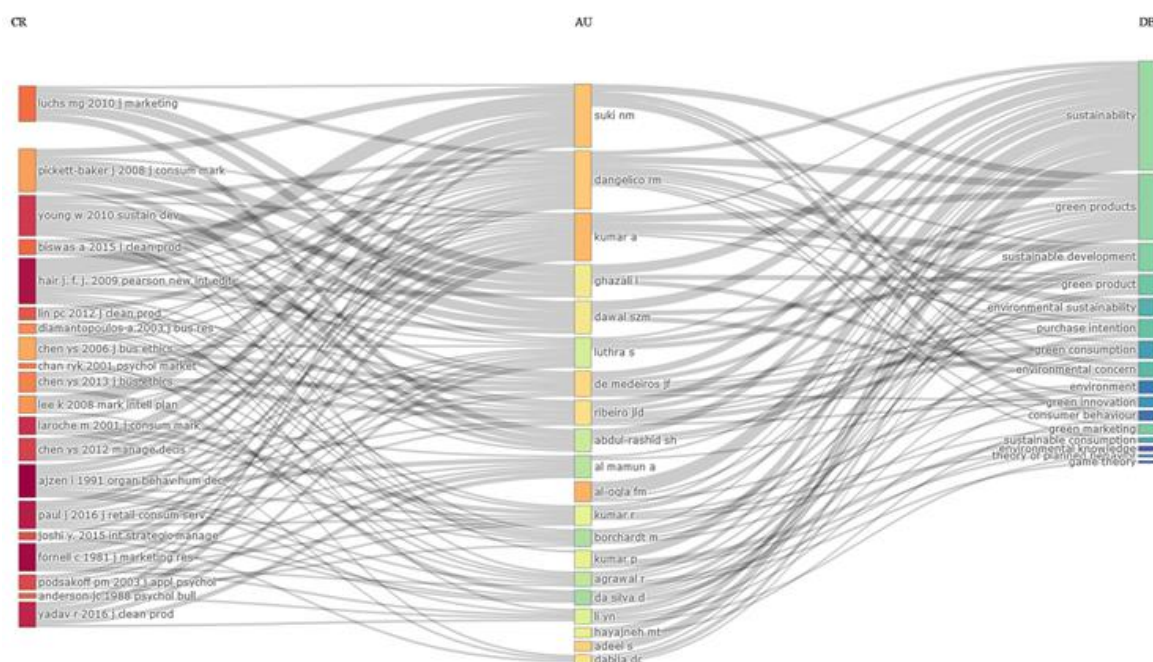
Employing Sankey Plots, the three-field plot (Figure 3) dynamically illustrates the intricate relationship between three fields, where the size of each portion is directly proportionate to the node's value (Riehmann, Hanfler & Froehlich, 2005). Positioned on the left side of the Sankey Plot are the authors, while the chosen sources for analysis grace the right side, and keywords take their place in the middle row. This visual representation provides an insightful glimpse into the interconnectedness of authors, sources, and keywords

within the analysed dataset (Mishra et al., 2021).

Description	Results
Timespan	2005:2023
Sources (Journals, Books, etc)	260
Documents	617
Documents Average Age	3.14
Average citations per doc	22.6
Keywords Plus (ID)	1324
Author's Keywords (DE)	2027
Authors	1872
Authors of single-authored docs	371
Single-authored docs	49
Co-Authors per Doc	3.37
International co-authorships %	28.69

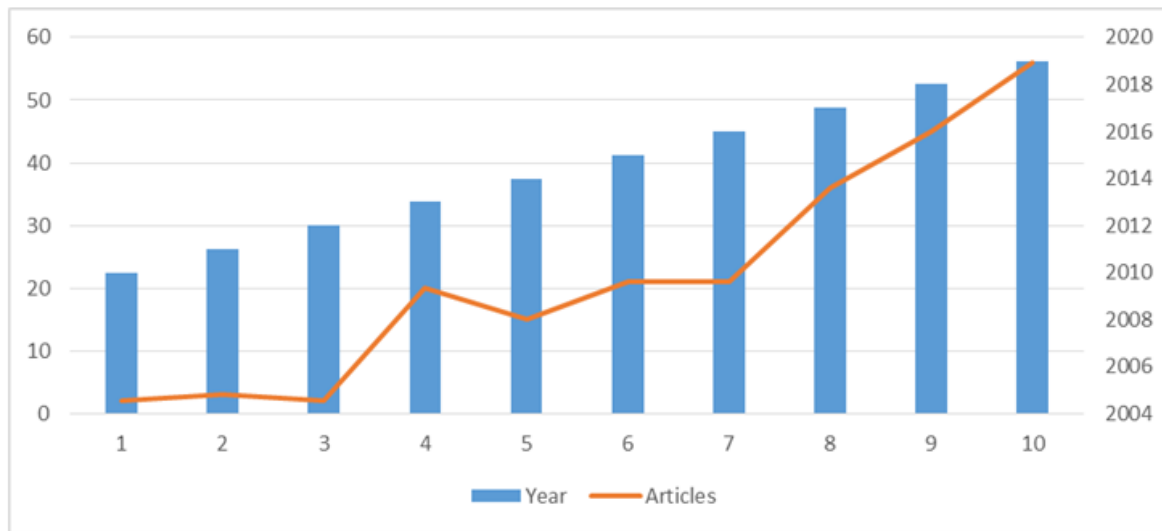
Source: Compiled from the Output of the R Software.

The terms sustainability, green products, sustainable development, green products, and environmental sustainability are used extensively in each of the 10 items, along with links to their corresponding sources and well-known writers. Interestingly, Sustainability is left out of this list (Billingsley, Gitman & Joehnk, 2020). Every one of the 10 prestigious magazines cover the subject of "Green products," highlighting its critical role in influencing "green consumption." The subtopics of "environmental sustainability," "environmental concern," and "sustainability" are noteworthy and are explored by these prominent writers and publications (CEVALLOS et al., 2022). But none of the publications discussed the value of eco-friendly products or how they contribute to sustainability.



**FIGURE 3
THREE FIELD PLOTS**

Sources: The scientific production of the research domain shows an increased tendency from 2005 to 2022 (Figure 4). It is anticipated that the number will exceed the numbers from the prior year by the end of 2023 (Chen et al., 2019). There has been a noticeable increase in volume since 2013, which may point to a rise in consumer awareness of green products. (Figure 5) shows that there was a significant rise in the average number of publications mentioned year starting about 2006 (Mishra & Sahu, 2025). Over 3.9 years have passed since the majority of the papers were created. Although there are constantly more publications on this subject, the research domain has not yet reached a significant development stage.



**FIGURE 4
SCIENTIFIC PRODUCTIVITY**

According to (Low & Siegel, 2019), the expansion of the research domain usually occurs in four stages: (1) prelude, (2) exponential development, (3) consolidation of the body of knowledge, and (4) decline in the number of publications. The notion of sustainability and its correlation with green products are still in their early phases, as seen by the literature that has already been written about them. It is anticipated that there will be little to no notable rise in the number of publications until 2023 (Setyorini, Indiworo & Sutrisno, 2021).

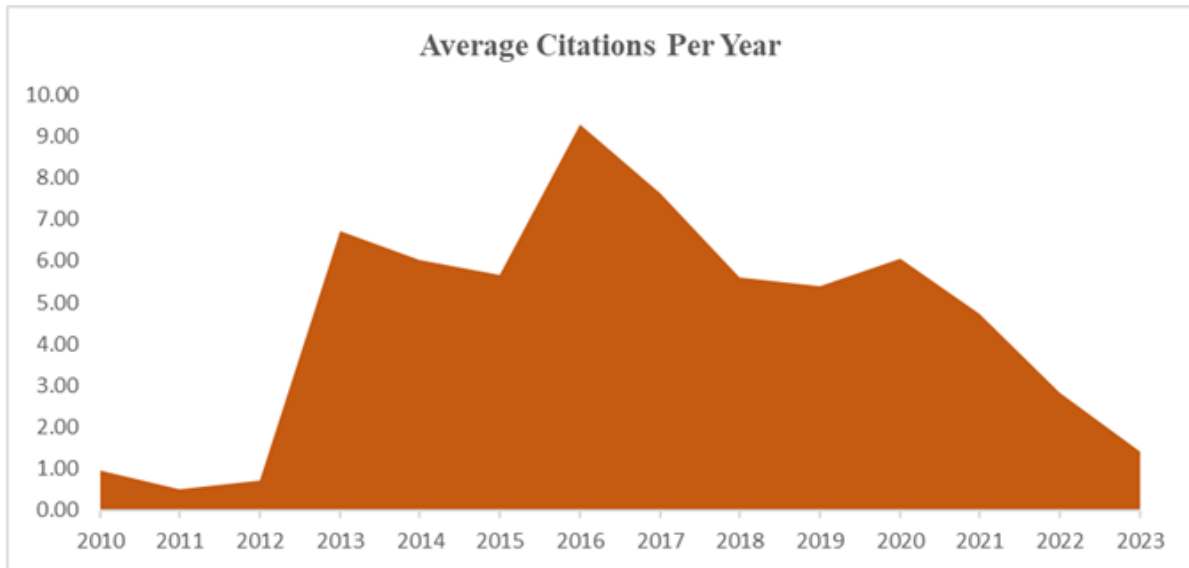


FIGURE 5
AVERAGE ARTICLES CITATIONS PER YEAR

The top 20 most referenced journals are shown in (Figure 6), which offers insight into the calibre of publications in the subject. The Journal of Consumer Affairs contains the most citations and is then followed by the source that has the greatest influence the Journal of American review (Khan et al., 2020). An in-depth examination of these books provides an understanding that a good percentage of the studies on Sustainability are concentrated in the areas such as social psychology, economics, consumer behaviours, and consumer and family studies (Mishra & Alavi, 2023). It is important to note that Sustainability has not elicited much coverage in existing literature.

