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Facilitators and obstacles to the implementation of sustainable public bidding: bibliometric analysis

Sustainable public bidding (SPP) can be understood as the integration of economic, environmental, and social issues during the acquisition of goods, works, and services by government agencies or public sector companies, which have been widely used due to the sustainable issue. The general objective of this research is to carry out a bibliometric analysis regarding the available publications involving the SPP to understand the content, the subjects discussed, the positioning and motivational factors for its application, and the main obstacles (2011-2021). Methodologically, this is exploratory research with a descriptive nature with a quantitative and qualitative approach to the data. During the analyzed period, 65 articles on the subject were identified, using the keywords (sustainable; green; procurement; purchasing; public; barrier; drivers) published in English in the Science Direct Elsevier database. In this research, it can be seen that barriers and facilitators for the implementation of the SPP focus on specific and repeated issues in the analyzed researches. There are relevant factors in the application of the SPP such as financial constraint, support from top management, and government legislation. Finally, when looking at the economic development of the countries surveyed, the incidence of SPP is relatively influenced.

Palavras-chave: Sustainability; Green public bidding; Barriers and facilitators; Iramuteq.

Facilitadores e obstáculos à implementação de licitações públicas sustentáveis: análise bibliométrica

Licitações Públicas Sustentáveis (CPE) podem ser entendidas como a integração de questões econômicas, ambientais e sociais durante a aquisição de bens, obras e serviços por órgãos governamentais ou empresas do setor público, que têm sido amplamente utilizadas devido à questão sustentável. O objetivo geral desta pesquisa é realizar uma análise bibliométrica das publicações disponíveis envolvendo o SPP para compreender o conteúdo, os assuntos abordados, o posicionamento e os fatores motivacionais para sua aplicação e os principais entraves (2011-2021). Metodologicamente, trata-se de pesquisa exploratória de natureza descritiva com abordagem quantitativa e qualitativa dos dados. Durante o período analisado, foram identificados 65 artigos sobre o tema, utilizando as palavras-chave (sustainable; green; procurement; shopping; public; Barreira; motoristas) publicadas em inglês na base de dados Science Direct Elsevier. Nesta pesquisa, percebe-se que as barreiras e facilitadores para a implantação do SPP concentram-se em questões pontuais e repetidas nas pesquisas analisadas. Existem fatores relevantes na aplicação do SPP, como restrição financeira, apoio da alta administração e legislação governamental. Por fim, ao olhar para o desenvolvimento econômico dos países pesquisados, a incidência de SPP é relativamente influenciada.

Keywords: Sustentabilidade; Concurso público verde; Barreiras e facilitadores; Iramuteq.

Topic: **Desenvolvimento, Sustentabilidade e Meio Ambiente**

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INTRODUCTION

The realization of purchasing by the State resides through the bidding process, where a company is hired to perform a particular service, deliver products or perform works in public bodies in the Municipal, State, and Federal spheres. In Brazil, the current rule governing the bidding process is Law 8,666/93. The market of Public Bidding PB is one of the largest economic sectors in the world representing, in 2017, approximately 14% of the European Union's gross domestic product (GRANDIA et al., 2020). With 48 members, the World Trade Organization (WTO) has instituted the Agreement on Government Procurement, estimated at more than US$1,7 trillion per year[1]. At the national level, in 2014, the Brazilian government spent 20.2% of gross domestic product (GDP) on expenses in public procurement (SILVA et al, 2018).

Cheng et al. (2018) argue that the public sector can influence Sustainable Public Procurement (SPP), both by designing appropriate policies for this purpose and by leveraging "green" markets through this important instrument of public procurement. The public procurement sector focused on sustainability might end up serving as a model for other public sectors, even from different countries, as well as business-related sectors, to be able to get into this suitability of buyings. An example in practice concerns the State Decree of São Paulo, number 59.038/2013, in which articles 2 and 3 define that the acquisition or lease of vehicles by public bodies should prioritize cars with Flex engine, in which the supply of ethanol is considered to be less polluting than gasoline (SÃO PAULO, 2013). Thus, car rental companies will tend to prioritize flex vehicles in their purchases to offer this service when requested by the State.

