Multidisciplinary Research Journal
ISSN (online): 3108 – 1533

Volume 2, Issue 2, 2026
April – June 2026

Review Article

Consumer Perception, Food Waste and Food Packaging Research: A Bibliometric Analysis from 2016 to 2026

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Received: 29 May 2026 ; Accepted: 24 September 2026; Published: 15 October 2026

Abstract: Food packaging is regarded as a threat to the environment because of the waste it produces. Packaging prevents food from spoilage, extends its shelf life and reduces environmental damage by reducing down the food waste. By reviewing the previous literature, consumer knowledge, interest, degree of awareness and understanding of the packaging functions are identified to influence their acceptance and rejection of packaging technologies, including those designed to reduce food waste. The purpose of this study is to analyse the evolution and intellectual structure of consumer perception, food waste and food packaging research. It specifically analyses publication trends, major sources, citations, researcher co-authorship networks and the evolution of keywords and thematic areas within the domain. To achieve these objectives, a bibliometric analysis was carried out on publications using the Web of Science database from 2016 to 2026. A total of 118 documents were analysed with the Bibliometrix package through the Biblioshiny interface and VOSviewer. The results showed a significant increase in publications after 2020 within the selected dataset, reflecting the increasing research attention to food packaging, food waste management and studies on consumer behaviour related dimensions. The findings indicate increasing scholarly attention to the intersection of consumer-related packaging, food-waste management and sustainability-oriented themes within the selected dataset.

Keywords: Consumer perception; Food waste; Food packaging; Bibliometric analysis; Biblioshiny; VOSviewer

1. Introduction

Food waste is a significant worldwide sustainability problem [1]. Food waste is food that is discarded even though it is not intended to be discarded and is avoidable [2]. Salume et al. [3] mentioned that food waste comprises edible parts of food produced for human consumption that are discarded, intended to be discarded, or diverted to another use and can occur in raw, processed or cooked forms [4,5]. Besides its environmental and economic aspects, food waste also has a huge social dimension to it. The loss of edible food is a missed opportunity to reduce hunger and improve food security and highlights the crucial importance of using food effectively to address the world's nutritional challenges [3]. Data reported by the European Commission show that food waste generation occurs primarily during the consumption stage (46%), followed by primary production (25%) and food processing and manufacturing activities (24%) [6]. Food waste is a significant sustainability issue with wide-ranging impacts and is closely linked to the achievement of the United Nations' Sustainable Development Goals (SDGs). Particularly, SDG Target 12.3 seeks to halve per capita global

food waste by 2030, emphasizing the importance of applying effective strategies across the food supply chain [7,8].

Packaging is the first communication to consumers and influences the way consumers evaluate products before purchase [9]. Packaging has several roles such as the protection of the product, the extension of the shelf-life, the provision of information, the traceability, the convenience, the indication of tampering and at the same time, it contributes to the assurance of food safety and quality along the entire food chain from production to consumption [10]. Food packaging increases the shelf-life of packaged food and preserves the sensory properties, quality and safety of packaged food. The researchers in the field of packaging are aim to promote environmental sustainability [11]. In their study, Yan et al. [12] stated that consumer perception influences packaging materials and designs [11,13]. Understanding consumer expectations regarding packaging characteristics and functionality is essential to encourage sustainable behaviour change [14]. Packaging is an important factor influencing consumer decision-making processes. Different packaging attributes can influence not only purchase intentions but also consumption behaviours after purchase [15].

Food waste in the consumer sector has a major impact on the environment, the global economy and society [16]. The production of food waste in the consumption phase is directly associated with consumers' purchase decisions and consumption practices. Therefore, food waste is a particularly important area for research and intervention efforts. This stage offers an important opportunity to develop targeted strategies for the reduction of food waste and for promoting more sustainable patterns of consumption [7]. Consumers account for a large proportion of the total amount of food waste generated [1] and individual habits are important in determining how much food is discarded [4].

To the best of our knowledge, there are limited bibliometric studies exploring consumer perception, food waste and food packaging. The present study conducted a bibliometric analysis of literature on the research topic based on data from the Web of Science (WoS) database. The analysis was aimed at identifying publication trends, collaborative networks, influential contributors and emerging research themes in the field. Bibliometric methods have been increasingly useful to systematically evaluate a vast amounts of scientific literature. They are useful for identifying knowledge structures, research impacts and developmental trajectories, and help researchers to propose future research directions to address theoretical and practical needs [17,18]. Bibliometric analysis also provides an efficient approach to uncover relationships, patterns and trends across large collections of academic publications. Compared with traditional review methods, modern bibliometric tools, such as Biblioshiny and VOSviewer, provide better data processing, visualisation and network mapping, thus improving the accuracy and efficiency of scholarly analysis [19].

The research questions to be answered in this study for a thorough understanding of the literature on consumer perception, food waste and food packaging are:

RQ_1: What are the most influential contributors and the key knowledge sources in these research domains, including leading authors, highly cited publications, prominent journals, frequently occurring keywords and productive countries?

RQ_2: What are the main research themes, conceptual structures and emerging trends in the existing body of literature?

RQ$_3$: What possible directions for future research on the role of consumer perception, food waste and food packaging in reducing food waste can be found based on bibliometric evidence?

In responding to these questions, the study seeks to investigate the intellectual landscape of the field, to identify its milestones and to point out research opportunities for supporting the design of packaging solutions and consumer-oriented strategies to mitigate food waste.

The findings of this study add to the knowledge base with a bibliometric evaluation of the research on consumer perception, food waste and food packaging. The study presents valuable insights for researchers, policymakers, packaging designers, marketers and sustainability practitioners by mapping the intellectual structure, thematic evolution, influential contributors and collaboration networks in the field.

2. Materials and Methods

The present research is based on bibliometric approach to analyse the existing literature in the selected field of study. Bibliometric analysis is a quantitative method that uses statistical techniques to analyse and visualise scholarly publications, enabling the identification of publication trends, intellectual structures, collaboration networks and the evolution of a research field [20]. The data were collected using the database of WoS by Clarivate which is well known to many researchers working in the field of bibliometrics and also many other areas of research [21]. Academics have been using WoS for its quality of archived sources for collecting materials that have been used by some previous studies to provide robust and high-quality data, mentioned Sarkar et al. [21] in their bibliometric study. Furthermore, a bibliometric analysis was conducted using the open-source software Biblioshiny and VOSviewer. The steps of the study were: study design, data collection, data analysis and visualisation and data interpretation.

