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Plastic Consumption In The Digital Era: A Bibliometric Analysis Based On Author And Index Keywords

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ABSTRACT

Although plastic is widely used for its affordability and durability, excessive consumption and improper disposal pose serious environmental risks. Digital technologies and ICT offer potential solutions, but bibliometric studies examining plastic consumption through digital innovation remain scarce. Subsequently, this study employs bibliometric analysis to examine publication trends on digital-age plastic consumption in Social Sciences, Economics, and Business fields, highlighting integrated research themes through analysis of author and index keywords. The findings suggest that the growth in published documents and citations highlights the increasing academic recognition of research on plastic consumption in the digital era. Moreover, Blanco I., Schettini E., and Vox G. emerge as key contributors. The leading publishing outlets and most frequently cited sources are Sustainability (Switzerland), Resources, Conservation and Recycling, and the Journal of Cleaner Production. The integrated research themes derived from the author and index keywords indicate that research on plastic consumption starts with a foundational basis, progresses through tools and strategies, and culminates in outcomes and challenges. The findings suggest that policies on plastic consumption in the digital era should establish a solid knowledge foundation, utilise digital tools for sustainable strategies, and implement regulations that align digital transformation with environmental objectives.

1.0 INTRODUCTION

Plastic has become an essential material in modern life due to its durability, versatility, and low cost. Its production and consumption have increased substantially across various sectors, ranging from

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medical instruments to construction materials and consumer packaging. However, the convenience of plastic usage has contributed to significant environmental degradation. Due to its widespread use and ineffective disposal methods, plastic has created a critical global environmental crisis, threatening ecosystems, wildlife, and public health. Research shows that global plastic production has risen from 2 million tonnes in 1950 to about 448 million tonnes by 2015 (Ritchie et al., 2023). Projections suggest that global plastic consumption may increase by approximately 90%, from 464 million tonnes in 2020 to an estimated 884 million tonnes by 2050 (Dokl et al., 2024).

This growth in production correlates with a significant increase in plastic waste generation, which has risen more than sevenfold in recent decades, reaching 360 million metric tonnes per year (Statista Research Department, 2025). A substantial portion of this waste, especially from short-lived products such as packaging and single-use plastics, contributes heavily to the problem, with packaging accounting for 40% of global plastic production (Dokl et al., 2024). For instance, an estimated 11 million metric tonnes of plastic waste end up in the ocean (de Sousa, 2024), contributing to the accumulation of approximately 170 trillion microplastics in global ocean systems (Eriksen et al., 2023). Alarming, around 91% of all plastic ever manufactured has not been recycled (OECD, 2022), highlighting a critical failure in waste management.

The challenges of plastic waste management necessitate innovative information and communications technology (ICT) solutions that extend beyond current practices. The digital era provides opportunities to optimise waste management systems and mitigate environmental degradation. Digital platforms and technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), and data analytics can revolutionise waste management through smart bins and dynamic routing, reducing costs and emissions (Martikkala et al., 2023; de Morais et al., 2024). These platforms also facilitate waste marketplaces, transforming waste into valuable resources by connecting various agencies (Ciulli et al., 2020; Srivisut & Kongjaroensuk, 2024) and enhancing transparency through blockchain (Bułkowska et al., 2024; Sahoo et al., 2021), paving the way for a more sustainable and circular future (Vavryshchuk, 2025).

Addressing plastic waste management challenges and developing ICT-driven solutions requires a multidisciplinary research approach. Moreover, extensive research across environmental science, engineering, computer science, and the social sciences highlights the need for a systematic approach, such as bibliometric analysis, to examine current knowledge. Specifically, existing bibliometric studies have primarily focused on analyses of co-authorship, co-citation, keyword co-occurrence, and keyword distribution in consumer behaviour and sustainability (Hael et al., 2025; Naini & Reddy, 2025). Nevertheless, they provide limited insight into research trends connecting plastic consumption and the digital era. Building on this foundation, this study aims to examine publication trends on plastic consumption in the digital era across the fields of Social Sciences, Economics, and Business. This study further extends existing bibliometric analyses by identifying emerging research themes through keyword co-occurrence analysis based on both author and index keywords.

Furthermore, this study contributes theoretically by providing a comprehensive understanding of emerging research topics and integrated themes at the intersection of plastic use and the digital era. Rather than relying solely on author keywords to identify research hotspots, including index keywords helps reveal knowledge gaps, emerging trends, and potential pathways for future studies. These insights clarify the intellectual development of research on plastic consumption in the digital era.

2. LITERATURE REVIEW

The use of plastic products is now a major sustainability issue because of its wide incorporation in modern lifestyles and consumption systems. Although there is an increasing awareness of environmental problems, plastic products are still widely used worldwide, especially in developing countries, due to their convenience, low cost, and availability (Rabiu & Jaeger-Erben, 2024). Public

awareness of plastic pollution has significantly increased, but this awareness does not necessarily translate into behavioural change, which remains a major challenge for the move towards sustainable consumption (de Sousa, 2023). Together, these findings indicate that plastic consumption is shaped by social and structural factors as well as individual decisions.