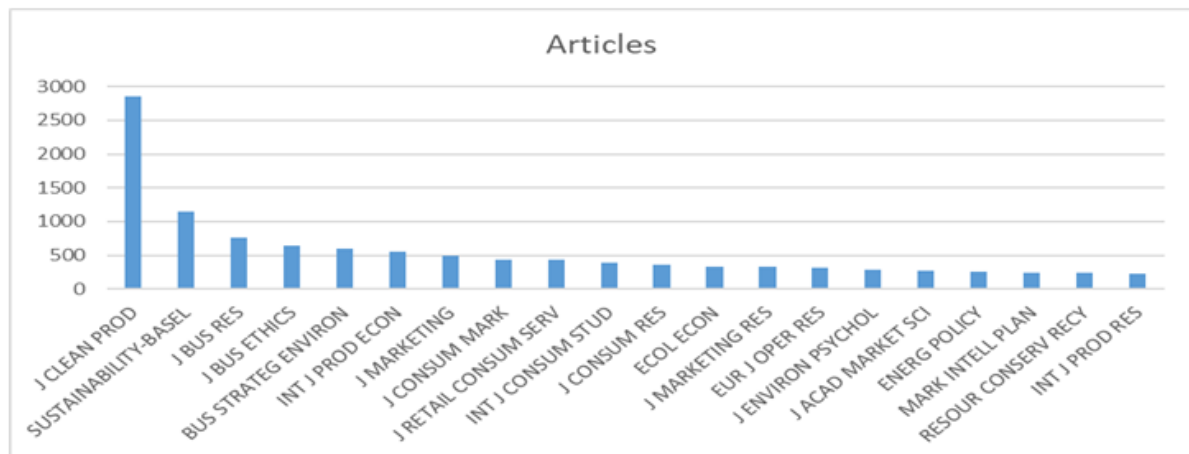
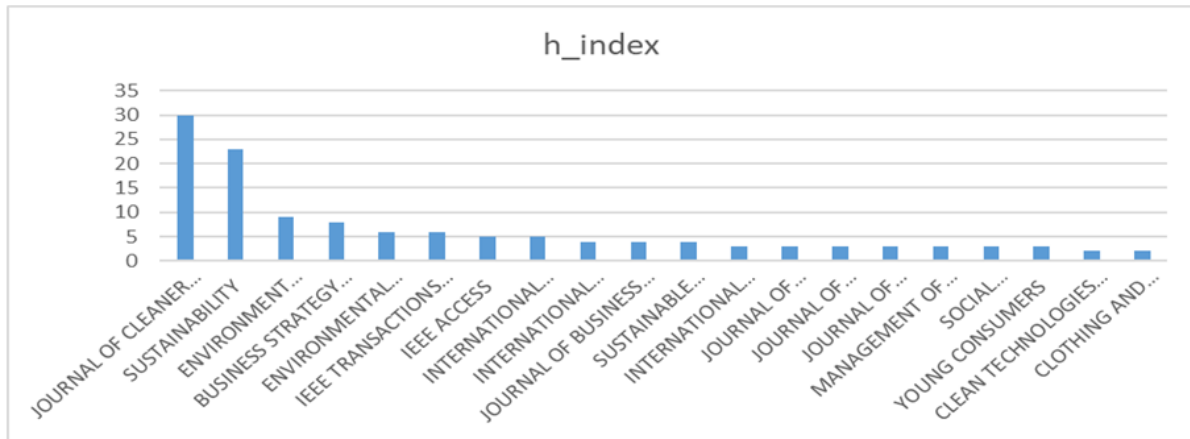
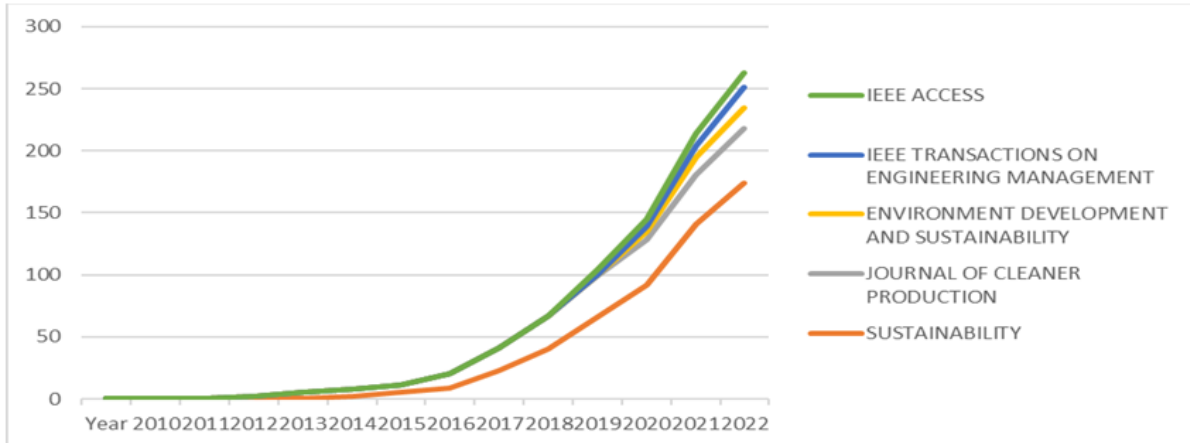


FIGURE 6
TOP 20 CITED SOURCES



**FIGURE 7
TOP 20 IMPACTFUL RESOURCES**

(Figure 7) that presents the list of the 20 most influential academic publications in the field is h-index based. This statistic is applied to assess the productivity and impact of citation of journals to ascertain their relative quality. The definition of the h-index is the maximum value of "n" where n is the number of journals that had published n articles, and each article has then had at least n citations (Mangla, Madaan & Chan, 2013). The h-index, an estimate of the contribution of a journal to the discipline, provides a more refined estimate of a journal contribution both in terms of quality and quantity than the journals with the most articles or citations. Journal of cleaner production has high h-index (Ouachani, Belhassine & Kammoun, 2021).



**FIGURE – 8
SOURCES DYNAMICS**

(Figure – 8) shows the source dynamics of the five most significant journals, where LOESS (Locally Estimated Scatterplot Smoothing) is used to present the number of publications in the given period of time. Based on this number, it is clear that IEEE Access and IEEE Transactions on Engineering Management are significantly publishing more papers since the year 2016 and the other journals have followed suit (Dhotre et al ., 2025). This may point to the development of an interdisciplinary area of study, the top-cited journals are both field-oriented (like Sustainability and Cleaner Production) and interdisciplinary (like Consumer Studies and Marketing). The fact that the number of journals devoted to the area of this research is great proves the variety of research topics and the multi-disciplinary character

of the field (Lusardi & Mitchell, 2011).

Authors: Al-Oqla, F. M. Suki, N. M Adeel, S Jose Luis Duarte. are the most prolific authors in this field as illustrated in (Figure 9) with more than 20 articles each. Assessment of the h-index of these authors as in (Figure 10) reveals that Michell, Lusardi and Xiao are the most essential authors (Santini et al., 2019). Their research is viewed as innovative and is significant in the future studies in this field. Figure 9: The majority of the Relevant Authors.

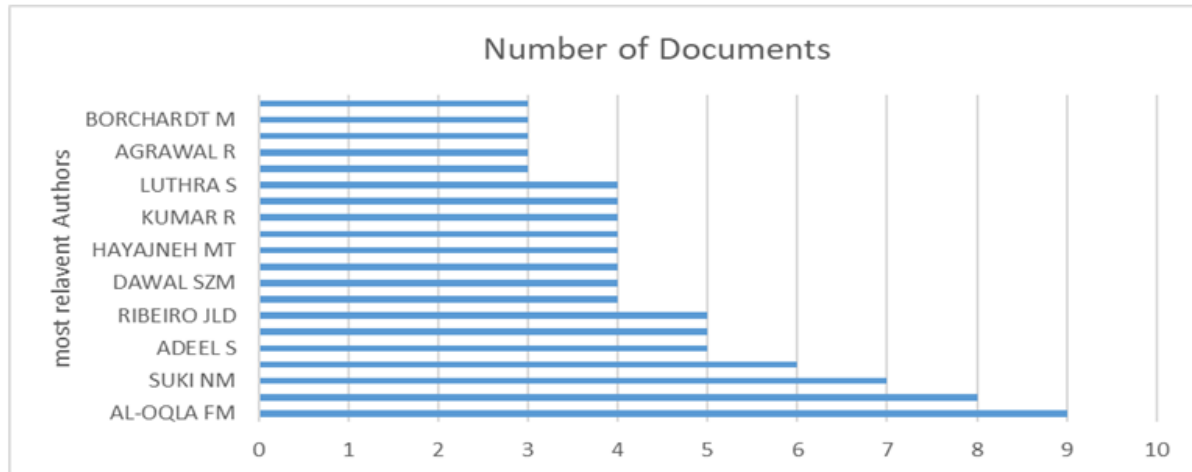


FIGURE 9
MOST PROLIFIC AUTHORS IN THIS AREA

Authors: The most prolific authors in this area, as shown in Figure 9, are Rasti-Barzoki M, Luthra S, Kumar p, Da Silva D, Al Mamun A, Kumar P, Dabu DC, Suki NM, De Medeiros JF, and Dangelico RM in particular have made a significant contribution with over 5-20 articles each. An examination of the h-index of these authors, as shown in (Figure 10), shows that Michell, Lusardi and Xiao stand out as the most important authors. Their work is considered ground-breaking and is important for future research efforts in this area.

