

Review

Bibliometrics of Scientific Articles on Solid Waste Management in Shopping Malls (1999–2020)Andre Cardim de Aguiar^{1,2}, Soraya Giovanetti El-Deir^{1,*}

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* **Correspondence:** Soraya Giovanetti El-Deir; E-Mail: soraya.el-deir@ufrpe.br**Academic Editor:** Islam Md Rizwanul Fattah**Special Issue:** [Advances in Environmental Research](#)*Adv Environ Eng Res*

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Received: May 09, 2022**Accepted:** July 13, 2022**Published:** September 20, 2022**Abstract**

The presence of shopping malls causes a social, economic, and environmental impact. The bibliometric analysis is a valuable method used to identify published research papers, and understand historic information published in scientific journals. This method can be used to carry out qualitative and quantitative analyses of scientific production on a specific subject. This analytical method primarily focuses on analyzing the bibliometric study of the solid waste management method used in shopping malls. A small number of studies on the management process used in shopping malls are reported. However, the last five years have seen a significant increase in the number of publications, and the papers are mostly reported from Europe and Asia. These publications are published in journals with high impact factors and are characterized by a Qualis/Capes grade [34]. Six groups were formed for similarity analyses, and the words waste, food, and environment were used for analysis. Five thematic sub-areas were identified. Based on the results, it was inferred that the waste management study conducted in shopping malls should be an object of research. This will help understand the processes and search for a way to improve the quality of the waste management process.



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Keywords

Scientific production; sustainability; waste management

1. Introduction

Processes associated with waste management are being widely researched nowadays as the associated processes affect the environment and society. It should be kept in mind that if not implemented properly, waste management methods can result in the degradation of the environment. The progress in the field of industrialization results in the production of a large amount of solid waste [1, 2]. Urbanization and populational increase, and the economic development that has occurred in the last years, have resulted in an increase in solid residues. The increase in the amount of production of solid residues can be attributed to the changes in the lifestyle of the people [3, 4]. The generation of solid waste produced on a large scale has become a global problem. Various technological routes are followed to direct the wastes to landfills that are not adequately treated [5]. In addition, there is an increase in the production of urban waste due to the growth of cities [6].

According to the “Global Waste Management Outlook” report, published by the United Nations Environment Program and the International Solid Waste Association, the amount of urban waste generated around the world is approximately in the range of 7–10 billion tons/year. The amount has increased significantly in the last 50 years [7]. It has been hypothesized that by 2025, the urban population should be approximately 4.3 billion, and approximately 2.2 billion tons of urban solid waste (USW) will be produced annually. This indicates that approximately 1.42 kg of solid waste will be generated per person/day [8]. The number of family members, the social situation, and academic formation directly affect the waste management process as these variables influence the production of waste and waste typology [9].

The composition of the urban waste includes plastic, metal, glass, paper, textile, building material, and organic material. An effective method for solid waste management is yet to be developed. However, there are methods that can be followed to minimize and improve the management process of solid wastes [10]. Achieving solid waste management is still a challenge, although there are methods that can be used to identify safe technological routes and reduce the negative environmental impact [10]. The lack of qualified technicians and the unavailability of clean and accessible technologies in countries, states, and cities, results in a compromise in the level of management associated with solid waste treatment [11]. In medium and large enterprises, the use of management models is influenced by the type of waste being treated. The methods used can help reduce or eliminate environmental impacts. However, the inadequate extent of separation at the source, inefficient installation, inefficient transportation methods, use of inadequate treatment methods, and the absence of legislation that may implement the necessary rules and regulations primarily result in the unsustainable situation of the system [12].

Besides being a place from where products can be bought, retail centers have become a place for personal and family entertainment. These centers have food courts, theatres, and movie theaters [13]. According to the Brazilian Association of shopping malls [14], an increase in income was recorded in this sector, and the approximate income was US \$ 35 billion in 2016. Approximately

558 malls were active until 2018 in Brazil, and there was a great diversity in the size and typology of the malls. Thus, there was a difference in the solid waste management method. Companies have started paying attention to the sustainability of their products to maintain environmental standards and add value to the institutional image that attracts customers [15]. The economic principles are guarded in such a way that the systems need to adhere to environmental restrictions. Ways to optimize the usage of economic resources are developed [16]. The waste management method is a key factor that determines the health of the environment. This has received immense attention from the scientific community in the last few years and directly affected the number of published articles in the area. The articles may be accessed through the database of Web of Science. For better understanding, the bibliometric studies that are based on the analysis of papers reporting the use of various solid waste management methods have been studied. An increase in the number of papers dealing with the solid waste management method has been observed in the last few years [2, 17].