2.1. Study Design

The major areas of focus for the data analysis and visualisation in this research have been consumer perception, food waste and food packaging. The research is focused on the time period 2016-2026 and contains research articles related to the study of consumer perception, food waste and food packaging. The main purpose of this research is to address the following major research questions.

- Identification of the trend in consumer perception, food waste and food packaging literature regarding the evolution of publications and number of citations.
- Identifying the key contributors to the field of research, such as leading journals, highly cited publications, prominent authors and productive countries.
- Identifying some of the key thematic areas, developing topics and keyword trends.
- Identifying the most frequent words associated with consumer perception, food waste and packaging research.
- Finding the country-to-country collaborations.

2.2. Data Collection

The data for the present bibliometric investigation were obtained from the database of WoS. A structured search strategy with a predefined search string was created to ensure the relevance and comprehensiveness of the selected publications. The search query was: *("consumer perception" OR "consumer behavio*" OR "consumer attitude*" OR "consumer decision*" OR "consumer choice*" OR "consumer awareness" OR "consumer") AND ("food waste" OR "food wastage" OR "food loss" OR "food discard*" OR "wasted food" OR "avoidable food waste" OR "household food waste" OR "leftover food" OR "uneaten food" OR "food spoilage" OR "food disposal" OR "expired food") AND ("food packaging" OR "packaging design" OR "reusable packaging" OR "reclosable packaging" OR "packaging material*" OR "packaging label*" OR "packaging sustainability")*, where OR and AND are Boolean operators that were used to combine search terms and * is a wildcard character which allows for word variations to be included (eg., "behavior" and "behaviour").

The search query used in this study was based on the methodology used in previous studies on food waste and consumer behaviour, including the work of Salume et al. [3]. To improve the accuracy and reliability of the found information, search terms were placed in quotation marks to enable the retrieval of records close to the desired research area [22]. Moreover, the "All Fields" option was selected in the WoS database to extract documents in all searchable fields.

The first application of the search string retrieved 155 documents from the WoS database. Several filtering stages were performed (Fig. 1) to obtain a more relevant and refined dataset.

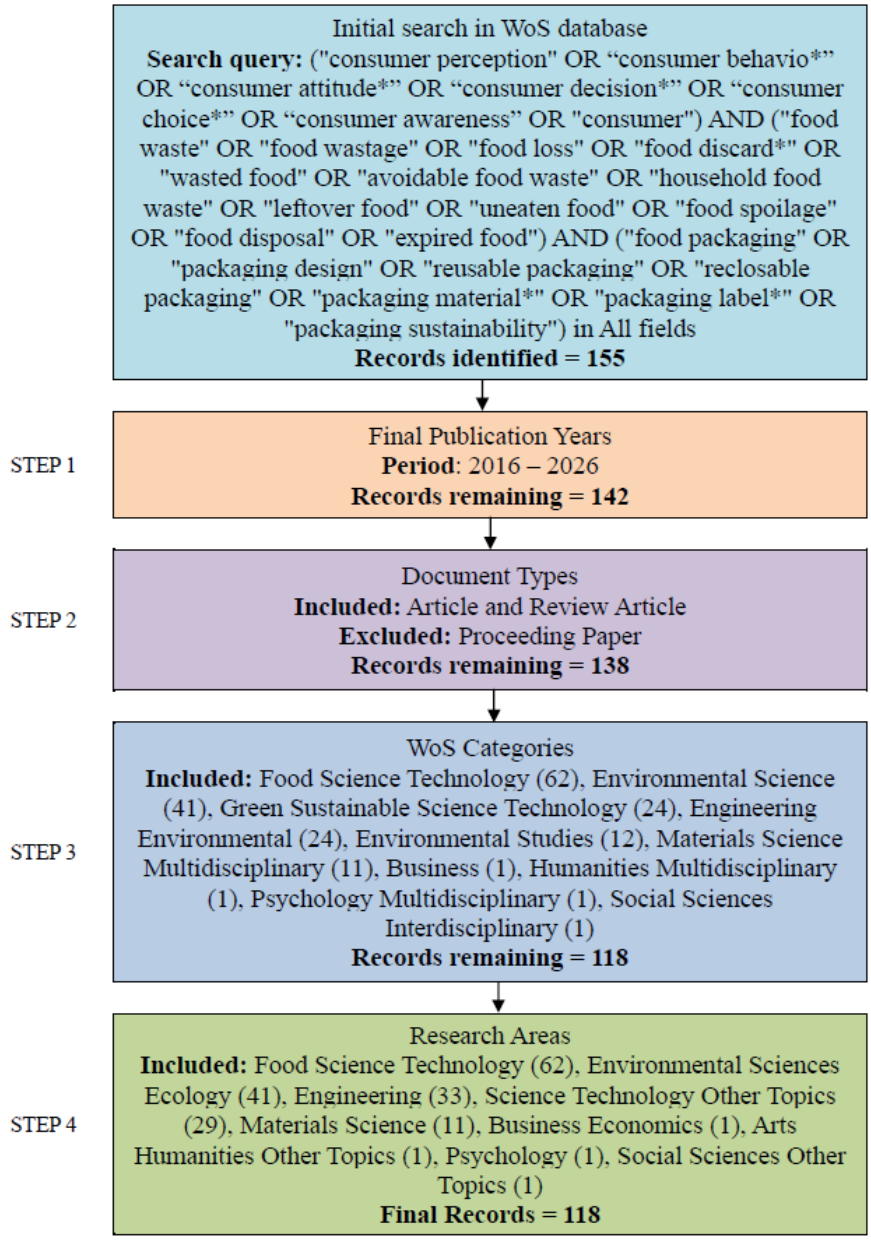
In STEP 1, the final publication year filter was applied by limiting the documents to the period from 2016 to 2026, which reduced the total number of records to 142. In STEP 2, the document types were narrowed to only "Article" and "Review Article" and excluded "Proceeding Paper", resulting in 138 records. In STEP 3, the WoS categories were refined to to include the most relevant subject areas related to consumer perception, food waste and food packaging. The selected categories were Food Science Technology (62), Environmental Science (41), Green Sustainable Science Technology (24), Engineering Environmental (24), Environmental Studies (12), Materials Science Multidisciplinary (11), Business (1), Humanities Multidisciplinary (1), Psychology Multidisciplinary (1), and Social Sciences Interdisciplinary (1). After these category-based refinements, the records were reduced to 118. Finally, STEP 4, involved the further refinement of research areas to ensure inclusion of the most relevant multidisciplinary domains. The selected research areas included Food Science Technology (62), Environmental Sciences Ecology (41), Engineering (33), Science Technology Other Topics (29), Materials Science (11), Business Economics (1), Arts Humanities Other Topics (1), Psychology (1), Social Sciences Other Topics (1). After this last refinement step, the dataset was composed of 118 records to be further analysed bibliometrically.