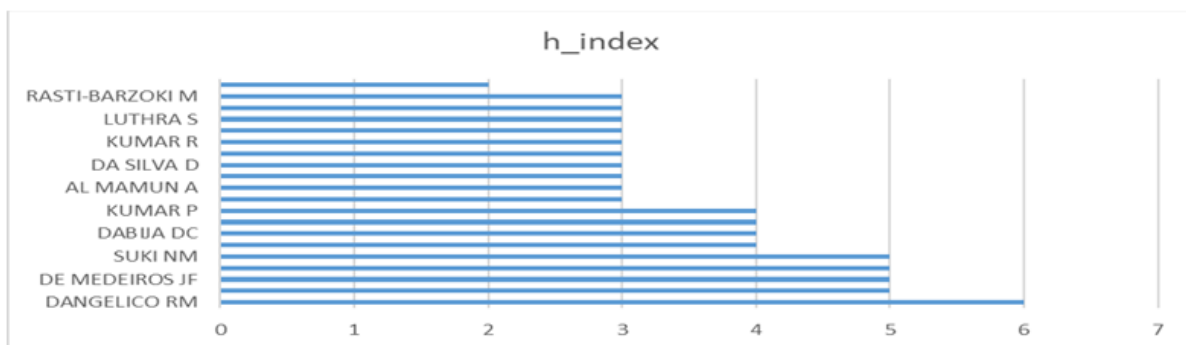


FIGURE 10
AUTHORS IMPACT

Table 2: Carefully shows how various nations have contributed to the field, which sheds light on the high involvement of developing or developed nations in the literature. China is its number one contributor, and it holds the head of the pack with most publications in the field. India follows far behind and takes the second position (Safari, Njoka & Munkwa, 2021). The publications are reflected by the amount of citations the articles have received, and China has significantly been receiving about 20 percent of the entire citations in the discipline.

Country Scientific Production		Most Cited Countries		
Country	Frequency	Country	Total Citations	Average Citations
CHINA	342	CHINA	2460	16
USA	91	USA	1936	55.3
ITALY	58	ITALY	1104	38.1
BRAZIL	62	BRAZIL	1058	33.1
INDIA	156	INDIA	864	14.6
IRAN	17	IRAN	486	60.8
MALAYSIA	95	MALAYSIA	426	12.5
PAKISTAN	68	PAKISTAN	403	21.2
NETHERLANDS	16	NETHERLANDS	402	44.7
UNITED KINGDOM	30	UNITED KINGDOM	386	27.6
GERMANY	17	GERMANY	381	47.6
CANADA	29	CANADA	372	37.2
AUSTRALIA	26	AUSTRALIA	333	37
SWEDEN	8	SWEDEN	265	44.2
SWITZERLAND	4	SWITZERLAND	222	111
IRELAND	2	IRELAND	207	207
JAPAN	12	JAPAN	200	40
NORWAY	4	NORWAY	196	98
KOREA	23	KOREA	191	15.9
POLAND	22	POLAND	185	16.8

This highlights how research activities have been centralized in the region thus depicting a strong and powerful research environment. Both China and India feature strongly in the top of the table, which is a clear indication of a gradual move towards the high-quality research in the field (Gudkova & Ermakova, 2020). Additional observations by bibliometric data indicate that China stands on top of citations received in comparison to the other parts of the world with India, Malaysia, USA and Pakistan close behind. Surprisingly, Ireland boasts of the best accolade of the highest average citation per article followed by Switzerland and Norway. On the other hand, Malaysia is ranked last in this list, which represents the least number of citations per article (Samantaray, Mishra, & Dash, n.d.). This subtle data reveals the varied terrain of various countries with respect to research productivity and impact, giving useful information on the world contributions to the field.

Documents: The 20 most globally and locally cited documents in the field are presented in (Figure 11). Each of these articles has accumulated more than 50 global citations. The foremost publication, indicating a seminal contribution to the field, was authored by Paul J. Paul's article from 2016 holds the top spot with over 869 global and 63 local citations, while Moser AK's publication from 2015 follows closely with 305 global and 25 local citations. Both of these highly cited articles delve into the significance of green buying behavior on individuals. These top-cited articles are regarded as key reference points in the field.

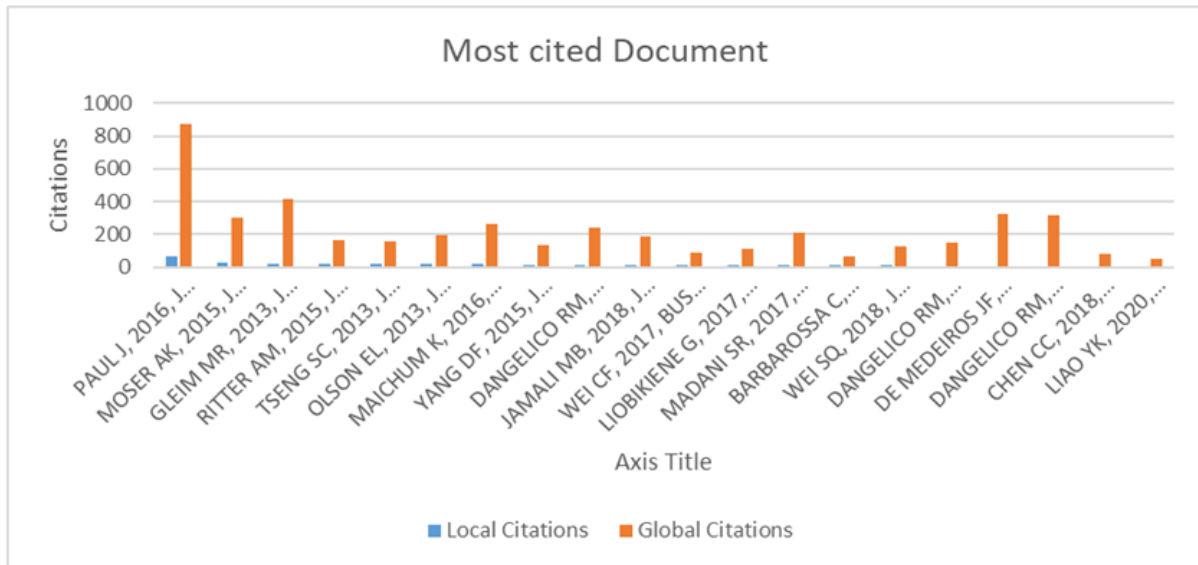


FIGURE 11
MOST CITED DOCUMENTS



FIGURE 12
WORD DYNAMICS

Keywords: When the utility of keywords was studied in the articles, it was found that the word consumption was used 98 times and then the word Sustainability was used 97 times. Later on, the words Impact, behaviour, attitude, knowledge, planned behaviour, and determinant were also noted. The keywords included such concepts as green products and sustainability. The frequency of words in the document is represented as a visual representation in the form of a word cloud alongside the document as illustrated in (Figure 12), with the size of each word depicting its significance in the literature. There were also prevalent variables like the consumer behaviour, intention, performance, supply chain and willingness to pay. Based on this word cloud, it can be concluded that these researches have delved into different antecedents of sustainability, green products and consumption. Most of them aimed at exploring the influence of green products on sustainable consumption-related decision making.