The bibliometrics method is an effective method that highlights the historic development and qualitative tendencies of publications [18]. The method is used to identify researchers working in the field and historical information published in scientific, academic journals. This tool has been widely used for evaluation by observing the development in the field via quote analysis. The published content can be analyzed, and institutions, journals, researchers, and search field performance [19, 20] can be studied [21]. Researchers have studied various solid waste management methods using this tool [22]. A statistical study on keywords was conducted, and researchers accessed the primary data representing the discussed content to improve the focus of the search and comprehend the trend and repetition changes [23]. To better understand the state of the art, this article proposes to carry out an analysis of scientific articles published on the Web of Science and Science Direct platforms to promote solid waste management in shopping centers. The data published in the last 22 years (1999–2020) were analyzed using statistical tools. The aim is to understand the primary scientific articles on the subject and understand the evolution of science in this field of study. The bibliometric analysis method can be used to identify the major publications in the field and reveal the details of centers of excellence. Related topics can be explored, and a rigorous scientific methodology can be developed by carrying out a systematic review of the literature. Bibliometrics uses a qualitative and quantitative approach to obtain a detailed description. The tool can be used to evaluate and monitor scientific production [24]. This methodological tool provides a higher degree of certainty regarding the excellence of what is being highlighted and reveals data on the theoretical evolution of the focal theme.

2. Materials and Methods

The Bibliographic and documentary survey was conducted following a data survey method to understand the usage of methods and techniques [25], comprehend the data obtained, and study the development of the object. The documents are stored in the archives of private institutes, scientific associations, and government entities. The data are obtained following procedures that adhere to the outlined regulations, laws, and services [26]. The Bibliographic entry is based on material that has been analyzed and was passed through analytical treatment methods. Articles, books, thesis, dissertations, annals [27], etc., were studied to get to know state of the art [26]. This

method assists in the evaluation of tendencies and behavior of scientific reports. Information on the authors, the publication means, research institutions, and keywords was analyzed.

The bibliometric indicators estimate the quality and number of publications [28, 29]. The keywords WASTE, MANAGEMENT, INDICATOR, and MALLAND SHOPPING CENTER were used as the search criteria. To obtain more accurate results, a filter was applied to select the scientific articles, journals, and areas of knowledge. The area of expertise was selected to be Engineering and Environmental Sciences, and the articles were fully analyzed to align with the central theme of the research. The keywords are directly related to the research object, except for the word INDICATOR. This keyword was included to understand the relevance of the study in the field of solid waste management. Were identified the scientific journals with their correspondent Qualis [30, 31]. The journals communicated from Brazil were considered, and the classification of the quadrennium 2013–2016 was analyzed. The subfields “Engineering I” and “Environmental Sciences” were studied, and SC Imago Journal Rank – SJR (2017) was taken into consideration. The areas are established using the “Sucupira” platform to support the evaluation process [32, 33]. This platform is used as a tool to collect data. [30, 31] This index indicates the scientific degree of the journal. The area “Engineering I” consists of programs in the sub-area Civil Engineering, Environmental Engineering, Sanitary Engineering, etc. The area “Environment Science” consists of programs in the interdisciplinary area and focuses on social and environmental issues [34]. The Scientific Journal Ranking (SRJ) value is a numeric value that indicates the average number of weighted quotes that the article published in that journal received in a selected year during the last three years [34]. The collected data were also analyzed and separated based on the year of publication, authors, institution, journal, and country. The analyzed scientific articles were decomposed in stages through formulae. The Microsoft Office Excel program was used to evaluate the data quantitatively and qualitatively, following descriptive statistical methods.

The titles, abstracts, and keywords were analyzed using the Iramuteq Program (Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires). A list of the main nouns used in the text (.txt file) that has more than 13 repetitions was selected. Those which were repeated less 13 times were considered by the system as irrelevant. Similarity analysis was conducted to identify the relationship between words, possible links, and co-occurrence by combining the textual corpus [35, 36]. Words with repetitions between 13 and 20 were classified under the category of low frequency, those between 21 to 40 were classified as intermediate frequency, and those above 41 were classified as high frequency. The font size of the words in the clouds corresponds to the frequency of their repetition in texts, and the thickness of the tie line among terms reflects the intensity of the relation. As reported by Camargo and Justo [37], Iramuteq allows the statistical study of textual data, and the frequency of word calculation within a graphic cloud of words and the correlation web in the Similarity Analysis were reported [36-38]. The method of Similarity Analysis makes it possible to study the inter-occurrence of words. Ramifications can be understood, and ideas can be developed. Generative words that are central to each of these sets were studied. Thus, different linking groups are identified, and these are labeled as halos. These groups are formed by connecting the textual corpus. This is a mathematical method that studies combinatory objects with determined sets [39]. The methods indicate the connection between the words and contribute to the identification of the textual corpus representation structure [40]. Graphic elements were organized using Excel for the analysis of Descriptive Statistics. A textual analysis was conducted using a list of keywords, and the frequency of occurrence was recorded. The

thematic sub-areas associated with each of the articles were studied, and the themes studied were comprehended. Each article was read, and the main aspect of the papers was discussed [41, 42].