The WoS categories and research areas were retained according to their conceptual relevance to the research scope and not based on a minimum threshold of publication frequency. Thus single-document categories were kept where the respective records were still relevant to the intersection of consumer perception, food waste and food packaging. Their inclusion maintains the multidisciplinary aspect and prevents the exclusion of potentially relevant contributions due to low category frequency.

2.3. Data Analysis and Visualization

For further processing of these 118 records, the Bibliometrix package with the Biblioshiny interface and the VOSviewer (Version 1.6.20) software package were used. All relevant bibliographic records were exported in plain text format. This file format is widely compatible with bibliometric analysis tools such as Biblioshiny and VOSviewer.

In order to get the answers to the research questions, a series of bibliometric analyses were performed to analyse citation patterns and identify the most influential sources, authors, countries and highly cited publications within the selected research domain. The intellectual and conceptual structure of the field was also explored through keyword co-occurrence analysis and international collaboration networks among countries applying science mapping techniques.



Source: Authors' creation
Figure 1. Steps of refining the sample for bibliometric analysis

3. Results and Discussion

The dataset summary is shown in Table 1. The dataset consists of 118 research articles from the years 2016 to 2026. These publications were obtained from 51 different sources. The article document type was 77 and the review document type was 41. The field has experienced a steady growth in scholarly interest during the study period with an annual growth rate of 14.87% in publications. The average age of the analysed literature was 3.6 years. In addition, the average citations per document were 45.57, which reflected the high academic impact and visibility of publications in the dataset. The selected research articles have a total of 10,122 cited references. In addition, the dataset contains 416 Author's Keywords (DE) and 499 Keywords Plus (ID). Author's keywords are the words used by researchers to define the main topics, concepts and the scope of their studies. On the other hand, Keywords Plus are automatically generated by the WoS database using information drawn from the titles, abstracts and cited references of indexed publications. The database also shows the contribution of 598 unique authors with only 3 articles being single-authored. Co-authorship value is 5.46 and the percentage of international co-authorship is 33.05.

Table 1. Bibliometric data-set information

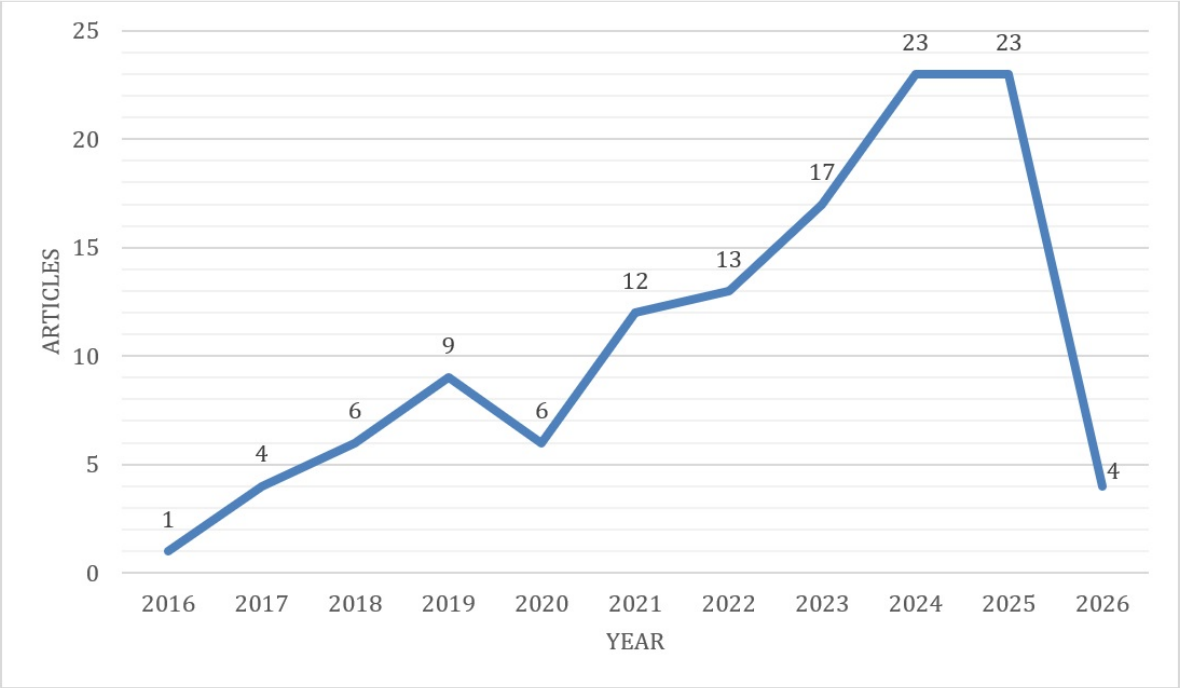
Description	Results
Main information about data	
Timespan	2016:2026
Sources (Journals, Books, etc)	51
Documents	118
Annual Growth Rate %	14.87
Document Average Age	3.6
Average citations per doc	45.57
References	10122
Document contents	
Keywords Plus (ID)	499
Author's Keywords (DE)	416
Authors	
Authors	598
Authors of single-authored docs	3
Authors collaboration	
Single-authored docs	3
Co-Authors per Doc	5.46
International co-authorships %	33.05
Document types	
article	77
review	41

3.1. Publications

The research output for the period from 2016 to 2026 is presented in Fig. 2 based on the WoS database. The trend of publications indicates a steady increase in research output over the study period which indicates increasing scholarly interest in related topics of consumer perception, food waste and food packaging. The increase is indicative of the rising importance of the field and its relevance to current research on sustainability and consumer behaviour. In 2016, only 1 publication was recorded, which increased steadily to 9 publications in 2019. In 2020 the publication output slightly decreased with 6 publications but increased significantly after 2021.