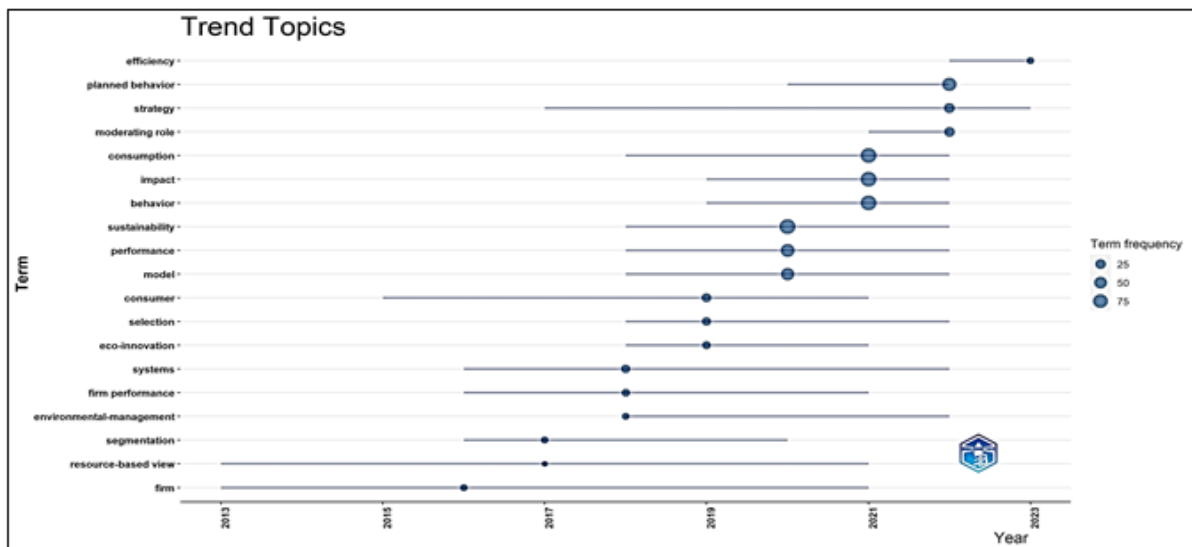


FIGURE 13
TREND TOPICS

The Trend Topics

The dynamics of the subjects of the trending topics is well illustrated in (Figure 13), which is displayed on a two-dimensional scale with the logarithmic frequency replacing on the vertical axis the publishing years replaced in the horizontal axis. One interesting trend can be drawn by reviewing the issues of the last five years (Goodell et al., 2021). The year 2020 had its own focus on sustainability, consumption, and behaviour that were closely connected with the environmental issues, resource-based considerations, and eco-innovation (Ingale & Paluri, 2022). Nevertheless, the story changed in 2021 and 2022 and it turned its attention into the topic of consumer behaviour and green products, with a particular emphasis made on efficiency strategies and a special focus on the sustainability practices.

Data Visualization

There has been an evident inflation in the interest and research concern of green products and sustainability within the past years. In this section, the theme of the field is revealed in terms of the data visualization methods (Garfield, 2004). Network analysis is the foundation of a quantitative evaluation that investigates the development of clusters, events and relationships among different units of analysis, such as overall link numbers and citation numbers (Lusardi & Mitchell, 2014). Different methods are used depending on units of analysis that include documents, authors, and key words and network is extracted where nodes are linked together by links. These generated maps are overlaid using statistical analysis, which implies a variety of instruments of the whole network (Atkinson & Messy, 2012). The result of scientific mapping in the form of network analysis reveals three unique knowledge structures conceptual structure, intellectual structure and social structure as shown in Figure 14

Conceptual Structure

The unveiling of the conceptual structure orchestration through co-occurrence networks or co-word analysis gives an intricate representation of relationship among themes, subjects and trends. It is a novel method that takes advantage of information in the research

papers, concentrating on ideas, often used phrases or common themes in the network (Liu et al., 2013). This conceptual framework is being constructed with the help of Multiple Correspondence Analysis (MCA), which is a technique used by the Bibliometric program to analyse multivariate nominal numerical and graphical data (Greenacre & Blasius, 2006). (Figure 14) is the canvas of the keyword co-occurrence network created with the default settings of the key-word plus unit of analysis, automated layout, and association normalization, the 50 nodes with Louvains clustering method.

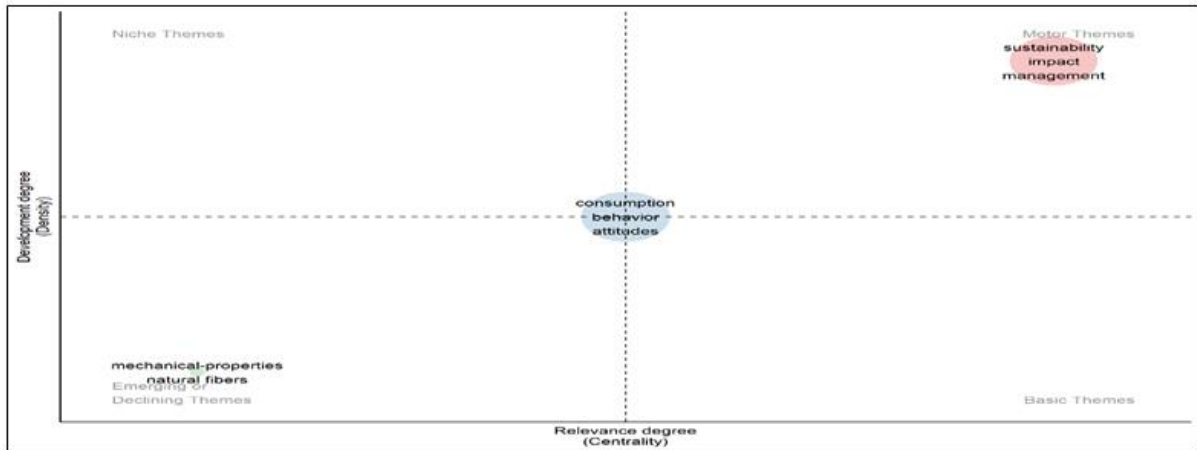


FIGURE 14
CO-OCCURRENCE NETWORK

The enclosed information richness and diversity of documents are condensed in a set of terms called "Keyword Plus" which is identified by a computer algorithm according to the common words in titles and reference lists and is emphasized by (Garfield & Sher (1993) and (Zhang et al., 2016). In Figure 14, it is possible to see how the data reveals the appearance of two clusters, which are differentiated by the colour of blue and red. Words are the vertices, color distinguishes distinct groupings, the size of a node is the incidence and the distance between the nodes represents relatedness (Sarkar, Ullah, & Sarkar, 2022). The blue cluster is mainly used in the discussion about the way people interact with green products, whereas the red cluster dwells upon sustainability and its deep importance.

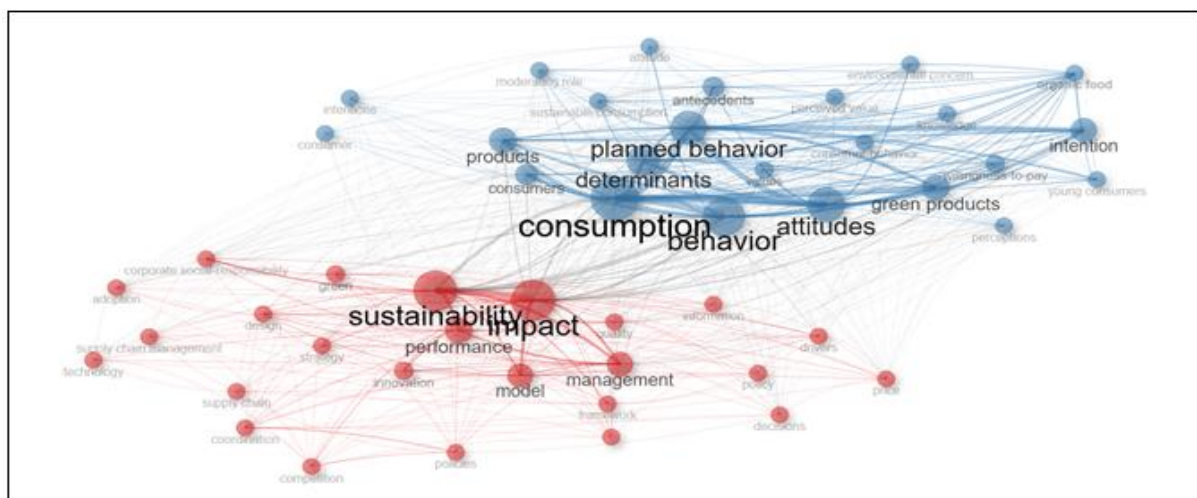


FIGURE 15
THEMATIC MAP

Thematic Map

Typical plot Typological themes are represented with the help of a two-dimensional plot, which is referred to as a thematic map, yet was introduced by (Cobo et al., 2011). Co-word analysis helps identify the clusters of keywords, which can be used to see the patterns in the area of research. These themes fall organically on the four quadrants of this graphical representation where centrality and density are the two dimensions to be used (Albino, Balice & Dangelico, 2009). On the map, every theme is represented in a visual way with a bubble, and in this case, we will see that theme consumption, attitude, behaviour, planned behaviour, Sustainability is embodied in the form of bubbles on the graph (Figure 15). The map clearly highlights three bubbles with each bubble having one theme in it. The most apparent theme in the upper right quadrant is the theme of sustainability, impact, management with high density and centrality (Park & Martin, 2021). Placed in the middle of the discipline as a motor theme, it is the representative of the most popular issue in the research field (Dangelico & Pujari, 2010). The theme of mechanical-properties natural fibers is located in the lower left quadrant with low centrality and density and is likely a less prominent theme in the discourse, on the whole. The final bubble is positioned at the center of the four quadrants, and it represents a theme that is equally important in the centrality dimension as well as density dimension (Swaroop, & Gade, 2023).

Thematic Evolution

The thematic evolution model, which combines a 100-word count in the keyword plus field with an appropriately considered minimum cluster count of five, is a seamless effort. This exploratory work was done in three different time slices, which were skillfully defined by cut points in 2012 and 2018. These strategic cut points were incorporated in our analysis which provided a level of depth into it, enabling us to study the changing dynamics of the thematic landscape in a nuanced manner (Figures 16-18).