3. Results

3.1 Scientific Production: Quantitative Characteristics

An increase in the number of studies published on this topic has been observed since 1991, and the extent of the increase has been significant since 2005 (Table 1). The increase could be attributed to the availability of places where solid wastes could be dumped. However, the number of papers reporting the solid waste management methods used in malls is scarce. The indicators that were used to observe the total number of articles that were published in scientific journals were expressive. The maximum number of papers were published in a previous period, and these were identified using the keyword "Waste" (228.753) in the Web of Science platform (WoS). The term "Shopping Center" was used as the keyword, and it was observed that the number of reports published in Science Direct (166) and WoS (209) was scarce. This reveals the indicators that can be used to limit the area of the research.

Table 1 Quantitative analysis of reports published between 1999 to 2020.

Keywords	ScienceDirect (n)	Web of Science (n)
Waste	66.078	228.753
Waste management	4.529	11.543
Indicator	85.480	163.976
Mall	1.001	2.082
Shopping center	166	209

The indicators were studied to determine five arrangements that corresponded to the addressed theme ("Waste" AND "Malls"; "Malls" AND "Indicator"; "Waste" AND "Shopping center"; "Waste management" AND "Malls" e "Waste" AND "Shopping center" AND "Indicator"). A huge number of articles were found on those research platforms. A total of 65 text articles, presented as the "total sample," were identified. The publications that did not have thematic compatibility and the duplicates were ignored. It was determined that sample number 23, and these were presented as the "post analysis sample" (Table 2).

Table 2 Quantitative analysis of publications concerning the indicators from 1999 to 2020.

Keywords	Total sample			Post-analysis sample		
	Science Direct	WOS	Total	Science Direct	WOS	Total
Waste + Malls	13	12	25	3	2	5
Malls + Indicator	14	15	29	6	5	11
Waste + Shopping center	3	5	8	2	4	6
Waste management+Malls	2	1	3	0	1	1

Waste + Shopping center
+ Indicator 0 0 0 0 0 0

It was observed (Figure 1) that between 1999 and 2013, a total of six articles, which represents 26% of the total number of articles published, were published on this topic. An increase in the number of publications was observed between 2014 and 2016. A total of 9 articles, or 39% of the total scientific production on the theme, were identified. In 2017, there was a decrease in the number of publications. However, the number increased (5 articles) in 2018, and the maximum number of publications (23 produced documents) was recorded soon after. Periods, where not a single article was published, were also observed.

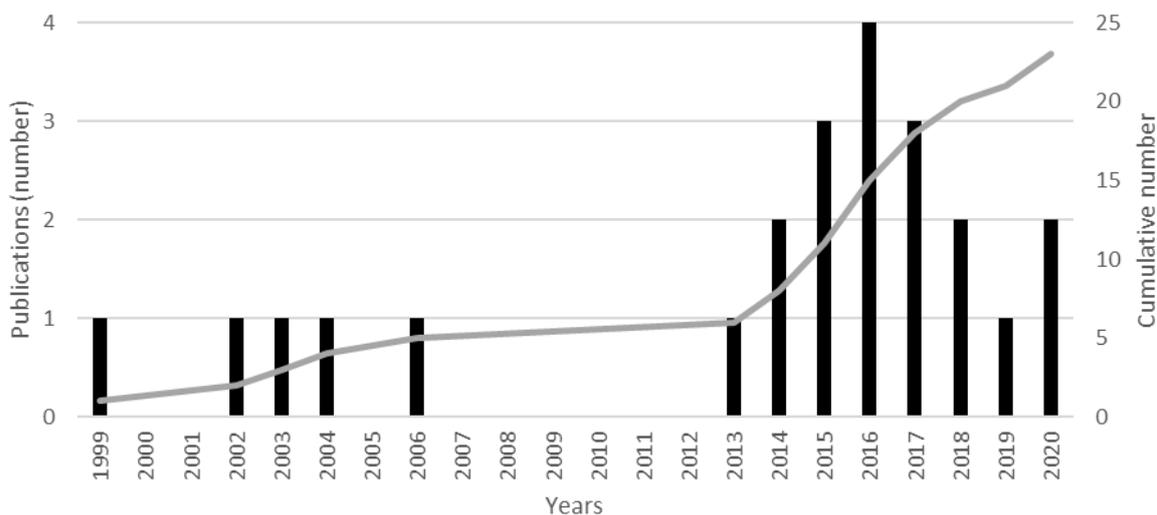


Figure 1 Production of articles concerning solid waste in shopping malls in the period spanning from 1999 to 2020.