In recent times, the behavioural determinants related to plastic reduction have been increasingly studied. Liang et al. (2026) found that consumers' intentions to reduce their consumption of plastic are influenced by their attitudes towards the environment, perceived behavioural control, and their view of social responsibility. Plastic use patterns also differ socio-economically and culturally across the region, further supporting the need for regional approaches to sustainable consumption, rather than a single approach or policy intervention (Liu et al., 2025). These findings underscore the importance of understanding consumer behaviour as a key component in plastic pollution mitigation efforts. The proliferation of digital technologies has created new dimensions to look at plastic consumption. Social media platforms have emerged as vital tools for environmental communication, providing users with opportunities to access information, share experiences, and participate in discussions about plastic pollution and sustainability. The evolution of the online discourse shows that the public is more interested in recycling, waste reduction, environmental responsibility, and collective action, indicating that digital platforms are becoming more influential in shaping environmental awareness and public engagement (Teh et al., 2022).

In addition to raising awareness, digital platforms can shape behavioural intentions and consumer decisions. Social media messages that are perceived as relevant, credible, and beneficial can motivate plastic reduction behaviour (Rapada et al., 2021). This highlights a shift in the role of digital technology, from sharing information towards influencing sustainable consumption behaviour. Similarly, social media has opened new possibilities for public involvement in policy discussions on plastic pollution and waste management, as well as advocacy, public mobilisation, and stakeholder engagement in sustainability initiatives (Vince & Hardesty, 2022). However, most studies examine communication outcomes and responses, with limited studies exploring the role of digitilisation in advancing plastic consumption research.

Using bibliometric approaches, previous studies examined plastic waste research with an emphasis on different research scopes (Oyewale et al., 2023; Rinanda et al., 2023; Wang et al., 2022). A major similarity is that these studies explore scientific literature using bibliometric methods and mapping tools to identify research trends, influential topics, and knowledge development. Their findings focused on sustainable solutions, particularly the circular economy and advanced recycling technologies. These approaches focused on reducing waste generation, increasing recycling efficiency, and recovering valuable resources from plastic waste. Nevertheless, these studies differ in analytical focus. Rinanda et al. (2023) adopted the broadest scope by investigating 30 years of plastic waste management research. The study mainly addresses ecological impacts, including microplastic pollution and environmental contamination. Oyewale et al. (2023) focused on sustainable consumption models and the transition from a linear economy to a circular economy, introducing the concept of degrowth to reduce excessive resource consumption. Wang et al. (2022) provided a more specific analysis of the COVID-19 period, showing how increased use of single-use medical plastics affected research priorities worldwide. The studies also differed in database selection. While Rinanda et al. (2023) and Wang et al. (2022) used only Web of Science, Oyewale et al. (2023) combined Web of Science and Scopus. Overall, these studies provide a broader understanding of plastic waste management from environmental, economic, and global perspectives.

However, bibliometric analysis focusing specifically on plastic consumption and digital innovations remains limited. Although digital technologies are increasingly recognised as key drivers of sustainable transformation, limited studies have examined the influence of digital innovations on the growth of plastic consumption research over time. Therefore, a bibliometric analysis is necessary to identify emerging research themes, knowledge gaps, and future directions in plastic consumption studies in the digital era.

3. Methodology

The process of conducting bibliometric analysis is illustrated in Figure 1. In line with previous studies (Rahman et al., 2023; Secinaro et al., 2021; Zakaria et al., 2021), Scopus was selected as the primary database for data retrieval. This is because of its comprehensive coverage of peer-reviewed literature across multidisciplinary fields and its robust citation indexing capabilities. The data was collected on August 7, 2025.

Relevant keywords, synonyms, and related terms were identified through a review of previous literature and refined using Boolean operators and truncation. The search strategy comprised two main concept groups, namely: (1) terms related to plastic consumption, waste, and pollution; and (2) terms related to digital technology, education, and knowledge sharing. The final search string was applied to the title, abstract, and keyword (TITLE-ABS-KEY) fields to retrieve relevant publication records, as follows:

((("consumer plastic use" OR "disposable plastic*" OR "food plastic packaging" OR "household plastic consumption" OR "macroplastic*" OR "microplastic*" OR "packaging consumption" OR "packaging waste" OR "plastic contaminants" OR "plastic consumption" OR "plastic demand*" OR "plastic debris" OR "plastic dependenc*" OR "plastic disposal" OR "plastic fragments" OR "plastic leakage" OR "plastic litter" OR "plastic packaging" OR "plastic particle*" OR "plastic pollution" OR "plastic product*" OR "plastic-related product*" OR "plastic residue" OR "plastic trash" OR "plastic use*" OR "plastic utilisation*" OR "plastic waste" OR "single-use packaging" OR "single-use plastic*") AND ("digital awareness" OR "digital campaign*" OR "digital education" OR "digital education platform*" OR "digital learning" OR "digital learning app*" OR "digital learning platform*" OR "digital literacy" OR "digital platform*" OR "digital solution*" OR "e-learning" OR "e-learning platform*" OR "e-platform*" OR "information system*" OR "IoT" OR "knowledge management system*" OR "knowledge sharing" OR "mobile app*" OR "mobile learning" OR "online learning" OR "online learning platform*" OR "online platform*" OR "smart technology" OR "social media" OR "technology adoption" OR "technology-based education" OR "virtual learning" OR "web platform*" OR "web-based education"))).*