The highest scientific production was in 2024 and 2025, with 23 publications each, which indicates high and increasing research interest in the selected research fields. In 2026 only 4 publications were found as data collection was conducted until 20 May 2026.

The results show that the research field has developed considerably in recent years, especially in the period after 2020. The continuous growth of scientific production reflects an increasing global concern about food waste management, packaging practices and the role of consumer perception in promoting sustainability-oriented behaviour.



Source: Authors' creation

Figure 2. Annual scientific production (2016 – 2026).

3.2. Citation Evaluation

Table 2 shows the per-year citation performance of the publications related to consumer perception, food waste and food packaging research from the years 2016 to 2026. The results indicate that older publications were generally cited more because they had more time to accumulate academic attention. A high MeanTCperYear (17.04) and the highest average total citations per article (MeanTCperArt=153.33) in the year 2018 indicated comparatively high citation accumulation within the analysed dataset. Similarly, the

publications in 2020 showed high citation performance with an average citation performance of 135.83 per article and 19.40 per year, which was the highest annual citation rate in the study period.

The results also show that publications from 2017, 2019, 2021 and 2022 also achieved significant citation impact indicating the growing academic importance for consumer perception, food waste and food packaging research in these years. Starting from 2023, citation values gradually decreased because of fewer citable years for accumulating citations of recent publications. The years 2024 and 2025 had the highest numbers of publications; however, the average citation values were relatively lower because of the recent publication period.

Table 2. Citation performance of publications

Year	MeanTCperArt*	N	MeanTCperYear**	Citable Years
2016	2.00	1	0.18	11
2017	84.75	4	8.47	10
2018	153.33	6	17.04	9
2019	81.11	9	10.14	8
2020	135.83	6	19.40	7
2021	56.00	12	9.33	6
2022	51.23	13	10.25	5
2023	34.24	17	8.56	4
2024	17.70	23	5.90	3
2025	9.91	23	4.96	2
2026	4.00	4	4.00	1

*MeanTCperArt: Mean Total Citations per Article; **MeanTCperYear: Mean Total Citations per Year

3.3. Most Productive Sources

The Top 10 productive sources contributing to the consumer perception, food waste and food packaging research field based on number of published articles are presented in Table 3. The results reveal that the journal Sustainability was the leading source with 12 publications, followed closely by Trends in Food Science & Technology with 11 publications and Journal of Cleaner Production with 10 publications.

Table 3. Top 10 productive sources

Sources	Articles
Sustainability	12
Trends In Food Science & Technology	11
Journal Of Cleaner Production	10
Food Packaging And Shelf Life	8
Resources Conservation And Recycling	6
Comprehensive Reviews In Food Science And Food Safety	5
Foods	5
Packaging Technology And Science	4
Food Control	3
International Journal Of Life Cycle Assessment	3

Other main sources were Food Packaging and Shelf Life with 8 publications and Resources Conservation and Recycling with 6 publications. Other journals that have contributed significant research in these fields include Foods, Packaging Technology and Science and Comprehensive Reviews in Food Science and Safety. The journals Food Control and International Journal of Life Cycle Assessment each contain 3 articles.

3.4. Most Relevant Authors

The results (Table 4) display the most relevant authors based on their number of publications in the consumer, food waste and food packaging research fields. Linda Brennan, Karli Verghese and Helen Williams were the major contributors, with 5 publications each. Simon Lockrey and Lukas Parker with 4 publications each. Caroline Francis, Sophie Langley, Marit Kvalvag Pettersen, Renee Wever and Fredrik Wikstrom each contributed 3 publications.

Table 4 also presents fractionalised articles, which are the share of contribution of each author in co-authored publications. Helen Williams had the highest fractionalized value of 1.22 among the listed authors, indicating a relatively stronger individual contribution in collaborative research work.

These results indicate that the research area is backed up by a team of active and influential researchers who contribute to a regular basis to the literature.

Table 4. Top 10 most relevant authors based on number of publications.

Authors	Articles	Articles Fractionalized
BRENNAN, LINDA	5	0.76
VERGHESE, KARLI	5	0.61
WILLIAMS, HELEN	5	1.22
LOCKREY, SIMON	4	0.56
PARKER, LUKAS	4	0.64
FRANCIS, CAROLINE	3	0.31
LANGLEY, SOPHIE	3	0.31
PETTERSEN, MARIT KVALVAG	3	0.41
WEVER, RENEE	3	0.63
WIKSTROM, FREDRIK	3	0.68

3.5. Country-Wise Scientific Production

India was the most prolific contributor (37 publications), followed by China (32 publications) and Australia (28 publications) as can be seen from the results in Table 5. The United States of America (USA) also showed a strong research productivity with 26 publications, followed by Italy and Portugal with 21 and 20 publications respectively. These findings show that consumer perception, food waste and food packaging research is gaining academic interest worldwide.

Country-level publication counts were calculated with full counting at the country level. Therefore, a publication with authors from more than one country is counted once for each country that contributed to the publication. Therefore, the frequency of documents indicates country participation in the dataset and is not mutually exclusive.

Other important contributors were Sweden, South Korea, Ireland and Spain. Fig. 3 shows the global distribution of research output, with darker shades representing countries with higher publication productivity. The continuous contribution of both developed and emerging economies is an indication of the increasing global concern for food waste reduction, sustainable packaging and environmentally responsible consumer behaviour.

