





Review

Green Packaging from Consumer and Business Perspectives

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Abstract: Sustainable development is a global objective that aims to address the societal challenge of climate action, the environment, resource efficiency, and raw materials. In this sense, an important strategy is the promotion of green packaging, that is, the use of sustainable materials and designs for the packaging of goods. In recent years, many research works have been published in the specialised area covering the different perspectives and dimensions of green packaging. However, to our knowledge, no previous investigations have analysed the research activity on green packaging from business and consumer perspectives. The present study intends to fill this gap by analysing all of the publications found in the Scopus database with the help of visual analytic tools, including word clouds and Gephi network visualization software. More specifically, our study analyses the impact of green packaging from business and consumer viewpoints, including some specific issues such as the design and materials used in green packaging, green packaging costs, marketing strategies and corporate social responsibility related to green packaging, and the impact of green packaging in waste management, the circular economy, logistics, and supply chain management. The results obtained reveal the growing interest of scholars and researchers in all of these dimensions, as is made patently clear by the increasing number of journal publications in recent years. The practical implications of this study are significant, given the growing awareness among companies and consumers about the importance of the promotion of sustainable development through green packaging alternatives. More specifically, the results of this research could be very useful for all of those agents who are interested in learning about the main lines of research being developed in the field of green packaging.

Keywords: green packaging; sustainable packaging; eco-friendly packaging; consumer behaviour; business; waste management; circular economy; supply chain; green logistics; green marketing



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1. Introduction

In recent years, there was growing interest in worldwide environmental protection. In this sense, green packaging is an aspect of great importance in order to reduce the impact of waste and pollution, and to promote sustainable development [1]. Green packaging—also known as ‘eco-green packaging’, ‘eco-friendly packaging’, ‘sustainable packaging’ or ‘recyclable packaging’—uses ecological materials for packaging purposes, while always bearing in mind that products must be effective and safe for human health and the environment [2].

The research papers published on green packaging can be classified into two main groups, depending on whether they are approached from the consumer perspective [3] or from that of the company [4]. Let us keep in mind that consumers and regulations are two key forces that motivate companies to incorporate new strategies for green packaging. In fact, firms are encouraged to promote sustainable packaging not only by the increasing importance that consumers place on the environment, but also by new laws, regulations, taxation, and other actions promoted by governments to make packaging sustainable and environmentally friendly [3,5]. For example, the directives promoted in the European Union demand that member countries introduce legislative initiatives on packaging waste

management [6]. Another example is the Containers and Packaging Recycling Law of Japan [7], which establishes that municipalities should collect and store the containers and packaging separated from solid waste.

On the one hand, an important field of research is the study of the ways in which consumers demand the use of green packaging strategies to reduce the negative impact of packaging on the environment. Indeed, the role of consumers is very important in green packaging, as modern lifestyles often demand longer product shelf lives. This demand is a key driver of the increased usage of green packaging by companies, which are also forced to develop formal sustainability policies. The study of green packaging from the consumer perspective includes the analysis of consumer opinions about green packaging and their purchase decisions.

On the other hand, numerous publications analyse green packaging issues from the viewpoint of companies. They cover a wide range of dimensions, including the ways in which technological, organisational and human capabilities contribute to the implementation of eco-design innovation in packaging, and its benefits in terms of brand innovation and environmental protection [8]. Companies are working on new lines of products for ethical, renewable and sustainable packaging, which obviously requires investing in new filling lines in order to accommodate more environmentally-friendly, reusable, recyclable and sustainable packaging, or the establishment of a joint collaboration with packaging suppliers [9].

Sustainable packaging is a relatively new concept that has attracted much attention in recent years. Indeed, it is a key issue to be considered in order to fulfill the Sustainable Development Goals [10], with social and economic implications [11]. Different review papers have highlighted that most research on green packaging is devoted to the packaging's composition (scientific aspects) and the packaging's manufacture (technological aspects). Other investigations have analysed specific topics such as the impact of packaging in supply chain [12], circular economy [13], marketing [14], and consumer behaviour [15]. However, to our knowledge, a literature review on green packaging covering different business and consumer dimensions has not been carried out. The aim of this study is to fill this knowledge gap by answering the following research question: 'Is green packaging attracting the interest of researchers interested in consumer behaviour and business strategies?' With this aim, we revised the publications related to green packaging that are included in Scopus, the largest abstract and citation database of research literature [16]. The review incorporates the use of network visualisation tools and word clouds in order to identify the main trends in this research field.

The remainder of the paper is organized as follows: Section 2 describes the methodology used in the study, and the database used to retrieve and analyse the publications in this topic; Section 3 analyses the publications related to green packaging, and highlights the main research trends in this research field; Sections 4 and 5 analyse the research activity in green packaging from the consumer and business perspectives, respectively; Section 6 presents the findings and their implications, the limitations of the study, and future research directions.

2. Materials and Methods

Bibliometric citation analysis allows us to identify the key publications and authors, as well as the ways in which certain topics have evolved over time [17]. Bibliometrics helps us to explore, organise and analyse large amounts of historical data, allowing researchers to identify hidden patterns that may be useful in the decision-making process [18]. This requires the use of tools for the analysis of publication data, including author affiliations, citations from other publications, co-citations with other publications, and associated keywords, etc.

In this paper, a particular methodology was used to retrieve and analyse an important volume of publications related to green packaging, with the aid of visual analytics and clustering techniques. The Scopus database was considered in this study for two main

reasons: (i) Scopus is a reference database that contains more than 70 million records from 5000 publishers, and it includes the technical and social aspects of science [19], while other repositories—such as Web of Science (WoS) or ScienceDirect—contain a lower number of documents. In fact, ScienceDirect contains full text articles from journals and books, primarily published by Elsevier, while Scopus indexes metadata from thousands of publishers, including Elsevier. Scopus also retrieves a higher percentage of citations across all areas than WoS [20]. (ii) Scopus provides Application Programming Interfaces (API) that allow researchers to find articles, authors and institutions in Scopus using scripts. This is the reason why our research uses ResNetBot [21], a software tool that allows us to extract large amounts of information using scripts from the Scopus database API interface.