Subsequently, this yielded an initial total of 590 publication records. This study did not limit the search to a specific period or publication type. However, several filters were applied, including a language filter, which reduced the dataset to 582 publication records. The next filtering option applied was a subject area restriction, selecting records classified under Social Sciences (SOCI), Business, Management and Accounting (BUSI), or Economics, Econometrics, and Finance (ECON). This is because the study focuses on areas such as consumer behaviour, awareness, technology adoption, knowledge sharing, sustainability management, and policy-oriented interventions. In addition, studies primarily under Environmental Science, Engineering, and Computer Science were omitted because they predominantly address topics such as materials science, waste processing technologies, engineering solutions, algorithm development, or technical system design, which fall outside the intended scope of this study. This refinement resulted in a final dataset of 122 publication records. These three domains were chosen because they encompass the human, organisational, and economic aspects of plastic consumption in the digital era. Technological solutions alone cannot resolve these issues without considering societal behaviours, market forces, and business dynamics.

The bibliometric data downloaded from Scopus was then used for the bibliometric analysis. Bibliometric analysis evaluates the current state of a specific field by employing quantitative methods and statistical techniques to examine publication patterns over a period of time (Dereli et al., 2011). Similar to previous bibliometric studies (Belu & Marinoiu, 2025; Sharma et al., 2024), this study also employed a combination of VOSviewer and Biblioshiny for the analysis. VOSviewer is a free software application that runs in a Java environment and is used to create detailed networks from large data sets (Van Eck & Waltman, 2020). Biblioshiny is a web-based application integrated into the Bibliometrix R package (Aria

& Cuccurullo, 2017) that facilitates bibliometric and visual analyses. Together, these tools enabled the identification of key publication patterns, influential authors, sources, countries, and research themes within the final dataset of 122 records.

The bibliometric analysis is divided into three main sections: descriptive analysis, citation and performance analysis, and keyword co-occurrence analysis. The descriptive analysis examined document types and publication trends. The citation and performance analyses identified the most-cited papers, leading authors in both publishing and citations, as well as influential sources and contributing countries.

Finally, a keyword co-occurrence analysis was conducted to identify key research themes and trends. The keywords obtained from Scopus can be categorised into two types: author keywords and index keywords. Author keywords are supplied directly by the authors to represent the core content of their work, while index keywords are assigned by Scopus according to controlled vocabularies and indexing standards to improve searchability. Using both author and index keywords enables a thorough exploration of integrated research hotspots at the intersection of plastic use and the digital era, facilitating the identification of thematic patterns and emerging trends in the literature.

Figure 1. Bibliometric analysis process

4. Results and Discussion

4.1 Descriptive Analysis

a) Document Types

The Scopus publications include a total of 122 documents, primarily consisting of finalised publications (121), with one article currently in the Articles in Press (AIP) stage. The documents comprised of 77 articles, 26 conference papers, 12 book chapters, 3 reviews, 2 conference reviews, 1 book, and 1 editorial.

b) Publication Trends

Figure 2 illustrates the distribution of publications, revealing an upward trajectory in research output. Before 2010, scholarly contributions in the research area were minimal, as there were only six documents published. Publication activity remained limited from 2010 to 2014, with only two recorded publications. A noticeable shift in publication trends occurred within a five-year interval from 2015 to 2019, with 11 publications. The increase in number indicates an emerging trend of research on plastic consumption.

From 2020 onwards, publications on plastic consumption show a significant upward trend, rising from 5 papers in 2020 to a peak of 24 papers in 2024, accompanied by a rise in citations from 143 in 2022 to 352 in 2024. This growth reflects rising global attention towards plastic-related sustainability challenges, driven by environmental awareness, policy initiatives, concerns over plastic waste, and emerging digital approaches for promoting awareness, education, and behavioural change related to plastic reduction.