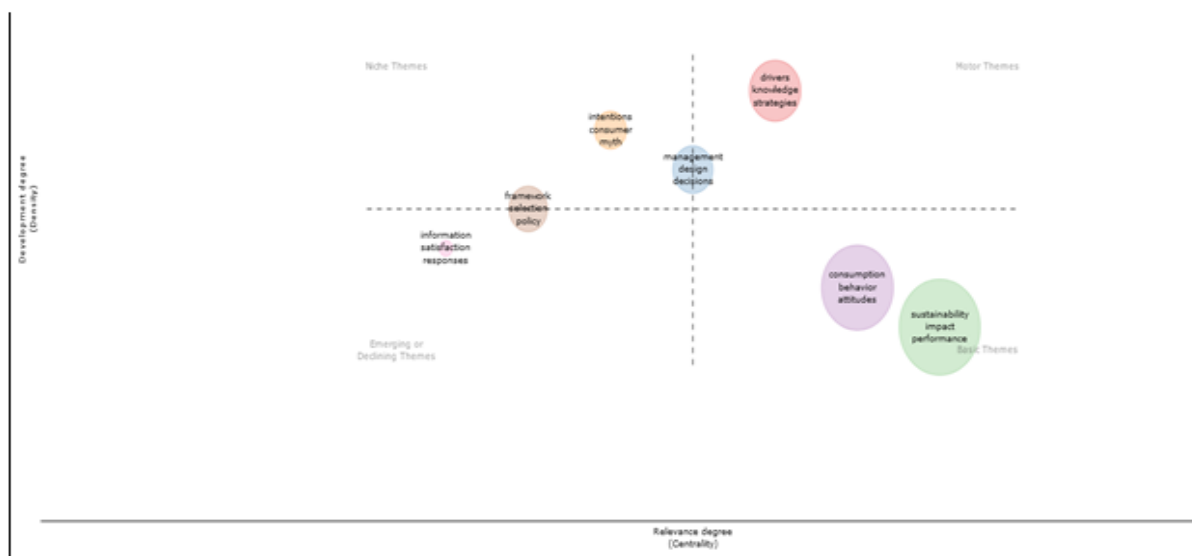


FIGURE 16
TIME SLICE 1 – THEMATIC EVOLUTION BETWEEN 2005–2012

In the years between 2005-2012, a niche theme was identified that is, Intentions, consumer, and myth whereas simultaneously, a theme named Information, satisfaction, and responses was observed to be emerging on the ascending path. At the same time, a motor

theme also emerged, named Drivers, knowledge, and strategies, and one of the underlying prominent themes of it is Consumption behaviour, attitudes, sustainability performance.

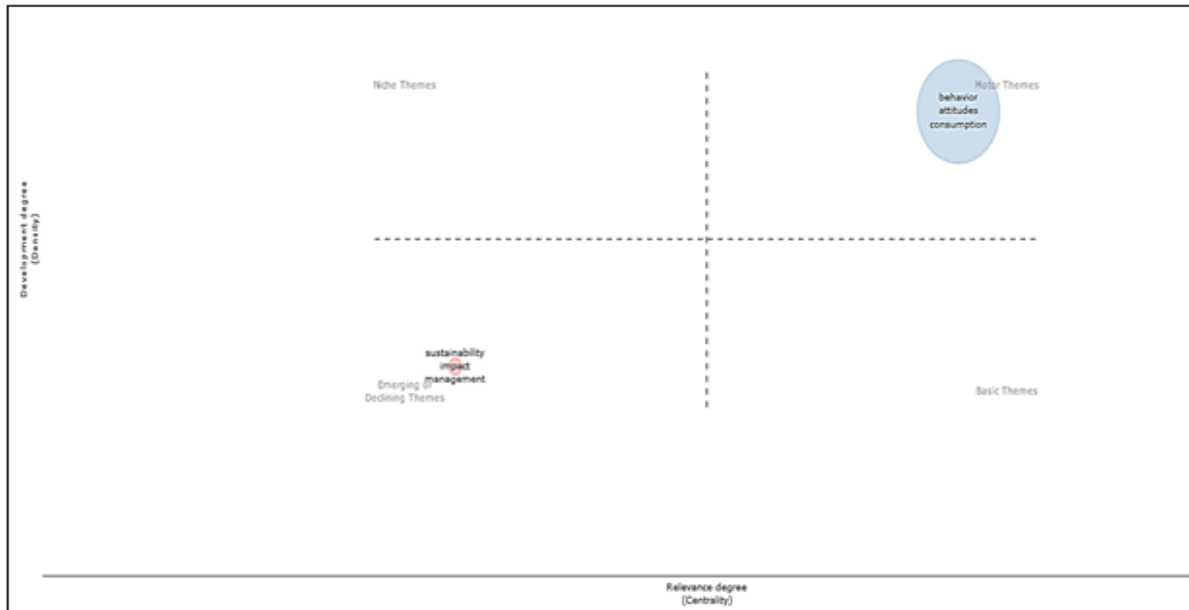


FIGURE 17
TIME SLICE 2 – THEMATIC EVOLUTION BETWEEN 2013–2018

The period between 2012 and 2018 witnessed a boom in the attention towards sustainability. Following the next timeframe of 2019-2022, it is interesting to note that a significant development happened as the theme of Consumption, attitude and behaviour developed into a more recognizable Motor theme, especially in the framework of sustainability. A noticeable movement is traced in the philosophy of sustainable behaviour, which can be considered a significant change in the visions.

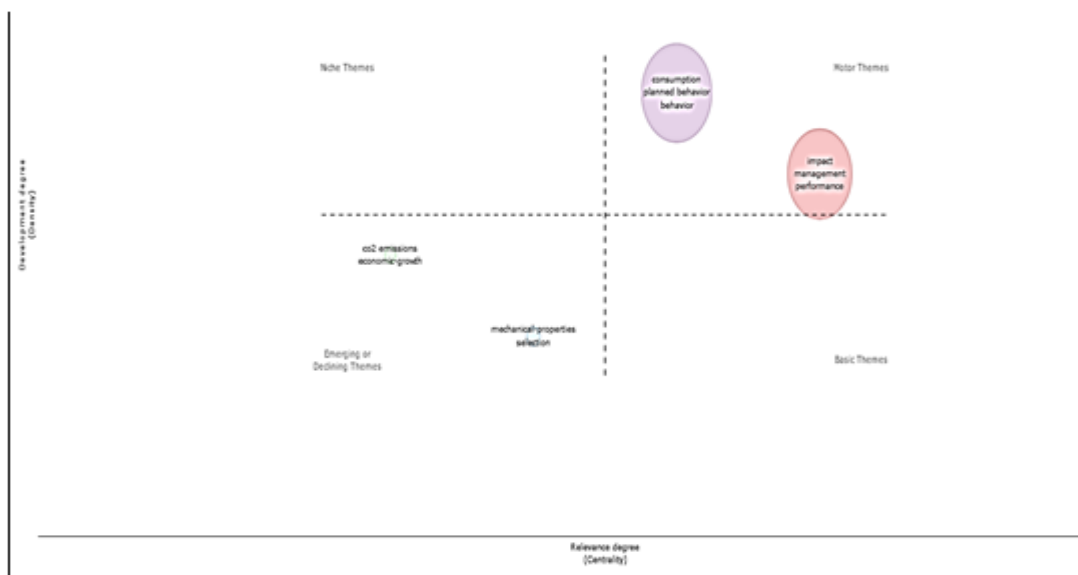


FIGURE 18
TIME SLICE 3 – THEMATIC EVOLUTION BETWEEN 2019–2022

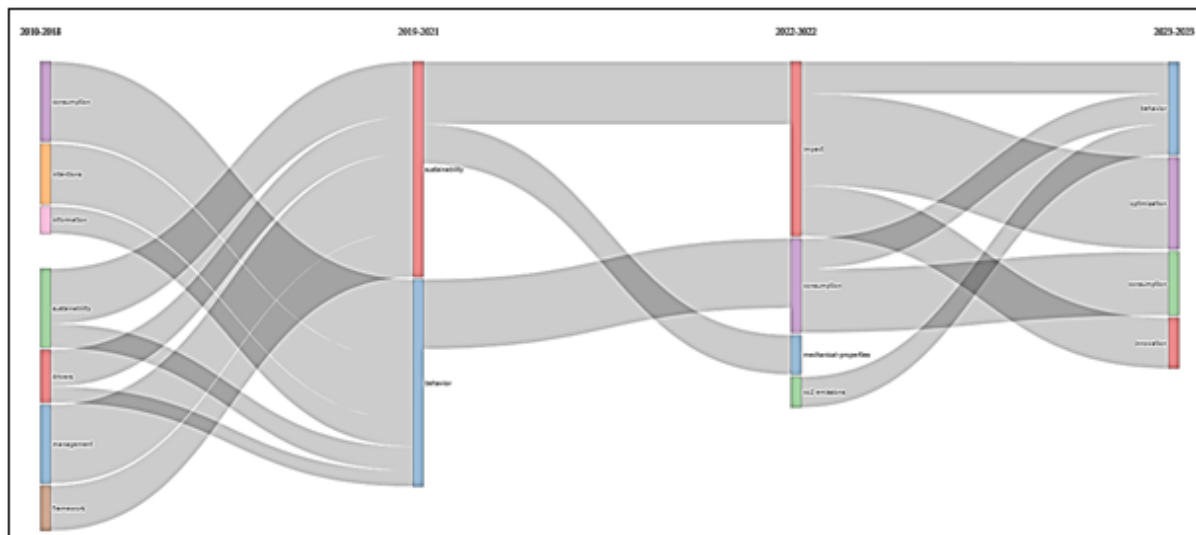


FIGURE 19
THREEFOLD PLOT

The three-field plot (Figure 19) facilitates the achievement of an in-depth insight into the broad and core themes. The inter-linkages of the themes in four separate time spans, namely the time between 2010-2018, 2019-2021, 2022-2022, and 2023-2023, come into clear focus as we continue analysing further. Such an approach not only will help to capture the evolution of these themes, but it will also be possible to examine the themes in relation to each other and how they change throughout the identified periods. During the first period, 2010-2018, three key themes, namely consumption, intention and information, merge to create a major theme, namely behaviour. The sustainability, drivers, management and framework also fit in the general theme of sustainability. Moving forward to the year 2019 to 2021, the aspect of behaviour and sustainability comes out strongly. Later in the 2022 period, sustainability is further subdivided, to create two separate spots: Impact and mechanical properties. Remarkably, Impact theme in 2022 results in the consideration of Behaviour, optimization, and innovation topics in 2023. Moreover, in 2022, there is a splintering of the topic of consumption and two spheres emerge Behaviour and consumption areas. This depicts a dynamic change and shift of focus on themes in the identified time spans.