Figure 2 presents the scientific reports published on the established indicators by 38 institutions spanned over 20 countries and various continents. We identified 39 institutions from 19 countries. A total of 23 articles were identified, 49% of the authors were from Europe, and 27% of the authors were from Asia. In South America, represented by Brazil, 8 authors (10%) published articles on this topic. Only three of the developing countries (Brazil, India, and China) published a large number of articles on the topic. Approximately 6 authors (8%) from North America and Canada were published, and the number of authors from these countries was higher than the number of authors (4) who published in the US. The continents of Oceania (4%) and Africa (2%) did participate in the studies, and 3 and 2 authors participated, respectively. Thus, there was a certain representation from all continents. International collaboration also called for attention, presenting the different nationalities.

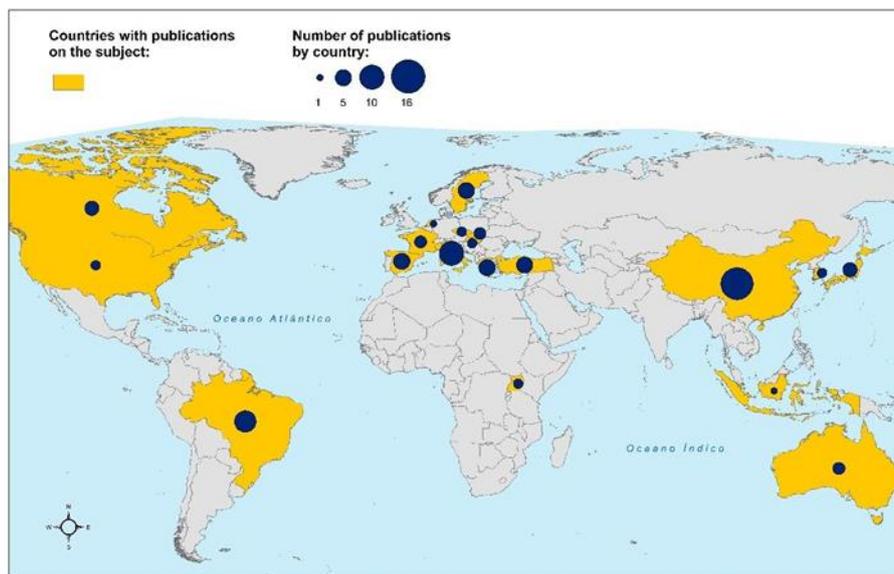


Figure 2 Number of researchers per country with publications.

In relation to the authors’ countries (Table 3), the People’s republic of China represented 19% of the total number. The “Tongji University” had a representation with 6 collaborations, and the “Universita degli Studi di Perugia” in Italy and the “Yıldız Technical University” in Turkey were represented by 5 authors each.

Table 3 Institutions with the highest number of published articles dealing with waste management in malls.

Continent Names	Country	Institutions	Number of Authors
Asia	China	Shanghai Jiao Tong University	4
Asia	China	Tongji University	6
Europe	Spain	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas	4
Europe	Greece	Division of Public Spaces, Municipality of Athens	4
Europe	Italy	Universita degli Studi di Perugia	5
Europe	Sweden	Chalmers University of Technology	4
Europe	Turkey	Yildiz Technical University	5
South America	Brazil	Universidade do Estado da Bahia	4

3.2 Quantitative Characteristics of Scientific Production

There was at least one paper on this topic in all the scientific journals. However, two articles were reported in Energy Procedia and Solar Energy (Table 4). Only 8 journals had their indicator above 1.00 SJR. This value was under the higher relevance category. Most parts of the analyzed journals were put under the “No Qualis” group, and 10 of them (43.5%) fell under the Engineering I category. It was verified that the Qualis/Capes grade [34] corresponding to the Environmental Science

Category was high, and six of the articles achieved the Qualis A1 grade. The journals *Atmospheric Environment*, *Energy and Buildings*, and *Journal of Cleaner Production* performed the best with respect to the SJR and Qualis/Capes indices [34].