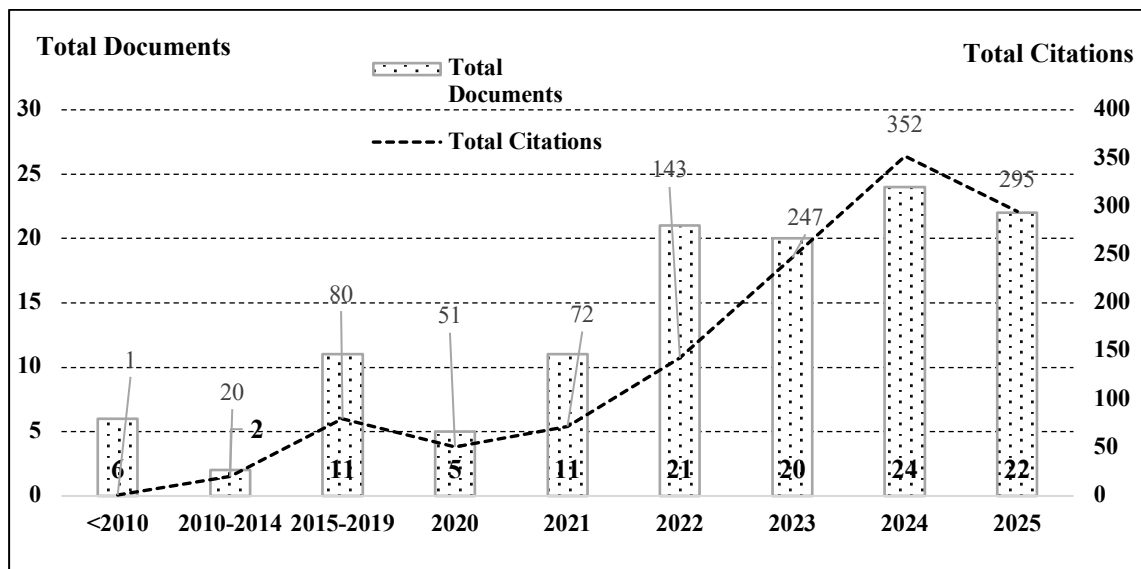


Figure 2. Publication Trends

4.2 Citation and Performance Analysis

a) Top-Cited Papers

Table 1 presents the top 10 papers published between 2017 and 2023 that cover various approaches including technological innovation, policy development, and behavioural influence. Blanco et al. (2018) and Struk (2017) received the highest number of total citations. In contrast, Oyinlola et al. (2022) have the highest citations per year. Technological solutions are a key focus area. These include IoT-based monitoring systems (Memon et al., 2019), GIS mapping (Blanco et al., 2018), blockchain for governance (Steenmans et al., 2021), and Industry 4.0 applications (Kazancoglu et al., 2021). The studies concentrate on improving waste tracking, efficiency, and governance. In addition to technology, research on the role of social media and consumer behaviour shows a growing interest in using communication strategies to boost public engagement in recycling and waste reduction efforts (Baek et al., 2022; De Fano et al., 2022). Policy-driven research, such as Indonesia's targets for reducing marine plastic, highlights the importance of government commitment in tackling environmental issues (Arifin et al., 2023). In sum, these top-cited papers indicate a shift from isolated waste management approaches towards more integrated frameworks, highlighting the convergence of digital innovation, governance, and circular economy thinking.

b) *Major Publishing and Citation-Leading Authors, Sources, and Nations*

Table 2 presents the productivity, h-index, and citation records of the top 10 contributing authors. Blanco I., Schettini E., and Vox G. dominate the field of plastic consumption, each having published three papers, achieved an h-index of 2, and accumulated 109 citations. They are the most productive and most cited authors. Loisi R.V. follows closely, with a slightly lower publication count but nearly the same citation impact at 108, showing strong influence despite having fewer works. Authors such as Praet E., Schofield J., and Vince J. hold an h-index of 2 with 40 citations each, suggesting steady but moderate influence. Abolfathi S. stands out with 53 citations from just one publication, indicating an exceptionally high impact per paper.

Table 1. Top Cited Papers

Rank	Author(s)	Paper title	Source title	TC	TC per Year
1	(Struk, 2017)	Distance and incentives matter: The separation of recyclable municipal waste	Resources Conservation and Recycling	107	11.89
2	(Blanco et al., 2018)	Agricultural plastic waste mapping using GIS. A case study in Italy	Resources Conservation and Recycling	95	11.88
3	(Kazancoglu et al., 2021)	Industry 4.0 impacts on responsible environmental and societal management in the family business	Technological Forecasting and Social Change	59	11.8
4	(Memon et al., 2019)	IoT based smart garbage monitoring collection system using WeMos Ultrasonic sensors	2019 2nd International Conference on Computing Mathematics and Engineering Technologies (ICOMET 2019)	55	7.86
5	(Oyinlola et al., 2022)	Digital innovations for transitioning to circular plastic value chains in Africa	Africa Journal of Management	53	13.25
6	(De Fano et al., 2022)	Empowering plastic recycling: Empirical investigation on the influence of social media on consumer behaviour	Resources Conservation and Recycling	47	11.75
7	(Steenmans et al., 2021)	Blockchain technology for governance of plastic waste management: Where are we?	Social Sciences	45	9
8	(Baek et al., 2022)	Emojis and assertive environmental messages in social media campaigns	Internet Research	35	8.75
9	(Ali et al., 2022)	Reducing plastic pollutants through catalysing consumer roles: A novel application of fuzzy total interpretive structural	Journal of Cleaner Production	33	8.25

10	(Arifin et al., 2023)	modeling Indonesian policy and researches toward 70% reduction of marine plastic pollution by 2025	Marine Policy	31	10.33
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Notes: TC – total citations

Source: VOSviewer and RStudio's Biblioshiny

Table 2

Top Prolific and Leading Authors

Rank	Top prolific author	Documents	Rank	Top leading author	h_index	Citations
1	Blanco, I.	3	1	Blanco, I.	2	109
2	Schettini, E.	3	2	Schettini, E.	2	109
3	Vox, G.	3	3	Vox, G.	2	109
4	Abidin, Z.	2	4	Loisi, R.V.	2	108
5	Borg, K.	2	5	Praet, E.	2	40
6	Briandana, R.	2	6	Schofield, J.	2	40
7	Curtis, J.	2	7	Vince, J.	2	40
8	Gunasekara, K.	2	8	Li, Z.	2	25
9	Li, J.	2	9	Wang, Y.	2	13
10	Li, Z.	2	10	Abolfathi, S.	1	53