Intellectual structure: The intellectual environment explores what the different writers have offered to the scientific community, and how the writers and different nations cooperated. It clarifies the level of collaboration existing between the research teams, research community, and their affiliation with the rest of the institutes. The intellectual form through citation and co-citation analysis exposes a range of views and school of thought which has undergone development over time. Under Citation and Co-Citation Analysis, quantitative techniques are utilized, and they include citation and co-citation analysis. The citation analysis works on the premise that authors provide reference to works that are part of their research questions with the increased number of citations depicting superiority and relevance in academic writings. A relation between two documents implies the existence of a referenced document that is represented in the reference section of another document. The co-citation analysis is a study of the relationship between the cited and the citing publications and the number of co-citations indicates that there exists a common thematic relationship between a set of articles. When 50 nodes and articles are used as a unit of analysis and the Louvain technique of clustering is applied, three author clusters will emerge with each cluster assigned a specific color. The strength of co-citation, which is perceived linkage of publications by citing authors, is measured (Small, 1978; Edge, 1979). Hu et al. (2013) state

that one of the metrics used in social network analysis, betweenness, demonstrates how the network coverage of the lead article is affected by others.

Regarding this analysis, Ajzen appears the most influential writer, as he has the best betweenness centrality scores in cluster 1. Fornell, one of the greatest contributors to sustainability studies, is close behind in position number two. In cluster 2, the author Laroche M. is the leader and Fornell C. is a leader of the third cluster. The three clusters in the analysis are all the key thematic groupings that bring different viewpoints to the intellectual arena. Social Network Analysis (SNA) was conducted in order to reveal the complex interconnection of research areas (Lusardi, 2011). Here is a brilliant analysis, with actors (in this case, authors, institutions or sources of publications) symbolized as nodes and the relationship existing among the nodes in the social network disclosed through a collection of nodes. The relations between these different fields make this network work and dynamic. To explore the geographical dispersion and dynamics of collaboration, collaboration networks that included 30 countries were carefully represented (Figure 20).

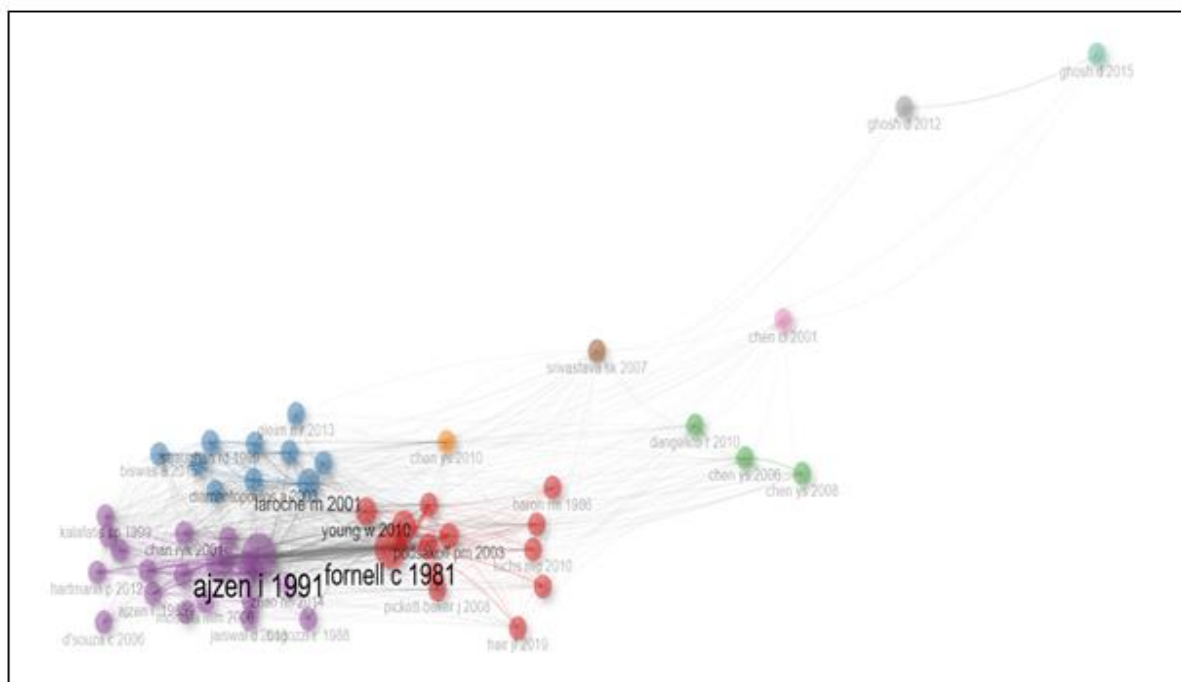


FIGURE 20
CO-CITATION NETWORK PAPERS

Regarding the regional perspective, China stands out as a primary player of the academic research, developing partnerships with a plethora of European and Asian nations, and even upcoming economies. The discovery of diversity in the knowledge base is done by the use of cluster analysis. When a document belongs to some cluster, it means that it has a great similarity to other documents in the same cluster since they are characterized by similar references (Bedi et al., 2019).

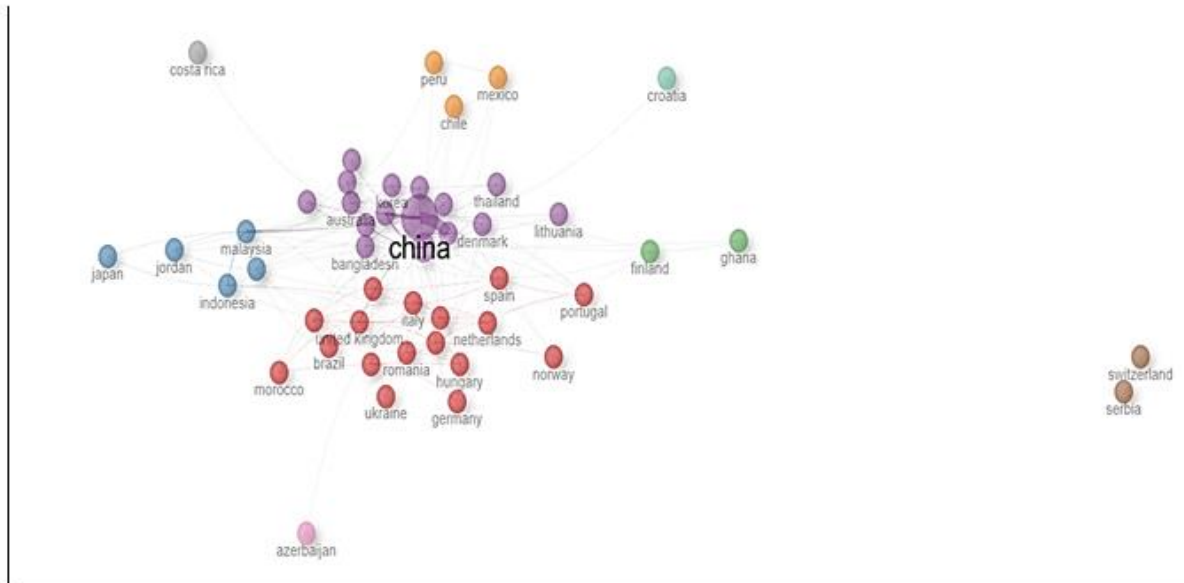


FIGURE 21
GEOGRAPHICAL COLLABORATION NETWORK

This multifaceted method does not only reveal the collaborative web which is created over the world areas but also throws some light on the complex web of collective knowledge within certain thematic groups. It was possible to find strong partnerships with Chinese researchers who have participated in interactions with scholars in different places, such as Thailand, Denmark, Bangladesh, Australia, Korea, and Denmark (Andreopoulou, Z. (2012). The second cluster is led by Malaysia which forges partnership with its partners in Indonesia, UAE, Jordan and Japan as shown in Figure 21. The third significant cluster presents India which exemplifies close ties with a great number of states, among which the USA, Pakistan, Australia, Korea, Vietnam, Saudi Arabia, Iran, Bangladesh, Qatar, Thailand, Denmark, Lithuania, Oman, Greece. It is a network of cooperative work which extends over continents and promotes the intense exchange of knowledge and skills in the field of research.