Table 4 Classification based on the highest *SCImago Journal Rank* (2020) e Qualis/Capes [33] Journal indicators for the articles falling under the category of Engineering I and Environmental Science.

Journals	SJR	Qualis/Capes (Engineering 1)	Qualis/Capes (Environmental Sciences)
Psychiatry Research	1.22	Without Qualis	B2
Expert Systems with Applications	1.27	A2	B2
Environment and Behavior	1.32	Without Qualis	Without Qualis
BMC Public Health	1.34	Without Qualis	A2
Journal of Cleaner Production	1.47	A1	A1
Atmospheric Environment	1.52	A1	A1
Solar Energy	1.61	A2	A1
Energy and Buildings	2.06	A1	A1

The Cloud of words (Figure 3) was studied, and it was observed that the most used word was “shop” (10.06%). It was followed by “mall” (8.83%), and this word represented this paper’s object of study. Other highly used words were “consumer” (8.21%) and “waste” (6.78%). These words reflect the object of study, and the results help analyze the waste production process in the consumer sector and big companies. The results obtained using the keyword “food” (6.57%) present the issues that were observed during the analysis of the articles. The problems involve the lack of food waste destinations. The problem can be addressed by evaluating the energetics of the material [43, 44], following the process of composting [45, 46], and using fertilizers during the production process under conditions of hydroponics [47]. The word “Energy” (6.16%) appears in the articles and reflects the interests of the companies in the field of improvement of energy efficiency of the buildings [48-50].



Figure 3 Most used words, structured from a cloud of words, in the analyzed articles.

It can be inferred that the keywords “Shop”, “Mall,” “Consumer”, “Waste”, “food,” “Energy”, and “Indicator” represent different linking groups that can be identified by halos. These form the connections between textual corpus (Figure 4). Structural analysis reveals six distinct divisions. The main group consists of the terms “Shop” and “mall” and exerts a better influence, as already identified in the study, than the subgroups. Other halos can be highlighted in three new ramifications <“waste”, “food” e “energy”>, <“consumer” and “indicator”> e <“environment” e “indoor”>. These are the foci of the analyzed articles. The keyword 'indicator' is almost disconnected from the rest of the clusters. This indicates that the study of solid waste management in malls does not focus on this aspect and is considered an emerging topic for further research.

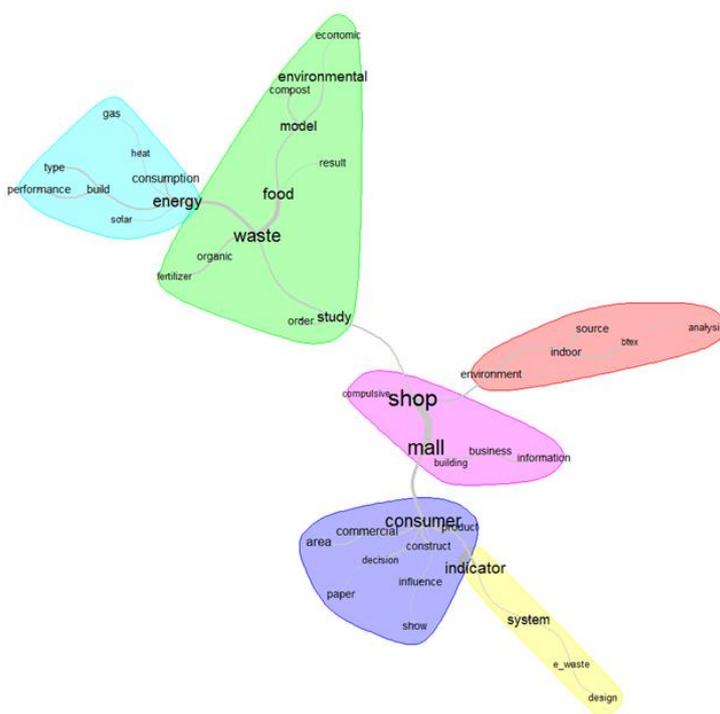


Figure 4 Set of words identified using the similarity analysis method.

3.3 Qualitative Characteristics of Scientific Production

Twenty-two primary keywords belonging to the high-frequency group were identified from the studied articles. The chosen words exhibited >13 repetitions, and their classifications and percentages are presented in Table 5.

Table 5 Repetition frequency of the major keywords used by the authors between 1998–2020.