Source: RStudio's Biblioshiny

Table 3 outlines the top publishing and cited sources. The most active publishing source was Sustainability (Switzerland) with 13 documents. It also ranked second in citations with 146. Resources, Conservation and Recycling closely followed with 9 documents but led in impact with 322 citations, making it the top cited source overall. The Journal of Cleaner Production had 3 documents and ranked third in citations with 68. Several sources produced 2 documents each, including the 2023 2nd International Conference on Smart Technologies for Smart Nation (SmartTechCon 2023), Environmental Impact Assessment Review, and the Proceedings of the 15th International Conference on Strategic Management and Its Support by Information Systems (SMSIS 2023). However, not all of these ranked highly in citations. Notably, Technological Forecasting and Social Change had one document with 59 citations, ranking fourth in citation impact. Similarly, ICOMET 2019 had one document with 55 citations, while the Africa Journal of Management and Social Sciences each had one document with 53 and 45 citations, respectively. Other sources, such as Internet Research (35 citations), Marine Policy (31 citations), and Antiquity (30 citations), also appeared in the citation rankings despite not being among the top publishers.

Overall, the inclusion of interdisciplinary journals such as Internet Research, Marine Policy, and Social Sciences among the most often cited sources reflects the growing breadth of plastic consumption research moving beyond environmental studies. These channels attract citations because of the interconnection of digital behaviours, governance, and marine pollution, which are at the core of the current global sustainability discussion.

Table 4 shows the top publishing and cited countries. The United Kingdom leads in both publication volume with 13 documents and citations with 226. Italy follows with 9 documents and 169 citations, while the United States has 11 documents and 149 citations. India and Indonesia each have high publication counts of 13, but their citations are lower at 107 and 83, respectively. This suggests that although some countries generate a high volume of work, others have a more significant impact with each publication.

Table 3. Top Publishing and Cited Sources

Rank	Top publishing sources	Documents
1	Sustainability (Switzerland)	13
2	Resources, Conservation and Recycling	9
3	Journal of Cleaner Production	3
4	2023 2nd International Conference on Smart Technologies for Smart Nation (SmartTechCon 2023)	2
5	Environmental Impact Assessment Review	2
6	Proceedings of the 15th International Conference on Strategic Management and its Support by Information Systems (SMSIS 2023)	2
7	Technological Forecasting and Social Change	1
8	2019 2nd International Conference on Computing, Mathematics and Engineering Technologies (ICOMET 2019)	1
9	Africa Journal of Management	1
10	Social Sciences	1
Rank	Top cited sources	Citations
1	Resources, Conservation and Recycling	322
2	Sustainability (Switzerland)	146
3	Journal Of Cleaner Production	68
4	Technological Forecasting and Social Change	59
5	2019 2nd International Conference on Computing, Mathematics and Engineering Technologies (ICOMET 2019)	55
6	Africa Journal of Management	53
7	Social Sciences	45
8	Internet Research	35
9	Marine Policy	31
10	Antiquity	30

Source: VOSviewer

Table 4. Top Publishing and Cited Countries

Rank	Top publishing countries	Documents	Rank	Top cited countries	Citations
1	United Kingdom	13	1	United Kingdom	226
2	India	13	2	Italy	169
3	Indonesia	13	3	United States	149
4	United States	11	4	India	107
5	Italy	9	5	Czech Republic	107
6	China	8	6	France	87
7	Australia	7	7	Turkey	87
8	Germany	7	8	Indonesia	83
9	Thailand	6	9	Nigeria	74
10	France	4	10	Belgium	58

Source: VOSviewer

4.3 Keyword Co-Occurrence Analysis

a) Research Themes Identified through Author Keywords

Figure 3 presents a visualisation map of keyword co-occurrence based on author keywords, featuring nine research clusters, each represented by a different colour. Cluster 1, depicted in red, is the

largest and includes eight items such as circular economy, plastic, plastic waste management, and Industry 4.0, which are clearly associated with the theme “Circular Economy and Technological Innovation for Plastic Waste Management”. Cluster 2 (green) relates to “Environmental Communication and Regional Approaches to Climate and Plastic Challenges”, with keywords of plastic waste, environmental communication, and Indonesia.

Cluster 3 (dark blue, six items) and Cluster 4 (yellow, five items) correspond to “Social Media Analytics and Consumer Behaviour in Sustainability” and “Social Media Influence and Behavioural Drivers in Environmental Sustainability” respectively. The author keywords for Cluster 3 are sentiment analysis, sustainable consumption, and social media influence, whereas those for Cluster 4 include social media, content analysis, and consumer behaviour.

Cluster 5 (purple, five items) is linked to the research theme of “Environmental Pollution, Resource Management, and Sustainability Goals”, while Cluster 7 (orange, four items) pertains to the domain of “Marine and Plastic Pollution in the Context of Global Crises.” Both clusters address issues related to plastic pollution, awareness, engagement, marine litter, and the impact of COVID-19.

Cluster 6 (light blue, five items) focuses on “Spatial Analysis and Case-Based Approaches to Environmental Solutions”, emphasising waste management, GIS, and packaging waste. This cluster demonstrates that GIS and practical case studies are employed to tackle challenges in managing packaging waste, in alignment with sustainable development goals and resource efficiency.

Lastly, Cluster 8 (brown, four items) represents the “Technological Innovations for Environmental Monitoring and Waste Management” theme, focusing on IoT, ultrasonic sensors, and RFID that explores the integration of smart technologies and community-driven data collection for monitoring environmental challenges. Cluster 9 (pink, three items) reflects sustainability, environment, and e-commerce, examining the relationship between digital commerce and sustainability, focusing on packaging waste, supply chain practices, and environmental impacts.