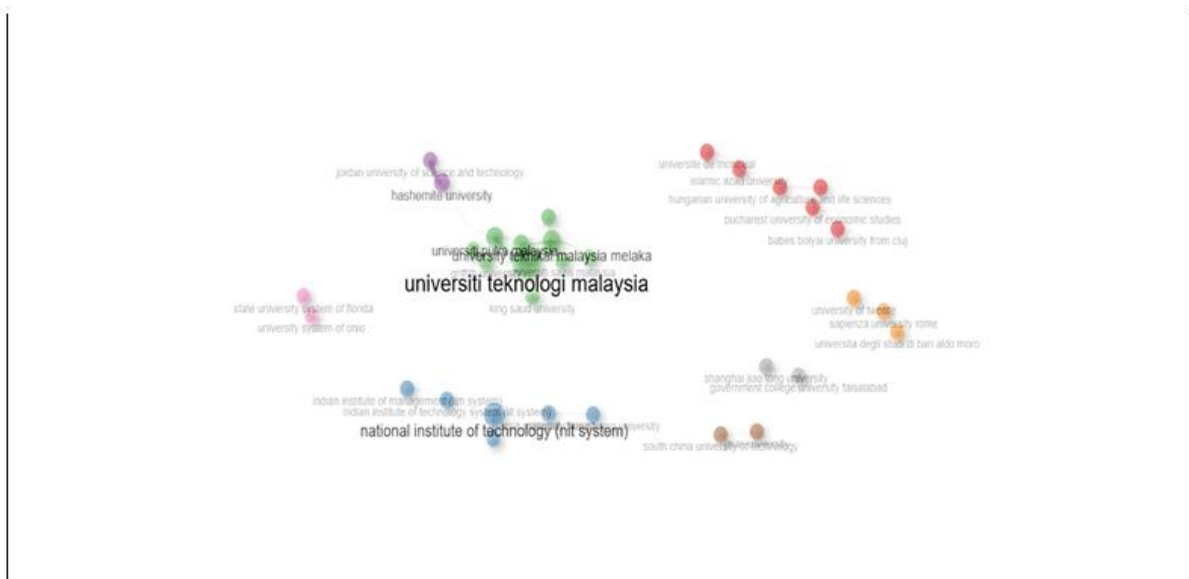


FIGURE 22
INSTITUTIONAL COLLABORATION NETWORK

The collaboration network among the institutions is represented in (Figure 22) with a focus on the predominance of the cluster consisting of Universiti Teknologi of Malaysia and the National Institute of Technology (NIT Systems). This article throws the light on the development of the Sustainability and Green Products sphere since 2005 and till 2023. An all-encompassing analysis of the conceptual, intellectual, and social framework of the research subject matter is offered. The accumulation of the scattered literature is a commendable input of this research, along with the prioritization of the sources, authors, and documents. Bibliometric R-package was used in the analysis; this software is widely known to be flexible and easy to use. The data collected based on the WoS database due to its formal organization, high-quality research material, and the ability to be processed by the program shows a steady rise in the number of publications, and the year 2016 could be characterized as the most active one.

An apparent and increasingly emerging tendency of contribution by the various fields of knowledge in the field of sustainability and green products is evident. This tendency indicates an expansion of activity and cooperation in different fields and represents an interdisciplinary approach to the problem of complex challenges and opportunities related to sustainability. Contributions are also coming out not only in the conventional areas like economics, finance and business but also in a spectrum of diverse areas. Some of the disciplines that have made great contributions are consumer and family studies, services marketing and social psychology. This diversification of contributions is an emphasis on a shared goal of comprehending and responding to sustainability and green products in multiple aspects. This interdisciplinary trend enhances the discussion by combining knowledge, approaches, and experiences in various disciplines. It promotes a broader and holistic view of sustainability, which promotes creative solutions and methods. The synergy between the various disciplines helps in coming up with a balanced and combined strategy in promoting sustainability and green product programs.

Future Research Direction

Gaps that are recognized in this study indicate the possible research direction in the future, which is to consider more databases to extract the data and to tune the key word search to be more inclusive. To get a more insight into the field of study, science mapping would be enhanced by manual selection of articles, abstract reading. The possibility of meta-analyses and literature reviews offering more detailed information about the antecedents of the domain and its results is very high. A detailed book review of the publications can bring deeper insights to the understanding of the applicable concepts and models. The paper illuminates a contextual difference between emerging and developed economies with an indication that collaborations can be promoted. This can be seen as a need to do more interdisciplinary studies, to explore the inter-relationship between Sustainability, Sustainable behaviour, Consumer behaviour, Green products, and Green marketing.

Future topics of further research focus are Circular Economy, Material Innovation, Energy Efficiency, Consumer Behaviour and Education, Digital Technologies for Sustainability, Biodiversity, and Ecosystem Services. To promote the growth of theory and practice, one should explore works of researchers in universities and industry practitioners. It is recommended that this field be studied longitudinally. This bibliometric analysis has a great contribution to the expanding literature on the topic of Sustainability as well as Green Products. This study will be used as a basis to develop evidence-based policies and programs to improve sustainability. With the process of the study, one can anticipate a better insight into the key variables affecting sustainable behaviour, effective approaches to green product

awareness campaign, and the most effective suggestions that can be recommended to policymakers and sustainability influencers. Finally, this study will help to develop the discourse surrounding the sustainability concept and become a part of creating a more sustainable, resilient, and successful society.

REFERENCES

- Abad-Segura, E., & González-Zamar, M. D. (2019). Effects of financial education and financial literacy on creative entrepreneurship: A worldwide research. *Education Sciences*, 9(3), 238.
- Albino, V., Balice, A., & Dangelico, R. M. (2009). Environmental strategies and green product development: an overview on sustainability-driven companies. *Business strategy and the environment*, 18(2), 83-96.
- Andreopoulou, Z. (2012). Green Informatics: ICT for green and Sustainability. *Agrárinformatika/Journal of Agricultural Informatics*, 3(2), 1-8.
- Aria, M., & Cuccurullo, C. (2017). bibliometrix: An R-tool for comprehensive science mapping analysis. *Journal of informetrics*, 11(4), 959-975.
- Atkinson, A., & Messy, F. A. (2012). Measuring financial literacy: Results of the OECD/International Network on Financial Education (INFE) pilot study.
- Bedi, H. S., Karn, A. K., Kaur, G. P., & Duggal, R. (2019). Financial literacy—A Bibliometric analysis. *Bedi, HS, Karn, AK, Kaur, GP, & Duggal, R., Financial Literacy—A Bibliometric Analysis. Our Heritage*, 67(10), 1042-1054.
- Billingsley, R., Gitman, L. J., & Joehnk, M. D. (2020). *Personal financial planning*. Cengage Learning.
- CEVALLOS, P. V., MONTILLA, P. A., BÍLER, R. S., & CEVALLOS, B. L. (2022). Planeación financiera empresarial, aproximación a su estudio desde una revisión bibliográfica. *CIENCIAS SOCIALES*, 4(2), 1-25.
- Chen, X., Lun, Y., Yan, J., Hao, T., & Weng, H. (2019). Discovering thematic change and evolution of utilizing social media for healthcare research. *BMC Medical Informatics and Decision Making*, 19(Suppl 2), 50.
- Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the Fuzzy Sets Theory field. *Journal of informetrics*, 5(1), 146-166.
- Dangelico, R. M., & Pujari, D. (2010). Mainstreaming green product innovation: Why and how companies integrate environmental sustainability. *Journal of business ethics*, 95(3), 471-486.
- de Carvalho, G. D. G., Cruz, J. A. W., De Carvalho, H. G., Duclós, L. C., & de Fátima Stankowitz, R. (2017). Innovativeness measures: a bibliometric review and a classification proposal. *International Journal of Innovation Science*, 9(1), 81-101.
- Desai, S., Tirunagaru, K. C., Venkateswara Rao, K., Upasana, R., Prasad, J. V. N. S., Nithin, K. N., ... & Misal, N. (2023). Agricultural impacts of climate change in India and potential adaptations. *CABI Reviews*, (2023).
- Dhotre, M., Nithin, K. N., Kolluru, R., & Desai, S. (2025). Recurring onion and tomato crises in India: A critical analysis and future perspectives. In *Emerging trends in food and agribusiness marketing* (pp. 123-160). IGI Global Scientific Publishing.
- Fitriah, W. (2021). Financial literacy and financial inclusion on the financial planning of the city of Palembang. *Review of Management and Entrepreneurship*, 5(1), 19-32.
- Garfield, E. (2004). Historiographic mapping of knowledge domains literature. *Journal of information science*, 30(2), 119-145.
- Garfield, E., & Sher, I. H. (1993). Brief communication keywords plusalgorithmic derivative indexing. *Journal of the American Society for Information Science (1986-1998)*, 44(5), 298.
- Goodell, J. W., Kumar, S., Lim, W. M., & Pattnaik, D. (2021). Artificial intelligence and machine learning in finance: Identifying foundations, themes, and research clusters from bibliometric analysis. *Journal of behavioral and experimental finance*, 32, 100577.
- Goyal, K., & Kumar, S. (2020). Financial literacy: A systematic review and bibliometric analysis. *International Journal of Consumer Studies*, 45(1), 80-105.
- Greenacre, M., & Blasius, J. (2006). *Multiple correspondence analysis and related methods*. Chapman and Hall/CRC.
- Gudkova, O., & Ermakova, L. (2020). Budgeting as a Way of Performance of the Development Strategy on the Example of JSC Konservsushprod. *Bulletin of Science and Practice*, 6(4).
- Huang, L., Shi, X., Zhang, N., Gao, Y., Bai, Q., Liu, L., ... & Hong, B. (2020). Bibliometric analysis of trends and issues in traditional medicine for stroke research: 2004–2018. *BMC complementary medicine and therapies*, 20(1), 39.
- Huston, S. J. (2010). Measuring financial literacy. *Journal of consumer affairs*, 44(2), 296-316.