Frequency	Keywords	Number (n)	Percentage (%)
Low	Source	13	2.67
	Analysis	13	2.67
	Gas	13	2.67
	Build	13	2.67
	Organic	13	2.67
	Consumption	14	2.87
	Performance	15	3.08
	Information	15	3.08
	Product	16	3.29
	Area	17	3.49
	Commercial	17	3.49
	System	19	3.90
	Study	19	3.90
	Indoor	20	4.11
	Environmental	21	4.31
Intermediate	Indicator	22	4.52
	Energy	30	6.16
	Food	32	6.57
High	Waste	33	6.78
	Consumer	40	8.21
	Mall	43	8.83
	Shop	49	10.00

Five sub-areas were identified (Table 6): electromagnetic equipment residues (EER), Organic residues (OW), Environmental impact (EI), Energetic efficiency (EE), and Performance Indicators (PI). These studies present the positive and negative aspects of the solid waste management process and the methods to improve the energy performance of the buildings, and performance indicators to improve the relationship with the consumers.

Table 6 Analyzed articles and their respective titles.

Sub-area	Title	Years
EER	A three-stage methodology for initiating an effective management system for electronic waste in Turkey.	2015 [51]

EER	Prerequisites for a high-level framework to design sustainable plants in the e-waste supply chain.	2015 [52]
OW	I-REXFO LIFE: An innovative business model to reduce food waste.	2019 [44]
OW	Be the Change You Want to See: Modeling Food Composting in Public Places.	2013 [45]
OW	Evaluation of new composting practices on a small scale with energy recovery.	2017 [46]
OW	Investigation of an accidental explosion of raw garbage composting system.	2006 [53]
OW	Study on the hydroponic culture of lettuce with microbially degraded solid food waste as a nitrate source.	2014 [47]
EI	The Regeneration of the Commercial Triangle of Athens; Sustainability Rationale.	2017 [54]
EI	Environmental impacts at the region of the medium São Francisco river.	2018 [55]
EI	Source characterization of BTEX in indoor microenvironments in Hong Kong	2003 [56]
EI	Fuzzy Logic Based Modeling of Traffic Flows Induced by Regional shopping malls.	2014 [57]
EE	A data-driven approach for building energy benchmarking using the Lorenz curve.	2020 [48]
EE	A universal method for performance evaluation of solar photovoltaic air-conditioners.	2018 [49]
EE	Distributed power from solar tower systems: a MIUS approach.	1999 [58]
EE	Performance comparison among Gas Heat Pump, Electric Heat Pump, and Conventional Thermal Devices in Tertiary Sector Applications.	2016 [50]
PI	Investigating factors influencing consumer decision-making while choosing green products.	2016 [59]
PI	Prevalence and construct validity of compulsive buying disorder in shopping mall visitors.	2015 [60]
PI	The relationship between shopping mall image and congruity on customer behavior: Evidence from Indonesia.	2016v [61]
PI	Are there differences in the attractiveness of shopping centers? Experiences from the Czech and Slovak Republics.	2016 [62]
PI	Retail Centers: Location and consumer's satisfaction.	2002 [63]
PI	RSSI-Based Indoor Localization with the Internet of Things.	2020 [64]
PI	A pilot and feasibility study to assess children's consumption in quick-service restaurants using plate waste methodology.	2017 [65]
PI	Business information extraction from semi-structured web pages.	2004 [66]

Subtitle: EER – Electronic equipment residues; OW – organic waste; EI – Environmental impact; EE – Energetic efficiency; PI – Performance indicators.

4. Discussion

4.1 Scientific Production: Quantitative Characteristics

An increase in bibliometric studies regarding solid waste has been observed in the last few years [67]. This shows the intensity of the researchers' interest in the process of scientific production and

the usage of scientific quantification methodology. In 1991, the issue of solid waste dumping became a major issue affecting the world's population [44, 47]. As reported by Chen et al. [35, 68], environmental impacts caused by human activities, climatic change, global warming, and the positive effects exerted by sustainable development resulted in an increase in the number of publications on solid management. A significant increase in competition among clients visiting shopping malls has been observed. Studies have primarily focused on the advantages of this kind of commercial arrangement and not on the solid waste management process [69]. However, it could be observed that there was a certain increase in the number of publications related to undertakings in the Shopping Mall category since 2000. According to Kaihatu and Spence [61], a good image of the company can be maintained by retaining the characteristics inherent to shopping. Hence, further studies should be conducted, and analytical methods should be used to identify these aspects associated with waste management to achieve sustainability.