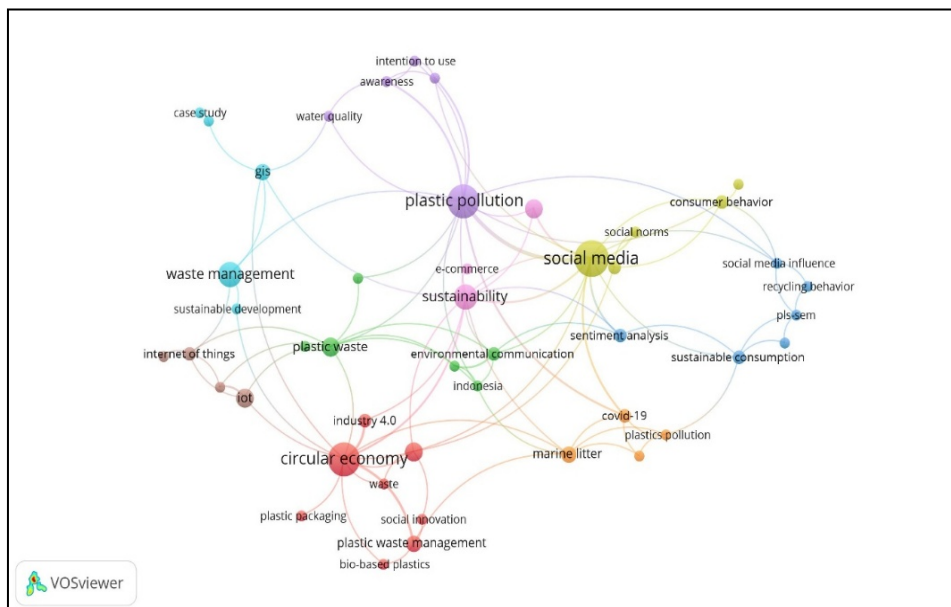


Figure 3 Author keyword co-occurrence network visualisation

Notes: Node = keyword; size of node = occurrence. Minimum number of occurrences of a keyword is 2. There are 46 keywords and 9 clusters that meet this threshold.

b) Research Themes Identified through Index Keywords

Figure 4 displays a visualisation map of keyword co-occurrence based on index keywords, highlighting five distinct research clusters. Cluster 1 (red) highlights “Marine and Plastic Pollution Challenges in the Digital and Educational Context”. It connects keywords such as elastomers, plastic products, microplastics, social networking (online), plastic pollution, marine pollution, and environmental issues. This indicates that digital platforms and education can play a significant role in raising awareness and promoting solutions to plastic-related environmental challenges.

Cluster 2 (green) focuses on “Waste Management Strategies and Geospatial Decision-Making”. It highlights the use of GIS and remote sensing to enhance decision-making in waste disposal and recycling. The index keywords include plastic waste, waste management, recycling, article, and plastic.

In contrast, Cluster 3 (dark blue) centres on “Social Media, Sustainability, and Stakeholder Perceptions”, with index keywords of social media, sustainability, technology adoption, and consumption behaviour. It examines the interplay between technology adoption, stakeholder perceptions, and human consumption behaviour in shaping sustainable practices. The cluster emphasises the critical role of communication and perception in achieving sustainability goals.

Cluster 4 (yellow) emphasises the theme of “Circular Economy and Information Systems for Sustainable Development”. It connects the issues of plastic recycling and packaging waste to climate change, highlighting the critical role of information systems in promoting sustainable practices. This cluster suggests that utilising information-driven approaches to manage plastic waste is essential for tackling sustainability and climate challenges.

Lastly, Cluster 5 (purple) focuses on “Technological Innovations for Reducing Environmental Impact”. It showcases how the Internet of Things (IoT) can be leveraged to monitor pollution, evaluate environmental impacts, and foster innovative solutions for sustainable waste management.

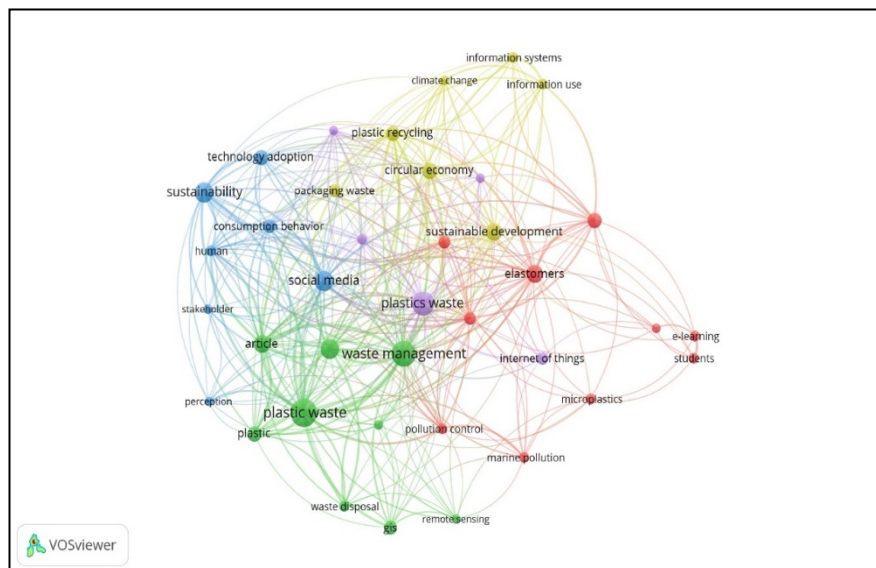


Figure 4 Index keyword co-occurrence network visualisation

Notes: Node = keyword; size of node= occurrence. Minimum number of occurrences of a keyword is 4. There are 38 keywords and 5 clusters that meet this threshold.