- Ingale, K. K., & Paluri, R. A. (2022). Financial literacy and financial behaviour: A bibliometric analysis. *Review of Behavioral Finance*, 14(1), 130-154.
- Jayantha, W. M., & Oladinrin, O. T. (2019). Bibliometric analysis of hedonic price model using CiteSpace. *International Journal of Housing Markets and Analysis*, 13(2), 357-371.
- Kapoor, J. R., Dlabay, Hughes R.J. (2014). Personal Finance. New Delhi: Mc Graw Hill Companies.
- Khan, A., Hassan, M. K., Paltrinieri, A., Dreassi, A., & Bahoo, S. (2020). A bibliometric review of takaful literature. *International Review of Economics & Finance*, 69, 389-405.
- Lingyan, W., Mawenge, Rani, D., & Patil, S. (2023). RETRACTED ARTICLE: Study on relationship between personal financial planning and financial literacy to stimulate economic advancement. *Annals of Operations Research*, 326(Suppl 1), 11-11.
- Liu, J. S., Lu, L. Y., Lu, W. M., & Lin, B. J. (2013). A survey of DEA applications. *Omega*, 41(5), 893-902.
- Low, M. P., & Siegel, D. (2019). A bibliometric analysis of employee-centred corporate social responsibility research in the 2000s. *Social Responsibility Journal*, 16(5), 691-717.
- Lusardi, A. (2011). I Will Teach You to Be Rich. Workman Publishing.
- Lusardi, A., & Mitchell, O. S. (2011). Financial literacy and retirement planning in the United States. *Journal of pension economics & finance*, 10(4), 509-525.
- Lusardi, A., & Mitchell, O. S. (2014). The economic importance of financial literacy: Theory and evidence. *Journal of economic literature*, 52(1), 5-44.
- Mangla, S., Madaan, J., & Chan, F. T. (2013). Analysis of flexible decision strategies for sustainability-focused green product recovery system. *International Journal of Production Research*, 51(11), 3428-3442.
- Merigó, J. M., & Yang, J. B. (2017). Accounting research: A bibliometric analysis. *Australian Accounting Review*, 27(1), 71-100.
- Mishra, A., & Alavi, S. (2023). Green energy, carbon emission and economic prosperity; an evidence of global perspective. *International Journal of Energy Sector Management*, 17(4), 661-676.
- Mishra, A., & Sahu, P. K. (2025). Do geopolitical uncertainty and inflation transmit opportunities or threats to green energy consumption?. *International Journal of Energy Sector Management*, 19(4), 1045-1060.
- Mishra, A., Sharma, M., Kumar, S., Tomar, R., Tiwari, A., & Guleria, A. (2021). Economic prosperity and environmental sustainability: role of infrastructure development. *Indian Journal of Ecology*, 48(16), 178-183.
- Nithin, K. N., & Mahajanashetti, S. B. (2025). Shift in Area towards Natural Rubber in Wayanad District of Kerala--A Markov Chain Approach. *Ecology, Environment & Conservation (0971765X)*, 31.
- Ouachani, S., Belhassine, O., & Kammoun, A. (2021). Measuring financial literacy: A literature review. *Managerial Finance*, 47(2), 266-281.
- Park, H., & Martin, W. (2021). Effects of risk tolerance, financial literacy, and financial status on retirement planning. *Journal of Financial Services Marketing*, 27(3), 167-176.
- Patel, R., Goodell, J. W., Oriani, M. E., Paltrinieri, A., & Yarovaya, L. (2022). A bibliometric review of financial market integration literature. *International Review of Financial Analysis*, 80, 102035.
- Rialti, R., Marzi, G., Ciappei, C., & Busso, D. (2019). Big data and dynamic capabilities: a bibliometric analysis and systematic literature review. *Management Decision*, 57(8), 2052-2068.
- Riehmman, P., Hanfler, M., & Froehlich, B. (2005, October). Interactive sankey diagrams. In *IEEE Symposium on Information Visualization, 2005. INFOVIS 2005*. (pp. 233-240). IEEE.
- Rodriguez-Ruiz, F., Almodóvar, P., & Nguyen, Q. T. (2019). Intellectual structure of international new venture research: A bibliometric analysis and suggestions for a future research agenda. *Multinational Business Review*, 27(4), 285-316.
- Safari, K., Njoka, C., & Munkwa, M. G. (2021). Financial literacy and personal retirement planning: a socioeconomic approach. *Journal of Business and Socio-Economic Development*, 1(2), 121-134.
- Samantaray, S., Mishra, A., & Dash, A. K. Does Renewable Energy Consumption Lead to Low Carbon Emissions? Evidence from BRICS Countries. *International Research Journal of Economics and Management Studies IRJEMS*, 3(1).
- Santini, F. D. O., Ladeira, W. J., Mette, F. M. B., & Ponchio, M. C. (2019). The antecedents and consequences of financial literacy: a meta-analysis. *International Journal of Bank Marketing*, 37(6), 1462-1479.
- Sarkar, B., Ullah, M., & Sarkar, M. (2022). Environmental and economic sustainability through innovative green products by remanufacturing. *Journal of Cleaner Production*, 332, 129813.
- Setyorini, N., Indiworo, R. H. E., & Sutrisno, S. (2021). The role financial literacy and financial planning to increase financial resilience: household behaviour as mediating variable. *Media Ekonomi dan manajemen*, 36(2), 243-255.
- Singh, S., & Dhir, S. (2019). Structured review using TCCM and bibliometric analysis of international cause-related marketing, social marketing, and innovation of the firm. *International Review on Public and Nonprofit Marketing*, 16(2), 335-347.

- Smith, C. A., & Eschenfelder, K. (2013). Public libraries in an age of financial complexity: Toward enhancing community financial literacy. *The Library Quarterly*, 83(4), 299-320.
- Swaroop, K. R., & Gade, S. (2023). Sustainable marketing and people behavior for enhanced governance. In *Leadership and Governance for Sustainability* (pp. 242-262). IGI Global Scientific Publishing.
- Tella, A., & Aisha Olabooye, A. (2014). Bibliometric analysis of african journal of library, archives and information science from 2000-2012. *Library Review*, 63(4-5), 305-323.
- Tseng, M. L., Tan, R. R., & Siriban-Manalang, A. B. (2013). Sustainable consumption and production for Asia: sustainability through green design and practice. *Journal of Cleaner Production*, 40, 1-5.
- Valencia, D. C., Giraldo, C., Valencia, J., Palacios, L., & Piedrahita, L. (2018). Relationship between ICT use and financial education levels in Latin America. *International Journal of Innovation, Management and Technology*, 9(4), 174-177.
- White, Thomas, F. (2021). Financial planning and management system and method.
- Xu, X., Chen, X., Jia, F., Brown, S., Gong, Y., & Xu, Y. (2018). Supply chain finance: A systematic literature review and bibliometric analysis. *International Journal of Production Economics*, 204, 160-173.
- Yan, J., & Zhang, N. (2019). Author co-citation network and research themes in knowledge management: A bibliometric analysis. *Information Processing & Management*, 56(3), 1214-1225.
- Yang, J., Zheng, F., & Zhang, Y. (2015). A bibliometric analysis of the strategic management research. *Scientometrics*, 105
- Zhang, D., Zhang, Z., & Managi, S. (2019). A bibliometric analysis on green finance: Current status, development, and future directions. *Finance Research Letters*, 29, 425-430.
- Zhang, J., Yu, Q., Zheng, F., Long, C., Lu, Z., & Duan, Z. (2016). Comparing keywords plus of WOS and author keywords: A case study of patient adherence research. *Journal of the association for information science and technology*, 67(4), 967-972.
- Zhang, Y., Yu, H., & Zheng, F. (2016). A bibliometric analysis of research on carbon trading. *Information Processing & Management*, 52(6), 1154-1167.
- Zhang, Y., Yu, H., Zhao, X., & Li, X. (2014). A bibliometric analysis of world volatile organic compounds research trends. *Scientometrics*, 101(1), 699-719.

Received: 19-May-2026, Manuscript No. AMSJ-26-17258; **Editor assigned:** 20-May-2026, PreQC No. AMSJ-26-17258(PQ); **Reviewed:** 03-June-2026, QC No. AMSJ-26-17258; **Revised:** 08-June-2026, Manuscript No. AMSJ-26-17258(R); **Published:** 15-June-2026