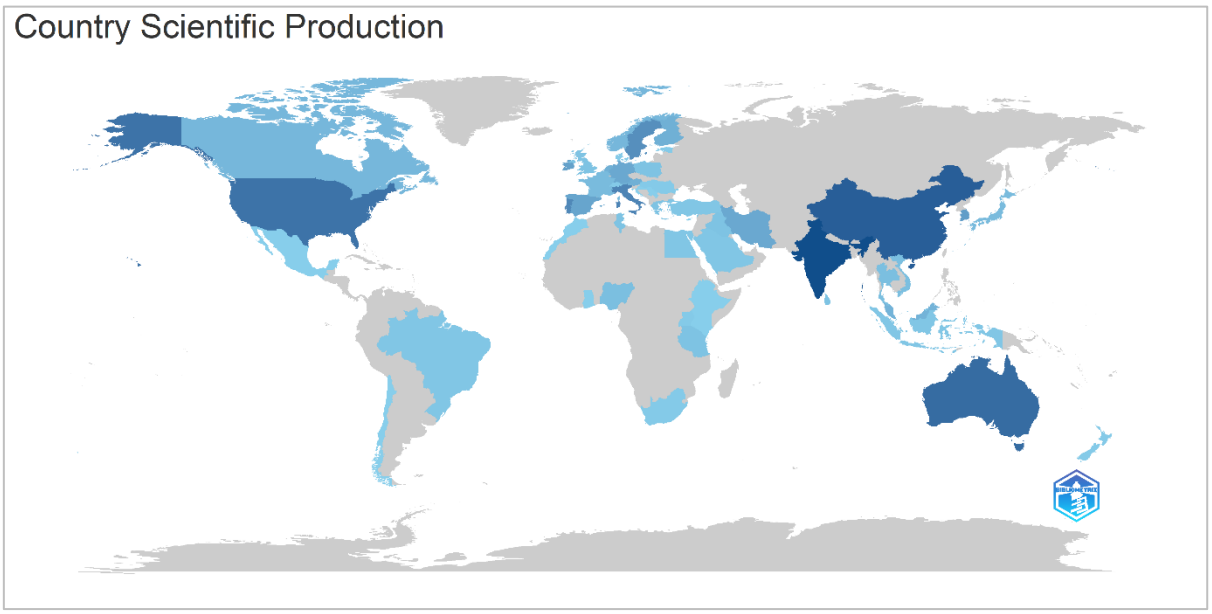


Figure 3. Country-wise scientific production of publications (This map was generated from Biblioshiny)

Table 5. Top 10 countries with highest scientific production of publications

Country	Frequency of documents
INDIA	37
CHINA	32
AUSTRALIA	28
USA	26
ITALY	21
PORTUGAL	20
SWEDEN	18
SOUTH KOREA	14
IRELAND	13
SPAIN	12

3.6. Most Cited Countries

The most cited countries according to total number of citations and average article citations in the selected research field are shown in Table 6 and Fig. 4. The result indicated that India was the most dominant country with a total of 577 citations, whereas Switzerland and Portugal were the second and third with 439 and 401 citations, respectively. Further, publications from Sweden, Norway, Australia and China also showed high citation impact, suggesting that researchers from these countries had made significant contributions to the

advancement of knowledge in the field. These citation patterns indicate differences in citation visibility across countries within the analysed dataset.

Average article citation counts provide an indication of citation visibility to research quality and impact within the analysed dataset. Switzerland (219.50) had the highest average number of article citations, followed by Vietnam (136.50), Thailand (115.50) and Norway (114.00). These findings imply that some countries have published fewer papers, yet their research has high academic influence and higher citation impact. On the other hand, countries such as Australia, China and the USA showed relatively higher research output but lower average citation values.

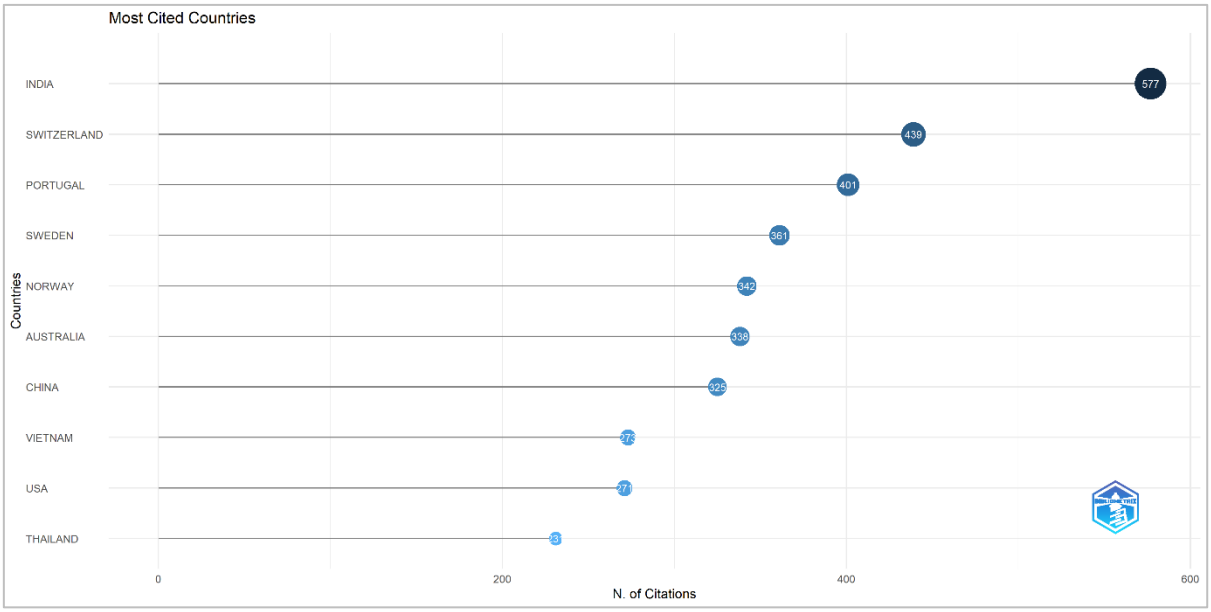


Figure 4. Most cited countries (This chart was generated from Biblioshiny).

Table 6. Top 10 most cited countries

Country	TC*	Average Article Citations
INDIA	577	82.40
SWITZERLAND	439	219.50
PORTUGAL	401	66.80
SWEDEN	361	60.20
NORWAY	342	114.00
AUSTRALIA	338	37.60
CHINA	325	29.50
VIETNAM	273	136.50
USA	271	27.10
THAILAND	231	115.50

*TC: Total citations

3.7. Most Globally Cited Documents

The research field of consumer perception, food waste and food packaging is shown in the top 10 globally cited documents in Table 7. The most influential document according to the results was the study of Geueke B. (2018) published in Journal of Cleaner Production with 433

total citations. Then, there was Bhargava N. (2020) in Trends in Food Science & Technology with 407 citations and Nilsen-Nygaard J. (2021) in Comprehensive Reviews in Food Science and Food Safety with 259 citations.