Most review papers found in the literature analyse a large number of publications using the search engines included in a given database, which often requires one to include one or several search terms. In our study, the publications analysed correspond to the documents indexed in the Scopus database that include “green packaging”, “eco-friendly packaging”, “sustainable packaging”, “biodegradable pack*”, “compostable pack*”, “recyclable pack*”, “bio-pack*”, or “environmentally pack*” in the title, abstract or keywords. The period of time covered in the study is from 1990 (when the first article meeting these criteria was published) to December 2020.

The information retrieved by ResNetBot was later processed using an online application for the creation of word clouds, and an advanced network visualisation software that includes clustering techniques. More specifically, it used Gephi [22], an open-source graph visualisation software that allows the creation of a detailed study of networks by means of algorithms and statistical tools, including clustering techniques used to detect community structures. It was noticed that some previous studies have shown that the keywords and their interconnection can be used to generate a thematic network [23].

It is also remarkable that the analysis of the information retrieved by ResNetBot using visual analytic tools has allowed us to identify some topics of interest. These topics are organized in Section 4 in two main groups: consumer and business perspectives, such that some representative publications are included in each group. In the case of the investigations that are closely related to business issues, they were analyzed from different dimensions, including the design and materials used in green packaging, green packaging costs, waste management and the circular economy, logistics and supply chain management, marketing strategies, and corporate social responsibility.

3. Research Activity in Green Packaging

This section analyses the research activity on green packaging; this is a considerable task, taking into account the large number of papers related to this topic. The scientific production of green packaging included in the title, abstract and keywords was retrieved and processed according to the proposed methodology. The data retrieved from Scopus shows that a total of 1620 documents were published from 1990 to December 2020. In reference to the publication format, most of the documents related to green packaging are journal articles (72.2%), followed by conference proceedings (15.4%), and finally books (12.4%). As can be observed, in Figure 1, that there is increasing interest in this topic, especially in the last four years.

By applying a filter by country/territory in Scopus, it is possible to observe that the scientific production related to green packaging is led by scholars and researchers from institutions of the following countries: China (221 documents including one or more Chinese authors), the United States of America (209 documents), India (119 documents), Brazil (115 documents), Italy (81 documents), the United Kingdom (62 documents), Spain (58 documents), Malaysia (53 documents), Canada (46 documents) and Germany (46 documents). Additionally, by applying a filter by affiliation, it can be observed that the ten universities or institutions with the largest number of researchers having published papers on green packaging are: Michigan State University (26 documents), Universidade Estadual de Londria (21 documents), University Sains Malaysia (20 documents), Universidade Fed-

eral do Rio Grande do Sul (16 documents), Ministry of Education China (15 documents), CNRS—Centre National de la Recherche Scientifique (13 documents), Empresa Brasileira de Pesquisa Agropecuária-Embrapa (13 documents), Consiglio Nazionale delle Ricerche (13 documents), University Putra Malaysia (13 documents), and VTT—Technical Research Centre of Finland (13 documents).

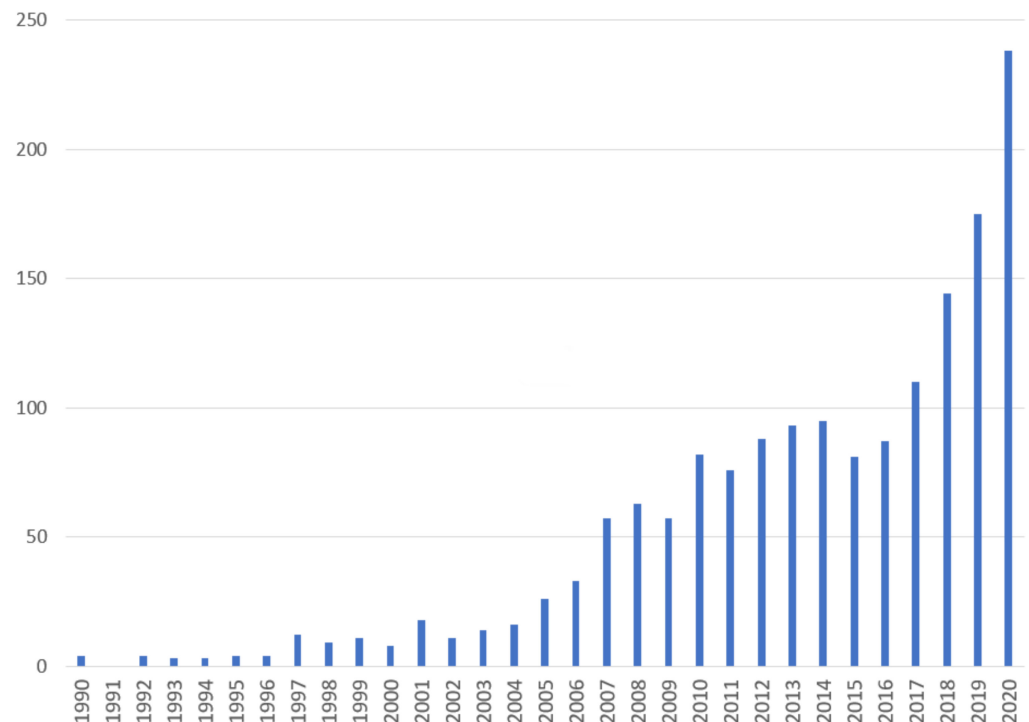


Figure 1. Number of documents per year related to green packaging retrieved from Scopus.

Figure 2 shows the network of publications related to green packaging indexed by Scopus from 1990 to December 2020. In this graph, the nodes represent publications, and the edges between two nodes evidence that one paper cites the other. The network structure is the result of the application of the ForceAtlas2 algorithm [24] included in Gephi. The network contains 1620 nodes (scientific publications) and 1292 edges (citations between scientific publications).

The inner part of this figure includes a group of connected publications, while the outer part is another group of publications that are not related to the inner documents. Following the conclusions obtained in previous studies, it can be determined that these documents on the outside may include some of the green-packaging-related terms in the title, abstract or keywords, but do not delve into this subject in the rest of the manuscript, which is why they do not cite papers from the inner part of the graph. Thus, henceforth, our analysis will focus exclusively on the connected section of the network.