Sit et al. [70] reported the competitive nature of shopping malls to attract new customers. As reported by Kaihatu and Spence [61], the malls try to create a positive image, and studies concerning various themes should be conducted for management adjustments so that various improvements can be made to Malls by adjusting the management procedures. Hence, it is important to conduct studies on waste management systems. The trends can be identified by analyzing the presented data [48, 68]. An increase in the number of publications has been observed in developing countries such as Brazil and India since 2007. The increase occurred when the countries took into consideration the system of management of RSU [21]. The number of articles related to the RSU in China was higher than that recorded for the US. Compared to the US, the growth rate was zero in 1993, and 107 articles were published in 2008 [48, 61]. The World Bank has recognized China as a leader in the field of RSU. There was huge pressure to invest in material management, and 210 billion was invested in projects. This resulted in an increase in the number of publications in the field. The production number was higher than the production number recorded in the US [21].

4.2 Qualitative and Quantitative Characteristics of Scientific Production

Carvalho [71] highlights those journals with indicator values above 1.00 SJR. These journals are classified under the category of high relevance. This indicates that they have great scientific importance and the potential to change the state of the art of the topic in focus. The themes highlighted in the word cloud show that there are subjects that are widely researched, giving relevance to emerging themes such as the identification of positive alternatives such as energetic valuation of the material [44], treatments that correspond to sustainable management as composting [45, 46], and food production with lower impact potential, such as hydroponics [47]. The search for energy sources from non-recyclable sources was also conducted to improve the energy efficiency of the buildings [48-50].

4.3 Qualitative Characteristics of Scientific Production

The readers could identify the focus of the research based on the keywords [23]. The frequency of words allowed the evaluation of variations, changes, and trends to understand the state of the art of the chosen theme. In the last 20 years, the number of publications containing the keyword solid waste or reporting the disposition methods substantially increased [22, 68]. The "Electronic equipment residues" are registered as a material that has been increasingly studied in the last few

years. It is estimated that approximately 65.4 million tons per year can be produced. This has resulted in a significant improvement in the plant's industrial design and installation properties. This can help achieve sectoral sustainability [52]. The rapid growth of the consumer market of electronic products was observed worldwide. Many of these products become obsolete as they are toxic and contain precious metals. Hence, the materials should be recycled to reduce the negative effects exerted on the environment [51].

The theme "Organic waste" was present in 5 articles. According to FAO [72], the estimated food waste is approximately 1.6 billion tons per year worldwide. This reveals the importance of the correct solid waste destination. If not treated properly, organic wastes can result in environmental contamination, and that is an important issue in many countries [47]. According to Liberti et al. [44], when the food is inadequate for human consumption, recycling boundaries are set. Therefore, one-third of the world's production is wasted. Energy and natural resources are exploited to sustain the life cycle of food items. Thus, a high environmental cost is realized. This is primarily true if the material is lost during the production chain. Therefore, it is important to reduce food waste. As reported by Sussman e Gifford [45], composting is a very effective method that can be used to reduce the amount of material that would go to landfills. Even though homemade and community composting areas are present, many of the generated wastes end up in landfills. According to Lima [46], environmentally-friendly composting models are generally used in industrial kitchens, shopping malls, condominiums, and other small and medium size generators of waste. The materials produced at the end of the process are used as manure and low-cost organic fertilizer [47].

The environmental impacts were the focus of four articles, and primary attention was paid to the construction of undertakings. According to Barboza et al. [55], economic growth results in the search for spaces that can be used for new civil constructions, commercial centers, and industrial centers. This also results in an increase in the production of solid waste and environmental sanitation issues. The extent of water, air, and land contamination also increases. As reported by Alexandri et al. [54], when the sustainability system is to be followed, the bioclimatic, environmental, cultural, and social issues should be taken into consideration. Besides, the cycle of life of the projects, the ecology of the used material, the extent of disposition achieved, mobility, and sustainable design must be valued. In the article by Guo et al. [56], the degree of air conditioning achieved in houses, schools, restaurants, and shopping malls was analyzed. The levels of benzene, toluene, ethylbenzene, and xylene (BTEX) and volatile organic compounds (VOCs) were analyzed. Adverse effects to health are observed when people come in contact with these substances. People experience dizziness, fatigue, asthma, rashes in the throat, nose, and eyes, and other similar symptoms. It was observed that the concentration of BTEX inside shopping malls is high. Vancheri et al. [57] present a model that assists the traffic flows in the commercial centers, supports the shopping planning decisions, focuses on the environmental impacts, and helps evaluate the nitrogen dioxide concentration to estimate the level of road services and optimize the processes. By analyzing the "energetic efficiency" of buildings (shopping malls, hotels, and hospitals), the performance models were developed based on the tool evaluation model. Chen et al. [48] and Chen et al. [68] presented a methodical approach, based on the Lorenz curve, to comparatively evaluate the system. The statistic indicators were analyzed, or the physical simulations of the buildings were conducted based on the data. This tool allowed the identification of the inequality in the energetic performance of the companies. The mistakes concerning the distribution could be identified, and the efficiency could be improved.