Some other studies also showed significant citation impact eg., Janjarasskul T. (2018), Nguyen A.T. (2020) and Luo X.Y. (2022). Amongst the listed publications, Bhargava N. (2020) had the highest citations per year (58.14) which indicates the rapid academic attention in a short span of time. Nilsen-Nygaard J. (2021) had the highest value in normalized total citations (4.63), which is a strong citation performance compared to publications from the same period.

Table 7. Top 10 globally cited documents.

Paper	DOI	Total Citations	TC per Year*	Normalized TC**
GEUEKE B, 2018, J CLEAN PROD	10.1016/j.jclepro.2018.05.005	433	48.11	2.82
BHARGAVA N, 2020, TRENDS FOOD SCI TECH	10.1016/j.tifs.2020.09.015	407	58.14	3.00
NILSEN-NYGAARD J, 2021, COMPR REV FOOD SCI F	10.1111/1541-4337.12715	259	43.17	4.63
JANJARASSKUL T, 2018, CRIT REV FOOD SCI	10.1080/10408398.2016.1225278	231	25.67	1.51
NGUYEN AT, 2020, J CLEAN PROD	10.1016/j.jclepro.2019.119792	229	32.71	1.69
LUO XY, 2022, COMPR REV FOOD SCI F	10.1111/1541-4337.12942	209	41.80	4.08
BEITZEN-HEINEKE EF, 2017, J CLEAN PROD	10.1016/j.jclepro.2016.09.227	181	18.10	2.14
BRENNAN L, 2021, J CLEAN PROD	10.1016/j.jclepro.2020.125276	149	24.83	2.66
NAIDOO M, 2018, J CLEAN PROD	10.1016/j.jclepro.2018.08.253	146	16.22	0.95
MOLINA-BESCH K, 2019, INT J LIFE CYCLE ASS	10.1007/s11367-018-1500-6	144	18.00	1.78

*TC per Year: Total citations per year; **Normalized TC: Normalized total citations

3.8. Most Frequent Keywords

Keywords co-occurrence analysis was done in VOSviewer with the combined 'All Keywords' field of Author's Keywords and Keyword Plus. The bibliometric dataset included 416 Author's Keywords (DE) and 499 Keywords Plus (ID) and the combined keyword set identified 852 keywords by VOSviewer. 45 keywords met the threshold and were included in the co-occurrence network, using full counting and a minimum occurrence threshold of five. The 45 keywords were then classified into four thematic clusters.

As shown in Fig. 5, the size of each node in the visualisation is proportional to the frequency of occurrence of a keyword and the lines connecting the nodes indicate the strength of the relationships between keywords. Different colours indicate different thematic clusters in the research area.

Cluster 1 (Red) is primarily dedicated to technological and packaging related studies. Keywords: "food packaging", "active packaging", "intelligent packaging", "antimicrobial", "antioxidant", "nanotechnology" and "shelf-life". The cluster shows that a large number of studies are concentrated in the field of advanced food packaging technologies aimed at

improving food quality, safety, storage and shelf-life extension. Keywords: “chitosan”, “silver nanoparticles” and “essential oils” indicate a growing interest in sustainable and functional packaging materials for reducing food spoilage and waste.

Cluster 2 (Green) focuses on sustainability and food waste management research. The main keywords are “food waste”, “sustainability”, “behavior”, “consumption”, “circular economy”, “food loss”, “life cycle assessment” and “waste”. The cluster is indicative of a strong research interest in the topic of environmental sustainability, food consumption patterns and waste reduction strategies. The presence of keywords such as “food supply chain” and “environmental impact” indicates the growing research interest on the generation of food waste at different steps of the supply chain and its environmental impact.

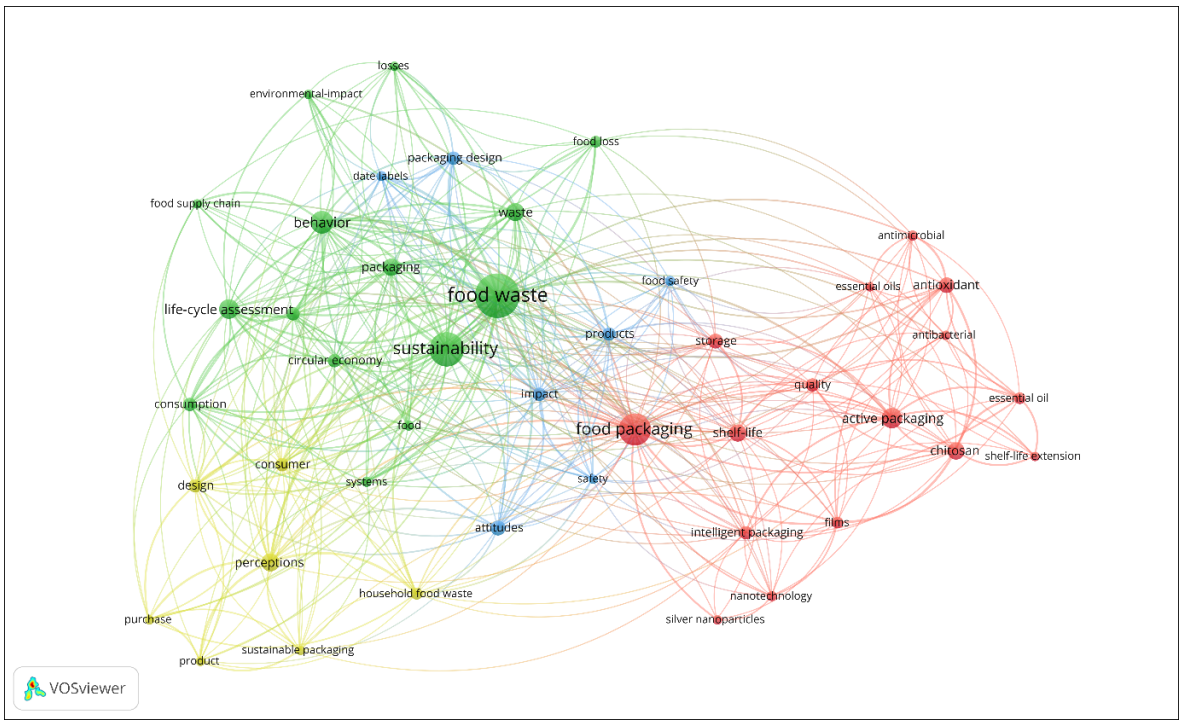


Figure 5. Co-occurrence network of all keywords (This chart was generated from VOSviewer)