Figure 3 shows the inner group of publications obtained by applying the ‘Giant component’ filter to the network of Figure 2. The colour of the nodes was established according to the type of document, wherein more than 82% correspond to journal papers (red colour), while papers published in books (blue) and conference proceedings (yellow) represent 13% and 5%, respectively. Bearing in mind that the size of each node depends on its degree—that is, the number of citations of one paper in others—it is clear that journal papers receive, on average, more citations than papers published in books or conference proceedings.

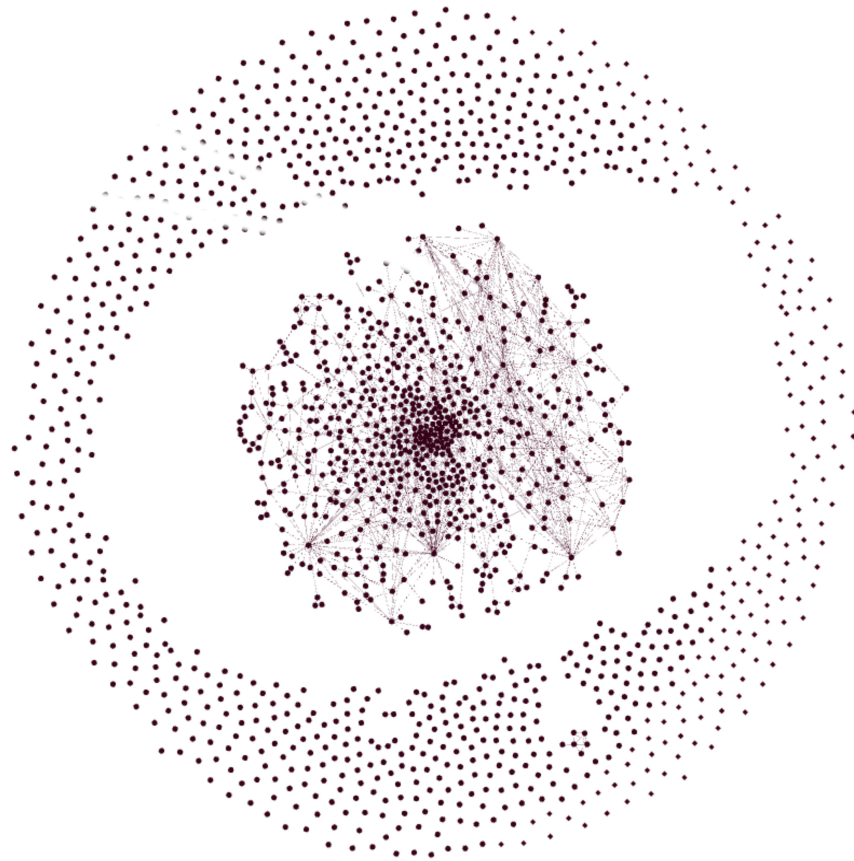


Figure 2. Network of publications related to green packaging in the Scopus database.

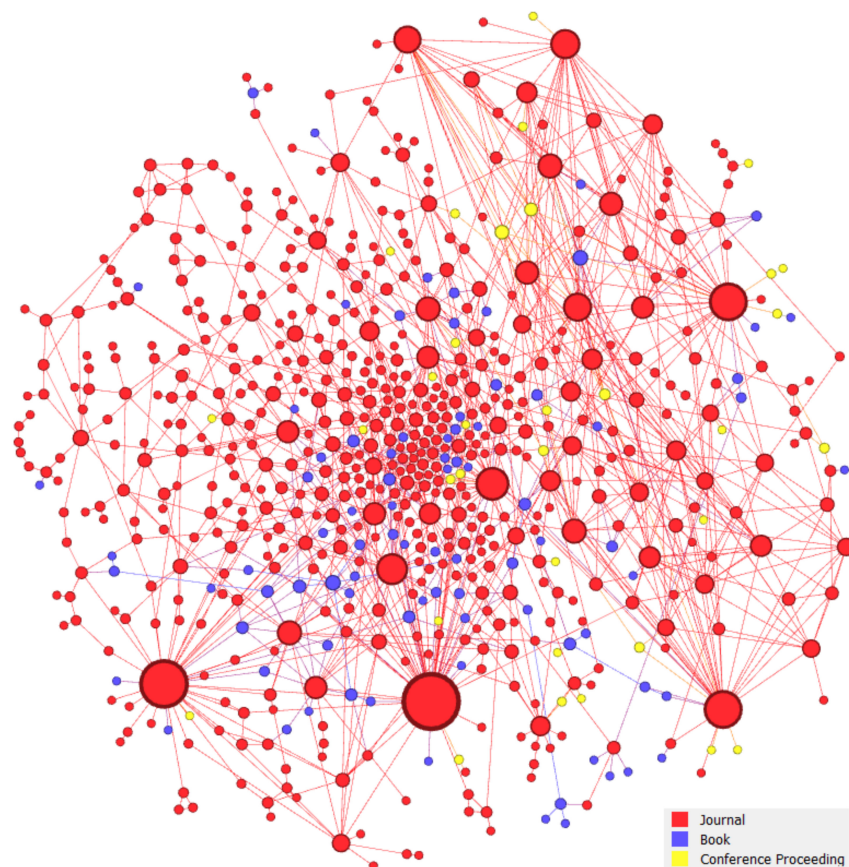


Figure 3. Publications related to green packaging retrieved from Scopus.

By first applying the ‘Giant component’ filter and then selecting ‘journal’ in the ‘Type’ filter to Figure 2, the network of publications corresponding to journals is obtained, as Figure 4 shows. This network is presented in colours in order to highlight the top eight journals with the highest number of green-packaging-related articles (Packaging Technology and Science, Journal of Cleaner Production, Carbohydrate Polymers, International Journal of Biological Macromolecules, Journal of Applied Polymer Science, Journal of Polymers and the Environment, Sustainability, Food Packaging and Shelf Life), while the rest of the journals are represented in grey. The analysis of the statistics included in Gephi indicates that these eight journals cover approximately 24% of the total journal publications included in this filtered network. As can be observed, the right part of the graph contains most of these publications, denoting intensive cross citation between the papers of these relevant journals.