4.4 Integrated Research Themes Derived from Author and Index Keywords

Figure 5 presents the integrated research themes derived from author and index keywords. These themes are organised into a hierarchical structure based on patterns observed in the keyword co-occurrence analysis, reflecting the progression from foundational concepts to enabling mechanisms and resulting outcomes. These themes can be categorised into three levels: foundational basis, tools and strategies, and outcomes and challenges. The foundational basis theme is “Circular Economy & Waste Management” which includes “Circular Economy and Technological Innovation for Plastic Waste Management” and “Information Systems for Sustainable Development”. This indicates an important research theme on the use of circular economy principles and technologies for plastic waste management and achieving sustainability.

The tools and strategies level defines the approaches and methods used in the field of plastic consumption in the digital era. Focal themes are “Technological Solutions and Smart Monitoring”, which centre on innovations in the monitoring and management of the environment, waste, and the mitigation of environmental impact. “Environmental Communication and Regional Policy” deals with the communication and addressing of climate and plastic challenges at the regional level. Another important area is “Social Media and Consumer Sustainability Behaviour”, which analyses the impact, influence, and the drivers of social media in promoting sustainable behaviour and the perceptions of the stakeholders. Finally, “Spatial and Case-Based Environmental Solutions” focuses on the application of spatial analysis and selected case studies in the formulation of waste management strategies and geospatial decision-making.

Lastly, the outcomes and challenges addresses the consequences and the persistent difficulties within the scope of research. This includes “Pollution and the Global Crisis”, focusing on the severe issue of environmental pollution, resource management, and achieving sustainability objectives, with special emphasis on marine and plastic pollution in the context of global crises, as well as in digital and educational frameworks. Another notable theme is the exploration of “Sustainable Consumption in relation to E-Commerce”, analysing the shifting patterns of consumption and their alignment with sustainability within the framework of the digital economy. Overall, Figure 5 provides an illustrative summary of the research focus in the hierarchy, starting from basic principles to specialised tools and the wide-ranging societal consequences of plastic pollution.