Cluster 3 (Blue) contains studies on food safety, packaging design and consumer attitudes. Keywords such as “food safety”, “date labels”, “packaging design”, “attitudes” and “safety” suggest that consumer understanding of packaging information and safety-related communication is important for reducing food waste. This cluster also highlights the importance of packaging design and labelling in influencing consumer behaviour and purchasing decisions.

Cluster 4 (Yellow) represents consumer-related themes. Keywords: “consumer”, “perceptions”, “purchase”, “household food waste”, “design”, “product” and “sustainable packaging”. This cluster reveals that consumer perception and buying behaviour are the main themes in the literature. The link between “sustainable packaging” and “household food waste” indicates a growing academic focus on how packaging design and consumer awareness can influence the reduction of waste in households.

3.9. International Collaboration Among Countries

Fig. 6 presents the collaborative network between countries in the field on research of consumer perception, food waste and food packaging. The world map shows strong research collaboration across continents. Countries with darker shades on the map are more productive in terms of research output in the area of study. The connecting lines between countries indicate collaborative relations among the researchers, and the thickness of the lines indicates the intensity and frequency of the collaboration. The results indicate that international research collaborations are important for the knowledge development in the fields of food waste reduction, food packaging and consumer behaviour.

Table 8 shows collaboration among countries. The most frequent collaboration was between China and the USA with collaboration frequency of 4. Italy and Tunisia and Portugal and Spain had strong collaboration links (frequency 3 each). Moderate strength of collaboration was also found for several countries, including Australia-Sweden, Austria-Greece, China-Korea, India-France, India-Italy, Italy-France and Portugal-France. India demonstrated the cooperation with many countries such as Malaysia, Portugal, Spain, Germany, Canada and Saudi Arabia, which shows the rising international research connectivity of India in this domain.

Table 8. Top 10 countries with most global collaborations

From	To	Frequency
CHINA	USA	4
ITALY	TUNISIA	3
PORTUGAL	SPAIN	3
AUSTRALIA	SWEDEN	2
AUSTRIA	GREECE	2
CHINA	KOREA	2
FRANCE	TUNISIA	2
INDIA	FRANCE	2
INDIA	ITALY	2
INDIA	MALAYSIA	2

The collaboration network also shows the active participation of European countries such as Italy, Portugal, France, Spain, Austria, Greece and Poland which established close collaborative relationships with several regions. Asian countries such as China, India, Korea, Malaysia and Indonesia also showed strong international partnerships. Partnerships with countries including Tunisia, Morocco, Kenya, Tanzania and Uganda further indicate the increasing global interest in research on sustainable food systems and food packaging.

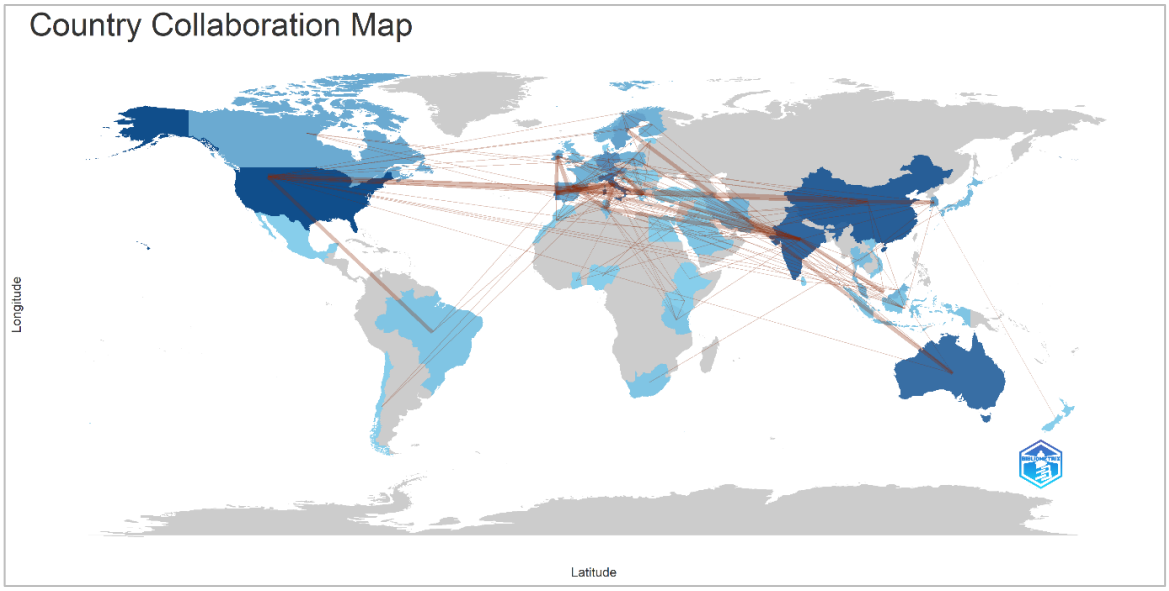


Figure 6. Country collaboration map (This map was generated from Biblioshiny)

3.10. Thematic Map

The thematic map of the research field based on keyword centrality and density is presented in Fig. 7. Thematic mapping is a useful tool to identify the importance and the level of development of the different research themes in the studies of consumer perception, food waste and food packaging. The upper right quadrant shows motor themes that are very well developed and are strongly linked to the overall research area. The important driving that emerged in this quadrant are "packaging design", "consumer perceptions", "recycling", "biopolymer", "migration" and "mechanical properties". These themes reflect a growing academic interest in recycling practices and consumer-oriented packaging innovation. The themes "packaging" and "life cycle assessment" also had high centrality, indicating the important role of these themes in sustainability and environmental evaluation research.