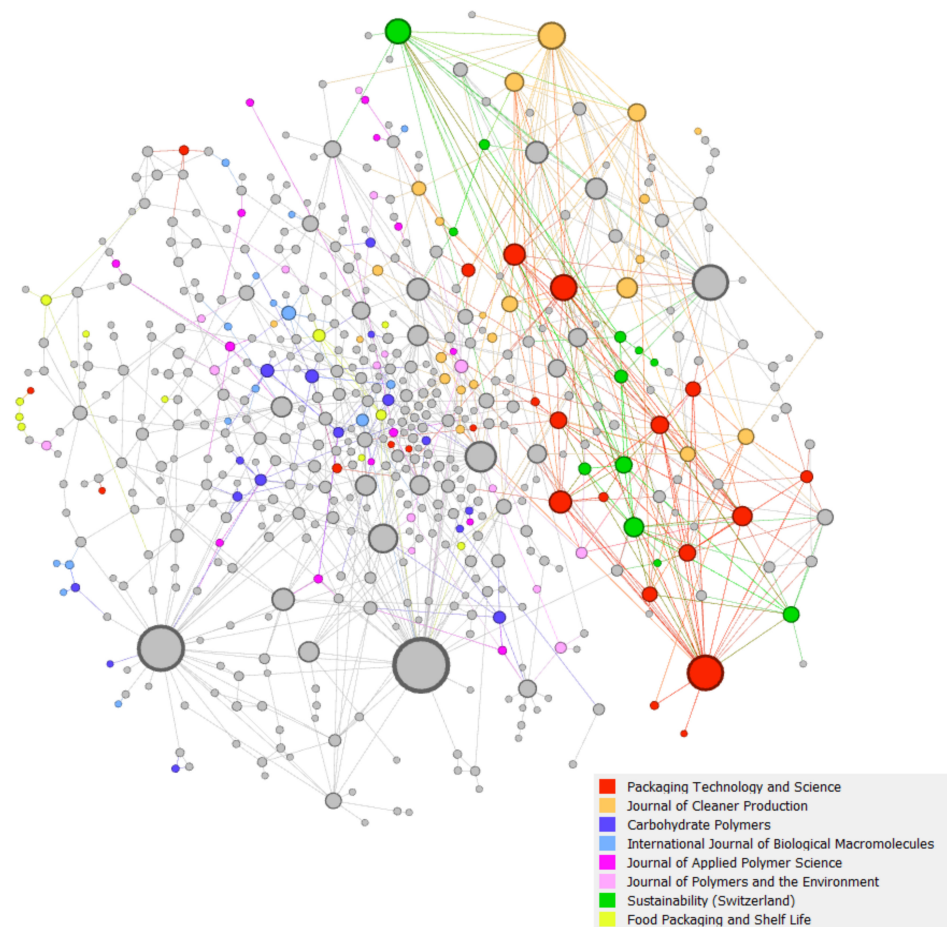


Figure 4. Publications related to green packaging retrieved from Scopus.

The statistical package provided by Gephi incorporates the Louvain method, which is often used for community detection purposes. Community detection is an emerging tool for the determination of the organisation and hidden relationships of the elements of complex networks [25,26]. Therefore, the Louvain method was applied to the network displayed in Figure 3. As shown in Figure 5, the Louvain method [27] found the three communities with a modularity value of $Q = 0.562$.

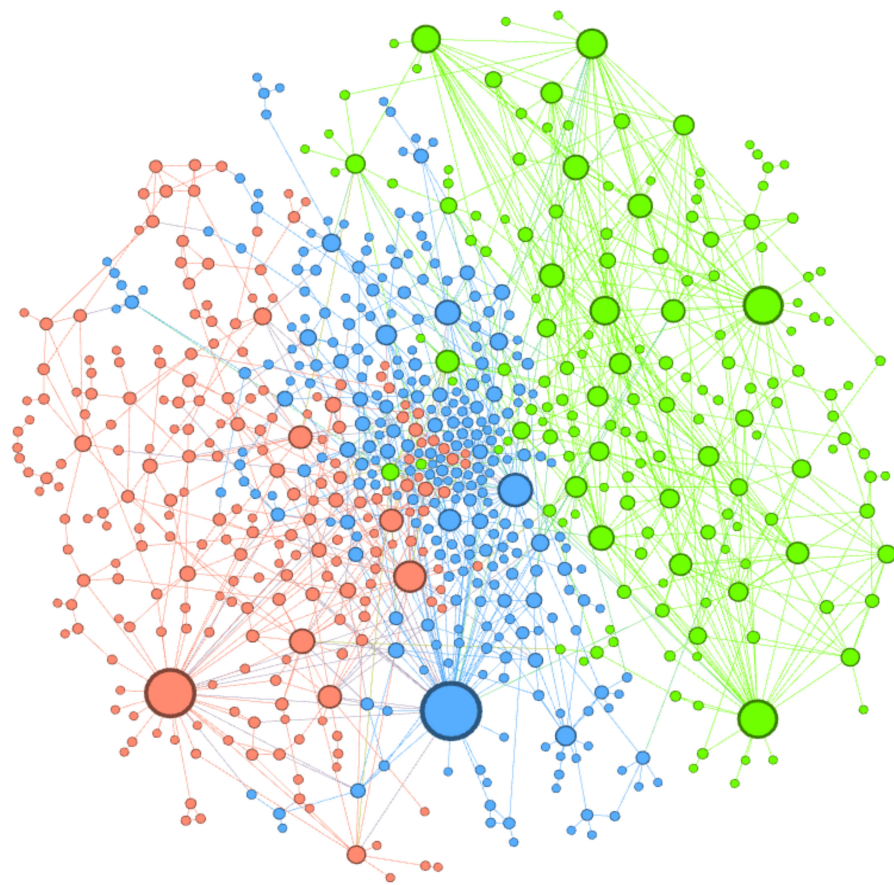


Figure 5. Communities detected in the internal network.