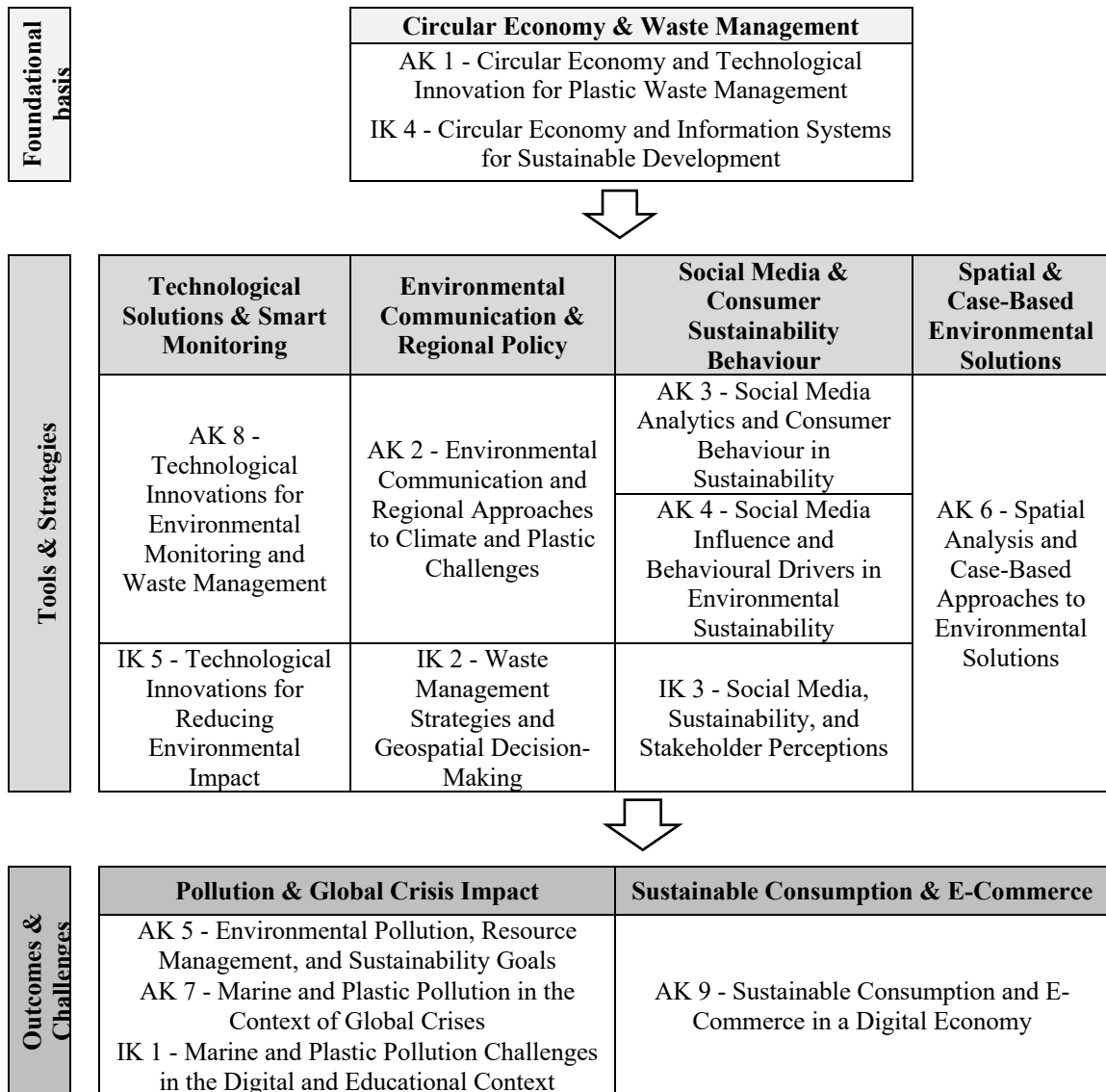


Figure 5. Integrated research themes based on author and index keywords

Notes: AK = Author keyword; IK = Index keyword.

5. Conclusion

Plastic consumption has continued to surge worldwide, while inadequate disposal practices have intensified a global environmental crisis with wide-ranging consequences for ecosystems and public health. Plastic. Addressing the challenges of plastic waste and ICT-driven innovations involves exploring a multidisciplinary research landscape. Bibliometric analysis provides a systematic method for mapping influential works, identifying research gaps, and tracing emerging trends. This study examines publication trends related to plastic consumption in the digital era, focusing on the fields of Social Sciences, Economics, and Business. It identifies key authors, publishers, sources, and contributing countries in this area. Moreover, by examining author and index keywords, the study uncovers integrated research themes and highlights the evolving scholarly focus across disciplines.

The findings show that scholarly attention to plastic consumption in the digital era is maturing, evidenced by the steady rise in both publications and citations. Blanco I., Schettini E., and Vox G. are prominent contributors to research on plastic consumption, irrespective of production volume, h-index, or citation count. The top publishing and most frequently cited sources are Sustainability (Switzerland), Resources, Conservation and Recycling, and the Journal of Cleaner Production. The United Kingdom leads in both publication output and citation impact.

The findings further reveal nine research clusters identified through author keywords. Cluster 1 focuses on “Circular Economy and Technological Innovation for Plastic Waste Management”, while Cluster 2 emphasises “Environmental Communication and Regional Approaches to Climate and Plastic Challenges”. Clusters 3 and 4 center on “Social Media Analytics and Consumer Behaviour in Sustainability” and “Social Media Influence and Behavioural Drivers in Environmental Sustainability”. Other key themes include “Environmental Pollution and Sustainability Goals” in Cluster 5, “Marine and Plastic Pollution in Global Crises” in Cluster 7, and “Spatial and Case-Based Environmental Solutions” in Cluster 6. Lastly, Clusters 8 and 9 investigate “Technological Innovations for Environmental Monitoring” and “E-commerce, Sustainability, and Packaging Waste”.

In addition, five research clusters based on index keywords have been identified. Cluster 1 highlights “Marine and Plastic Pollution Challenges in the Digital and Educational Context”, linking microplastics, pollution, and online platforms. Cluster 2 focuses on “Waste Management Strategies and Geospatial Decision-Making”, emphasising GIS and recycling. Cluster 3 explores “Social Media, Sustainability, and Stakeholder Perceptions”, examining technology adoption and consumption behaviour. Cluster 4 emphasises “Circular Economy and Information Systems for Sustainable Development”, connecting recycling, packaging waste, and climate change. Finally, Cluster 5 showcases “Technological Innovations for Reducing Environmental Impact” highlighting IoT applications in pollution monitoring and waste management.

Lastly, the integrated research themes identified through author and index keywords reveal that plastic consumption in the digital era evolves across three thematic levels: foundational basis, tools and strategies, and outcomes and challenges. Government agencies and regulatory bodies should first strengthen the foundational level by promoting awareness, transparency, and sustainable consumption practices. At the tools and strategies level, investing in digital technologies such as IoT, AI, and data analytics can optimise waste management and support circular economy models. To effectively address outcomes and challenges, it is essential to implement coordinated international policies that mitigate environmental impacts, regulate digital consumption, and promote innovation. Integrating these research themes ensures that strategic initiatives align digital transformation with sustainable plastic consumption.

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Authors Contributions

Che Faridah Che Mahmood: Contributed to the Introduction and Conclusion.

Nor Zubaidah Nor Albashri: Contributed to the Literature Review.

Mazlina Ismail: Contributed to the Results and Discussion.

Nur Adilah Saud: Contributed to the Results and Discussion.

Suhaili Mohd Yusof: Contributed to part of the Results and Discussion, and performed proofreading and language editing.

Yan-Ling Tan: Contributed to the initial manuscript drafting and revision, methodology, data collection, and data analysis.

Conflict of Interest

There is no conflict of interest associated with this publication.

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