In the lower-right quadrant, we see basic themes that are the conceptual basis of the research field. The major themes identified in this quadrant are "food waste", "food packaging", "active packaging", "intelligent packaging", "smart packaging", "food safety" and "antimicrobial". These themes suggest the growing importance of packaging technologies and food safety solutions to reduce food waste and improve product shelf-life.

The niche themes are located in the upper-left quadrant, specialised and well-developed, but relatively isolated from the broader field. This part contained topics such as "biopolymers", "proteins", "self-cleaning", "superhydrophobic", "biodegradable packaging" and "packaging waste". These themes are mainly focused on advanced packaging materials and innovative sustainable technologies.

The emerging or declining themes are in the lower-left quadrant with "artificial intelligence", "nanotechnology", "shelf-life", "time-temperature indicator" and "response surface methodology". These themes may represent either emerging research directions or those that currently receive relatively less research attention.

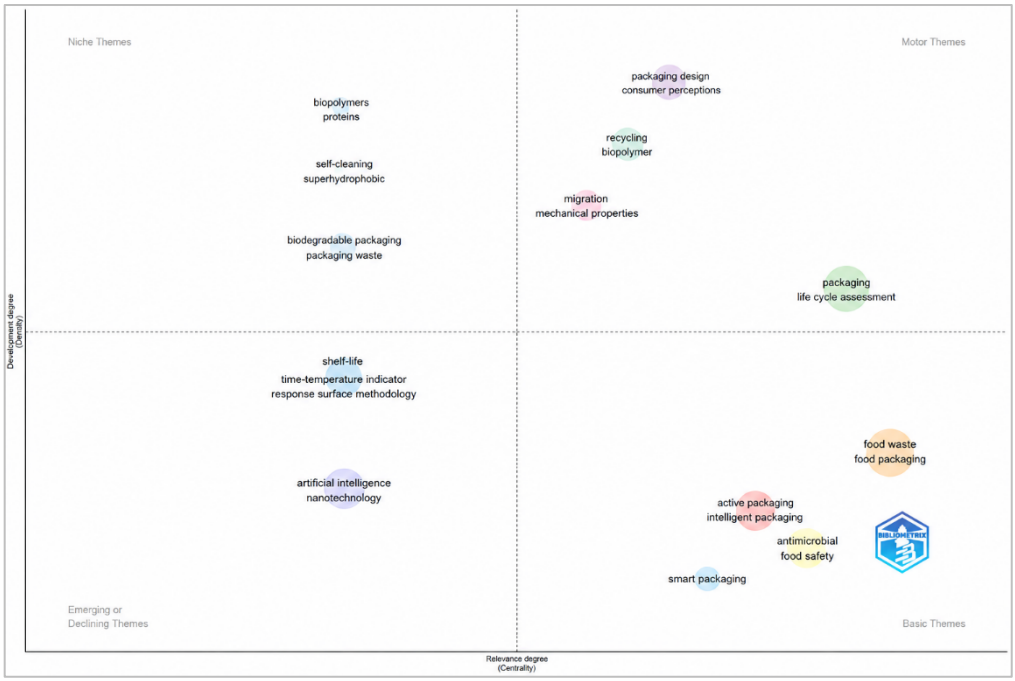


Figure 7. Thematic map (This chart was generated from Biblioshiny)

The thematic map suggests that research in this field is mainly on packaging design, food waste reduction, consumer perception and advanced food packaging technologies. The distribution of motor, basic, niche and emerging themes shows the diversity and dynamism of the field, its multidisciplinary nature and its constant evolution. The results also highlighted the growing research interest in sustainable materials, intelligent packaging systems and consumer-oriented solutions for improving food safety and reducing food waste.

4. Conclusion

The present bibliometric study aimed to explore the research landscape of consumer perception, food waste and food packaging based on publications indexed in the WoS database over the period 2016-2026. The results showed an impressive increase in scientific production, particularly after 2020, with an increasing academic and industrial interest in sustainable consumption, packaging innovation and food waste reduction. The analysis recognised the leading journals, influential authors, highly cited documents, productive countries and major collaborative networks that have contributed to the development of these research fields. Further analysis of keyword co-occurrence and themes revealed that the field is multidisciplinary, integrating consumer behaviour, food safety, circular economy, intelligent packaging and waste management research.

The study also revealed that food waste, packaging design, consumer perception, active packaging and food safety have emerged as major research areas. Meanwhile, emerging topics such as smart packaging, nanotechnology, artificial intelligence and biodegradable materials are attracting increasing attention. In the international collaboration network, a strong partnership was observed between countries such as China, the USA, India, Italy, Portugal and Australia, which reflects the global relevance of reducing food waste and improving sustainable packaging practices. Overall, the bibliometric evidence indicates increasing research attention to consumer-related packaging, food waste management and sustainability-oriented themes.

However, these patterns should not be interpreted as direct evidence of changes in consumer behaviour or environmental outcomes.

The findings provide useful insights for policymakers, packaging manufacturers, food companies, retailers and marketers from a managerial and practical perspective. The prominence of sustainable packaging, packaging design, recyclability, food safety, shelf life and food waste-related themes indicates areas of increasing scholarly attention. These findings may assist stakeholders in identifying research-informed areas for consideration in packaging development and sustainability initiatives.

However, there are limitations in the study despite its contributions. The first limitation is associated with the data source, as the analysis only considered retrieved records from the WoS database. Relevant scholarly contributions may have been missed due to the exclusion of publications from databases such as Scopus, PubMed and Google Scholar. A second limitation concerns the time span of the dataset. The 2026 data collection was finalised in May 2026, so the publication and citation indicators for 2026 are a partial record only and may differ from the final annual results at the end of the year. Future studies could consider multiple databases for more comprehensive coverage and comparative bibliometric analysis across different indexing platforms. Further research may also focus on emerging themes such as smart packaging, artificial intelligence, sustainable consumer behaviour, biodegradable materials and circular packaging systems to better understand future developments in food waste and packaging research.

Multidisciplinary Domains

This research covers the domains: (a) Consumer Behaviour, (b) Food Waste and (c) Food Packaging

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

Declaration on AI Usage

The authors declare that the manuscript has been prepared without the use of AI tools.

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