Although all of the papers (nodes) in the graphs shown in the previous figures are related to green packaging, it would be expected that each community, formed by dense subgraphs which are relatively separated from other communities, would include papers with methods and/or applications that are somewhat different to the papers included in other communities. Word clouds are visual representations of the frequency of the appearance of words within a text, such that the more frequently a word is found, the larger it becomes in the word cloud generated. Taking this into consideration, word clouds were generated from the keywords used by each community found in Figure 5. In our study, the appearance frequency of these keywords was refined in order to avoid duplication. For example, those keywords that appear in singular and plural (e.g., thermoplastic and thermoplastics) were combined into the singular form, while those words that appear in hyphenated and non-hyphenated forms (e.g., pretreatment and pre-treatment) were combined in the non-hyphenated form. In order to clarify the visualisation of the word clouds shown in Figure 6, only the keywords that appear in at least three documents were considered.

The analysis of these word clouds shows the differences between these communities. On the one hand, the orange and blue communities include a set of keywords related to materials (cellulose, biopolymer, antimicrobial, nanocomposite, film, etc.) used in green packaging. The main difference between these two communities seems to be that the first includes terms related to food safety with higher frequency (starch, protein, edible, oil, water, permeability, barrier, antimicrobial, etc.), while the second includes other terms that are more related to the study of materials (polymeric, nanocomposite, etc.). On the other hand, the community shown in green is significantly different from the other two communities, as it includes terms related to green packaging from the perspective of consumer and business management (management, development, supply, product, cycle, circular, economy, chain, logistics, consumer, consumption, behaviour, or marketing).

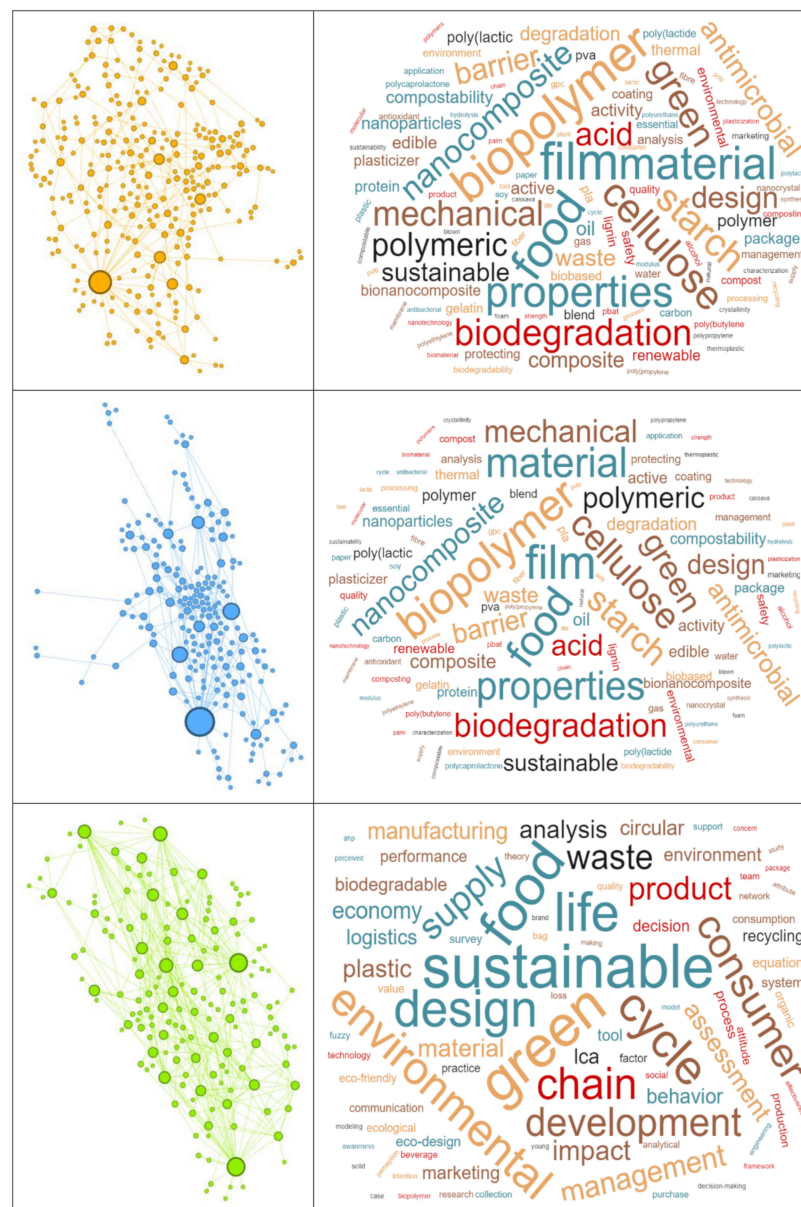


Figure 6. Word clouds generated from the keywords of the communities detected by the Louvain method.

4. Research in Green Packaging from a Consumer Perspective

Their response to the increasing awareness of environmentally-friendly packaging, thanks to the role played by the media [28], has allowed socially-responsible companies to be welcomed by most consumers [29]. Paper [30] studies, in detail, the green packaging actions of large, mid-size, and small companies, concluding that consumer pressure is a key factor for engagement in green actions, especially for large firms. Another study found that lifestyle and retailers' environmental reputations have an important influence on purchasing behaviour in relation to sustainable packaging [31]. Despite these findings, it should also be reported that the consumer perceptions of green packaging are not always clear, particularly in emerging markets [3]. In this line, different authors have shown that companies should establish procedures to understand customers' perceptions of green packaging [32], and to carry out effective and clear CSR communication plans [29].