Zhao et al. [49] reported a photovoltaic air conditioning system that can be used to achieve efficient performance and economic advantages. The system uses cooling technologies and solar heating techniques. The European government aims to supply local energy to residential areas, commercial centers, hospitals, eco-parks, small rural areas, islands, and communities that live in the mountains. To achieve this, it is important to integrate solar tower fields, unique cycle turbine gas, and the residual heat application system. The method can also be used in shopping malls for water heating and to cool general spaces to improve the energy efficiency of the undertakings. According to Pezzola, Danti, and Magnani [50], the European Union policy focuses on energy efficiency to achieve sustainability. This helps reduce the extent of global warming gas emissions.

The “Performance indicators” were studied the most, and 8 papers on this theme were reported. Kunc et al. [62] analyzed the attractiveness of the commercial centers in the Czech Republic and Slovakia and calculated the sub-variables based on previously reported international studies. Léo and Philippe [63] observed the concentration of customers in convenient commercial spaces in terms of location and services offered. They linked the location strategy of service companies looking for activities to analyze consumer-leading buyer flows. Kaihatu and Spencer [61] evaluated the flow dynamics at Indonesian shopping malls, bringing up indicators concerning the customers’ behavior to comprehend the competitive advantages in those spaces. The authors believe that there is a certain consumer bias toward certain establishments, and consumers prefer to return to those commercial centers. Léo, Philippe [63] and Maraz Brink and Demetrovics [60] discussed the compulsory buying disorder (CBD), which is a complex and highly discussed concept. Customers of four shopping malls in the Budapest region, Hungary, were the study samples. The authors used some indicators to analyze the permanence and validate the disorder. Cohen et al. [65] evaluated the nutritional values of the items to know the eating habits of children who frequently eat in fast food restaurants located inside commercial buildings (shopping malls). The concept of green products is related to the concept of sustainable production and supply chain management. This concept exerts a positive impact on the natural environment [35, 59, 72].

Special software can be used to check online buying habits [29] and obtain commercial information for Korean customers. The authors considered that the changes in the web pages and the nature of the information presented help increase the confidence of the consumers and highlight the importance of obtaining detailed information from the home pages and interfaces. The green procedures are followed at all parts of the supply chain to address environmental issues. Factors that directly influence the supply chain were also studied. Sadowski and Spachos [64] discussed the “internet of things” concept and reported the experimental results that may be used for the selection of intern localization systems in smart buildings.

5. Conclusions

The bibliometric analysis method can be used to understand indicators to achieve sustainability. This issue affects society and the environment as the enterprises are considered potential polluters. The historical information on articles published by scientific journals was identified. Significantly high numbers of papers are reported in the literature. However, papers on the solid waste management process used in malls have been rarely reported. This is an important topic of research. It was observed that there was a significant difference in the number of articles found using Science Direct and Web of Science. The number of articles identified using the latter was twice the number

of articles identified using isolated indicators. However, when the indicators were combined, equivalent figures were obtained. A significant increase in the number of publications was observed in the last 10 years. A significant amount of research on the topic was conducted on the European and Asian continents. These publications are present in journals with different impact factors, and most papers were categorized based on the Qualis/Capes classification system [34].

The bibliometric review method can be used to analyze large databases containing hundreds, thousands, or tens of thousands of articles or data. This study is relevant to the focal themes that are being studied and point out the emerging areas for research. The solid waste management system in malls, especially those that use indicators, has been rarely researched. The small number of articles demonstrates the need to conduct further research as shopping malls produce a large amount of waste daily, and the amount of waste produced per day can be equal to that produced by small cities with up to 30,000 visitors per day.

The Similitude Analysis method was used to form 6 groups, and the word residue was in the same group as food and environment. Five thematic sub-areas were identified. Waste management in shopping malls should be the object of research to better understand the processes and seek ways to improve managerial quality. This study typology should be developed for the different areas to identify relevant topics to be addressed by scientific research centers and centers of excellence. It is understood that the results reported herein can potentially help conduct future research on shopping malls.

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Author Contributions

André Cardim de Aguiar - data collection, data analysis; Soraya Giovanetti El-Deir - research coordinator, text writing and research reviewer.

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Competing Interests

The authors have declared that no competing interests exist.

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