Different scholars and researchers have analysed which factors determine the purchase decisions of green-packaged products. For example, some authors consider that purchasing choice is closely related to the origin of the products, the price, and the packag-

ing typology [33], while other researchers also conclude that the customer's willingness to buy sustainable products can differ according to the packaging format [34]. In [3], it is concluded that consumers' perceptions of green packaging are limited to the design, price and the biodegradability and recyclability of the packaging materials. Other investigations have shown that the purchase intention of green packaging depends on the level of the environmental concern of customers [35]. An interesting investigation presented in [36] analyses the surveying attitudes of consumers from the United States, France and Germany, concluding that consumers' perceptions of packaging are centered on end-of-life attributes, that is, they are interested in reusable, recyclable or biodegradable packages. Some authors have devoted their investigations to ascertaining the motivations of young consumers regarding eco-friendly packaging [37]. In [32], the authors determined that young consumers living in Denmark consider that the environmental sustainability of packaging for liquid food depends on the material type and on how it can be managed at the disposal stage. Another investigation involving a European country is presented in [38], which analyses how to limit the use of disposable plastic bags in Poland. As for [39], this work presents the beliefs of Polish and French students regarding which attributes and messages of sustainable packaging provide a positive impact on consumer behaviour. In addition, in [40], an online survey involving 241 respondents in Portugal reported that gender, environmental commitment, and the consideration of the views of society as a whole are key variables which determine whether or not customers consider green packaging to be important.

The previous studies show that customers have different reasons for purchasing green-packaged products. In addition to personal attitudes and environmental concern, many investigations identify the willingness to pay more among the reasons for acquiring these products [35,37]. In fact, although an important percentage of customers are willing to pay more for green-packaged products [41], another group of customers indicate that their purchase decision depends on the price. This controversy has led to increased interest in the analysis of the importance of altruistic and egoistic values in customers' purchase intentions towards green-packaged products [35]. This is the case of the investigation presented in [42], in which the authors analyse the opinions of customers. They conclude that although the tag of 'recyclable packaging' is a key factor in the willingness to pay more, half of the respondents reported that they are not willing to pay more, independently of gender and age. Another investigation analyses the responses provided by 268 Romanian consumers about green packaging, reporting that, despite most of them agreeing on the importance of packaging for environmental protection, low consumer budget was an important reason for the refusal to pay more for green-packaged products [43]. As for a study involving a large group of consumers living in China, it was found that the factors that determine consumers' interest in paying more for green-packaged products include the environment, the quality of green packaging, and the packaging price [44]. In [45], the opinions of 343 Indian respondents suggested that consumers' willingness to pay more for green packaging is determined by different factors, including functional, economic, symbolic, biospheric, altruistic, and epistemic values. Finally, other authors have analysed the introduction of green products, eco-bags and recyclable packaging in Brazilian supermarkets from the consumer viewpoint [46].

5. Research in Green Packaging from a Business Perspective

As commented above, companies are working hard to respond to customers' demands to reduce, reuse and recycle. To achieve this goal, companies must identify the factors related to green practice [47] in order to incorporate suitable materials [48] and new designs [49] to create authentic green-packaged products. In fact, it is important to focus efforts not only on the use of eco-friendly ingredients, but also on friendly packaging to reduce pollution [30]. One advanced manufacturing approach is green manufacturing, which aims to promote resource efficiency in order to reduce environmental impact [50]. Green manufacturing systems require a reduction in the use of non-toxic materials and environmental pollution per product, and an increase in the use of biodegradable mate-

rials [51]. Indeed, manufacturers are establishing plans to reduce energy usage, water consumption, waste generation, toxic emissions and packaging size [52].

In addition to manufacturing processes, at present, many managers and firm owners pay special attention to green supplier selection in order to gain a competitive advantage all over the world [53]. In fact, the interest in reducing food waste motivates retailers and brands to look for sustainable packaging formats. Other studies have shown that the paper-board packaging industry is incorporating sustainability initiatives for packaging food and beverages [8], for example, by removing bleach from the process or by reducing the amount of fiber in the packaging while maintaining the material's structural consistency [54]. In addition, luxury brand owners in the cosmetics industry are investing large amounts of money to design new eco-friendly packaging alternatives with luxury finishes [55].

Research institutes and companies are working together to develop packaging platforms based on renewable resources [52] from the perspective of the bioeconomy, that is, the use of renewable biological resources with an economical focus. This is the case in the study presented in [56], in which the socio-ecological and technological innovations are shown to be two different bioeconomy visions that should be considered in order to favour sustainable packaging production and consumption strategies. Firms are forced to include green packaging within the guidelines of their corporate social responsibility in order to demonstrate their commitment to sustainable development by reducing the wastage of materials [4], whilst always including not only the impact of their strategies on customers but also on employees. Indeed, company personnel must receive specific training about the meaning and importance of sustainable packaging materials and products within the industry [57].

Given that entrepreneurship and innovation play a key role in natural resource conservation and environmental protection [58], this section analyses some of the most interesting contributions related to green packaging from a business perspective.

5.1. Design and Materials Used in Green Packaging

In recent years, there has been increasing interest in the study of materials and design strategies for green packaging with different real applications, although various authors have pointed out that many packaging products promoted as green material are not actually made completely from natural renewable resources [59].

In terms of design, some authors indicate that green packaging implies a new perspective on packaging structures to meet all of the specific functions of commercial packaging [49]. Designing green packaging is a difficult task, especially in a context in which manufacturers are focusing packaging processes on reducing energy usage and the packaging size. Fortunately, computer-aided design offers powerful tools to construct a package that fits such objectives [60]. In [61], the authors propose the development of a Sustainable Packaging Design Model (SPkDM) which incorporates eco-design strategies into the packaging development process in order to reduce the production time, costs, and environmental impact.

With regard to the materials used in the packaging, recent studies have shown that major retailers aim to reduce carbon dioxide emissions through packaging innovations [62]. What is more, some firms have incorporated initiatives such as assigning a carbon rating to their products [48]. Moreover, the energy waste in the production of materials is an environmental concern that requires us to establish appropriate actions [63]. In addition, packaging processes must be safe not only for the environment but also for human health [2], making it important to research, for example, the use of antimicrobial packaging strategies [64], especially for food and cosmetics [65].

Certain studies have analysed the use of recyclable materials for packaging. In this sense, the first issue that companies need to consider is the reduction of the risks derived from the use of recyclable packaging materials for food products, as recycled paperboards produced from consumer wastes could carry risks for food packaging [66]. This danger has led some authors to propose models, including Bayesian network analysis, to determine the

risks of the use of green and recyclable paper materials in the food packaging industry [67]. In [68], it was determined that the coextruded film used for UHT milk packaging is not easily recyclable, and that the final product of its separation or attempted recycling has no favourable characteristics for any other subsequent industrial process. Other investigations have analysed the environmental sustainability of several fluid milk containers through life cycle assessment, including the common monolayer high-density polyethylene and gable-top carton containers [69]. In [70], the advantages of cardboard-forming technology are described for sustainable packaging derived from the use of recyclable and biodegradable fibrous materials. The reuse of materials for green packaging is also studied in [71], in which the use of sustainable packaging materials from tannery trimming solid waste is analysed, concluding that the solid waste problem of the tanning industry can be utilised to make valuable materials that replace non-biodegradable plastics. The study conducted in [72] analyses the substitution of ceramic components for recyclable PET bottles, aluminium cans, and Tetra Pak cartons, used as a fill material for semi-precast slabs. The authors of [73] studied the use of metal cans, and concluded that the steel and aluminium used to manufacture cans is a recyclable material with the potential to be used in highly-integrated packaging. The research published in [74] analyses how to synthesize hydrophobic bioplastic films from tea waste in order to obtain more suitable packaging solutions.

In addition to the studies analysing the use of recycled materials for green packaging, many others have focused their research on the possibility of different and, in some cases, novel materials. Some years ago, investigations were generally concentrated on paper-based packaging products, because they were a cheap and sustainable alternative to their plastic counterparts [75]. However, in recent years, further steps are being taken which aim to use sustainable materials as alternatives to traditional materials such as plastic, paper, and polystyrene foam. An investigation along this line is presented in [76], in which the properties of Cellulose nanofibrils and tannin are analysed, as they are nontoxic packaging materials for food and pharmaceutical products. In addition, several studies have considered the use of fibre materials [55]. Other works have supported the creation of new plastics from ethylene vinyl alcohol (EVOH), poly(vinyl alcohol) (PVOH), poly(lactic acid) (PLA), and Cellulose for sustainable packaging that safeguards food quality while minimising spoilage and waste [77]. In [78], it is shown that chitosan films display great potential to be used as packaging films for food products with intermediate moisture sorption. The study conducted in [79] discusses the possibilities of soy protein isolate films for use as antioxidant packaging films for food. In [80], the properties of soy-protein-based films are analysed as an alternative material to produce green packaging. The researchers in [81] examine recent technological advances using polyester resins for green packaging. The research carried out in [82] presents safe and healthy sustainable packaging made from a roll covering created from thermoplastic polyurethane elastomers. The benefits of biopolymer films and coatings in packaging applications are discussed in [83]. Natural fibres, including maize fibres, are renewable resources that have also been proposed for biodegradable/recyclable packaging [84]. In [85], it is shown how a company improved its packaging after evolving away from polyvinyl chloride and the two-piece plastic clamshell or carded blister to an eco-friendly virgin polyethylene terephthalate, along with a recycled-content PET blister. In [86], a procedure is described for designing packaging film based on polyethylene (PE), polypropylene (PP), and alkali treated-wheat straw (WS).

An important issue in green packaging is how to print information on containers (logos, product information, etc.) [87], which is why some innovations have been presented in recent years that offer the possibility of avoiding the use of paper labels by directly painting the information onto the packaging's surface.

5.2. Green Packaging Costs

Researchers specialising in important industries are investigating how to develop sustainable initiatives, not only to overcome the challenges of reducing gas emissions, but

also in terms of energy costs [52,63]. With respect to green packaging, manufacturers choose packaging based on costs and consumer preferences [69]. Some authors have indicated that green packaging that uses biodegradable polymers is in great demand, but involves issues of high production costs, processing and performance [88].

In addition to the energy costs, retailers and packaged goods companies are promoting cost reduction initiatives for green packaging [89]. The paper presented in [90] analyses green packaging from the process dimension in order to establish strategies to reduce the cost of remanufacturing in comparison with new manufacturing. An important motivation for packaging companies is packaging redesign for the adaptation of the processes to different packaging types and sizes [91]. Companies involved in the fabrication of packaging machines are introducing innovations aimed at the development of machines that allow higher levels of flexibility for the modification of the type of package used according to the product being processed, thereby avoiding new capital investments every time the packaging format changes.

Some investigations have proposed mathematical models for the evaluation of the cost required to develop innovative solutions for product packaging [92], while other studies suggest supporting the cost estimation of different types of packaging using multicriteria decision analysis [93].

5.3. Waste Management and the Circular Economy

Sustainable packaging also has important implications for waste management and the circular economy. This is the case for food packaging, which should consider not only the direct environmental effects of packaging, but also food losses, waste, and circularity [2].

As is widely known, waste management is an important environmental issue. For example, the source-separated collection of waste is a common and important issue for city councils, as material collection by type and an efficient kerbside system are beneficial for the environment [94]. Furthermore, the impact on waste prevention derived from eco-innovation in packaging is also an important issue [8], as companies need to reduce waste not only in their factories but also in their stores. Bearing in mind that food packaging is an important issue to reduce such waste [95], some studies have analysed the advances in food packaging with the aim of reducing the environmental impact while satisfying the food quality required by consumers [11].

In addition to waste management, green packaging is closely related to the circular economy—a production and consumption paradigm that ensures sustainable growth over time by recycling, reusing and reducing the need for resources [96]. Some public institutions are developing strategies that aim to favour circular economy, such as the Circular Economy Package promoted by the European Union [97]. Different researchers have shown that green packaging is a key factor in the circular production–consumption system, as it favours heterogeneous consumer needs and extends material life cycles [55]. Paper [98] provides some insights about the perceptions of stakeholders in the food packaging supply chain regarding the transition to a circular economy system. Some authors have previously compared the circular design strategies based on biodegradable materials to linear redesign based on packaging lightweighting [99], while other researchers have proposed the use of operation research methods, including heuristic algorithms, to optimise the circular packaging network [100].

5.4. Logistics and Supply Chain Management

The circular economy is related to logistics and supply chain management. On the one hand, there is an important relationship between packaging and logistics [87], and a new concept emerging in recent years called ‘Sustainable Packaging Logistics’ (SPL) [101] embodies this link between green packaging and green transportation [102]. Indeed, the increasing length of global supply chains requires the use of several packaging layers along the supply chain [103]. The investigation presented in [104] proposes a framework for the assessment of the sustainability of logistics service providers. Moreover, due to the diffi-

culty of managing supply chains that contain green design, some researchers have analysed the optimisation of green logistics [105], including quantitative methods to evaluate the packaging and logistic design decisions [106]. Some researchers have also demonstrated that packaging logistics sustainability favours sustainable development [107] and allows for a proactive integration of efficiency and sustainability into supply chains [108].

On the other hand, the adoption of green initiatives by firms also influences the environmental outcomes of supply chains [109]. Supply chain management is a strategy which involves decisions concerning sourcing, manufacturing, transporting, consumption, and reverse logistics [110]. An increasing number of companies are incorporating green supply chain practices in order to achieve customer loyalty and improve brand image [111], and to reduce the negative environmental impact of packaging processes [112]. Advanced strategies for supply chain management have been shown to be a key factor for commercial success [113]. Examples of the positive effects of green packaging in the supply chain are found in different sectors, including the agroindustry [114], the pharmaceutical industry [115], and the automotive industry [116], among others. This has led to the appearance of the concept of 'Circular Supply Chain Management' (CSCM), which integrates the philosophy of the circular economy into supply chain management [117] by covering issues such as green purchasing, green manufacturing, green distribution, green packaging, and green marketing, among other dimensions [118]. These well-known dimensions have been found to be related to, at the least, economic, environmental and social performance. In particular, biodegradable packaging is an important research area for CSCM [119], although it is also important to note that there are certain critical barriers hindering the adoption of CSCM [120]. Some researchers have proposed the optimisation of decisions related to industry chain integration and green supply chain management using multi-objective decision making approaches and Pareto-based analysis [111]. For example, [121] analyses e-commerce industry chain integration and business innovation from the viewpoint of green packaging using multi-objective decision-making approaches.

5.5. Marketing Strategies and Corporate Social Responsibility

Packaging developers must satisfy environmental requirements along with several logistics, production and marketing requirements [122]. Some firms are promoting programs to provide customers with choices and alternatives for greener packaging. Strategic and operational actions focused on green packaging require the coordination of packaging development and marketing strategies within multidisciplinary product-packaging development teams [123]. The concept of 'Green Marketing' and its derivatives in terms of changing consumer behaviour towards sustainability is discussed in [124–126]. The role of green packaging strategies for the creation of higher levels of consumer preference is presented in [127]. An interesting investigation presented in [128] shows that green packaging and green advertising benefit a company's competitive advantage and business performance. Companies need to promote their efforts in sustainable packaging by means of marketing strategies supported by information and communication technologies [124,128]. In fact, the social networking websites of green packaging initiatives are becoming important issues in the business world [129]. Furthermore, neuromarketing techniques [130] can be applied in sustainable product marketing [131].

Although most consumers view socially-responsible companies in a positive light, some authors argue that it is necessary that corporate social responsibility (CSR) be supported by effective and clear CSR communication. In fact, customer satisfaction influences the firm's performance and CSR [132]. Some investigations have determined that the profusion of eco-labels has made it difficult for consumers to identify socially-responsible companies, ultimately reducing the effectiveness of CSR initiatives [29]. In the case of green packaging, packaging companies are establishing procedures to accurately provide the information that customers request [133]. An interesting investigation presented in [4] shows that the consumer-oriented CSR of food packaging is linked to the perception of health benefits for consumers, whereas employee-oriented CSR is associated with the

attitude toward the company. Packaging decisions are also related to other important firm decisions, such as the return policies [134,135]. However, CSR is important not only to establish an accurate relationship with customers but also for all of the agents involved in the supply chain, including intermediaries, suppliers and logistics providers. This is the reason why a new concept called ‘Logistics Social Responsibility’ (LSR) was introduced in recent years in order to establish the strategies to follow for the socially-responsible management of the supply chain [136].

6. Discussion and Conclusions

Green packaging, also known as eco-friendly packaging or sustainable packaging, is an emerging area of interest for scholars, researchers and practitioners around the world. This paper presents a novel study that analyses the importance of green packaging in the scientific community from consumer and business perspectives. The analysis of the large network of publications related to green packaging retrieved from the Scopus database using advanced visual analytic tools, such as graph visualisation tools and word clouds, together with the analysis of a wide sample of more than a hundred manuscripts have provided some interesting results. Firstly, the results obtained allow us to respond to the research question included above; that is, it can be said that researchers in the fields of business and consumer behavior are increasing their interest in the analysis of green packaging strategies, which highlights the importance acquired by the societal challenge concerning climate change, environment protection, and resource conservation. Secondly, it was found that certain peer-review journals are becoming a referent for scholars and researchers interested in publishing their investigations on green packaging. Thirdly, from the consumer perspective, it was observed that customers are concerned with environmental issues, and their purchase decisions about green-packaged products are dependent on different factors and variables, including their environmental concern regarding the packaging’s design; the typology, biodegradability, and recyclability of packaging materials; and the origin of the products, among others. Nevertheless, it was observed that the willingness to acquire green-packaged products of a significant number of customers is also dependent on price. Fourthly, from a business perspective, it was observed that companies are being forced to adapt green packaging initiatives due to the societal pressure derived from environmental concern, and customers’ attitudes and willingness to pay, in addition to other factors such as laws and regulations. Fifthly, some investigations highlighted that firms are also directly involved in training their company personnel, and are indirectly involved in the labour practices of their trading partners in their supply chain. As a personal contribution, we believe that the scientific community that is interested in this topic should try to take a more global approach to green packaging, so that in addition to those typical studies focused on packaging food, beverages, or other everyday consumer goods, the use of sustainable materials in many other real-life applications can also be analysed.

Some of the limitations of this study are owed to the fact that the documents were retrieved from only one database, and, beyond any doubt, it is not possible to present in detail each and every aspect contained in hundreds of manuscripts. As a future work, we plan to apply this methodology to analyse other relevant sustainability issues. In line with other recent studies that have analysed the impact of coronavirus SARS-CoV-2 (COVID-19) in the environment [137], it will be interesting to investigate the effects of COVID-19 on the development of new designs and materials for green packaging.

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