Therefore, SPP has become one of the most important public practices, which allows the state administration to use its market authority to encourage private organizations to contribute to the achievement of their goals (ROSEL, 2021). Governments around the world have been trying to reduce the negative impacts of production and consumption through Sustainable Public Procurement (SPP) (LĂZĂROIU et al., 2020; SÖNNICHSEN et al, 2020).

Based on Rosel (2021), Lăzăroiu et al. (2020), and Sönnichsen et al. (2020), it is noticed the existence of several studies where the SPP are recognized as a mechanism for achieving environmental sustainability goals in the countries. This interest goes along with public policies on the environment that have been discussed from the end of the 20th century to the beginning of the 21st regarding sustainability. Bringing to the Brazilian context, the uses of the SPP were defined by the Ministry of Environment (MMA) as:

> A formal administrative procedure that contributes to the promotion of sustainable national development through the insertion of social, environmental and economic criteria in the acquisitions of goods, contracting of services and execution of works.

Academically, several authors discuss what green public procurement (GPP) would be. According to Alarcão, et al. (2018):

> Sustainable purchase applies to that commercial relationship in which a supplier of goods, products or services seeks to offer its customer [...] one or more qualifying elements [...] and which have, as their characteristic, the production of economic, social and environmental advantage for society"

For Lindström et al. (2020) SPP can be understood as “a purchase process in which the government

[1] https://www.wto.org/english/tratop_e/gproc_e/gpa_1994_e.htm

strives to acquire goods, services and works with less environmental impact, based on life cycle costs, compared to the non-green alternative that, otherwise, would be acquired". (LINDSTROM et al, 2020).

Most works are dedicated to the description of benefits, that is, (SOMBOONPISAN et al., 2021), social (MONTALBÁN et al. 2018), and economic results (SILVEIRA et al., 2020) that the SPP have already brought to institutions, society, and the environment. However, the simple observation of these elements does not explain their operating mechanisms and the necessary steps of the SPP implementation process within the government. Despite being able to systematically identify both the challenges and recognize the facilitator elements for the use of SPP, it enables a keen knowledge about this institute, bringing great gains to the public sector, which has SPP as an inducing tool for environmental, social, and economic development.

Taking into account the amplitude of the topic and current debates, the general objective of this work is to carry out bibliometric analysis regarding the available publications involving SPP to understand the content, debated subjects, positions, motivational factors for its application, and the main obstacles (2011-2021). This might enable us to analyze the application of public procurement as an instrument of social, economic, and environmental sustainability.

THEORETHICAL REVIEW

Since it is an attempt to present the current theoretical scenario on sustainable public procurement, it is important to bring the context in which this theme was developed. Historically, the idea of sustainable development came up from global awareness of the need to ensure the right of present and future generations to an ecologically balanced environment. (UN, 1992; GARCEZ et al., 2020).

World Scenario

The 1960s was the landmark regarding the ideas for the formation of international environmental law, linked to the idea of development, with the main global discussions on the subject in the 1970s (BLIACHERIENE, 2014). This factor is based on socio-cultural aspects of society at that time, driven by the *Counterculture* movement, initiated by young people in the West, in addition to the perception of the growing impact of environmental pollution, especially in developed countries.

From this movement emerges the naturalist ecological movement characterized by the direct influence of the libertarian ideals defended by intellectuals, such as Marcuse (1898-1979), Dumont (1904-2001), Illich (1926), and which was marked by its utopian ecology (ecotopia) and by antisocial attitudes typical of environmental denial. This "current of thought" considered Nature "as a sanctuary or as an object of aesthetic delight" which should be preserved, but was appropriated by capitalist logic transforming the "green" into a simple object of consumption, into no more than a simple commodity. (ROCHA, 2006). This movement was reflected institutionally in countries and world organizations in the 1970s, so there was a concern of the countries to take into account sustainable policies.

In 1968, a non-governmental organization called Club of Rome was created, founded by entrepreneurs and liberals, aimed at discussing economic, political, natural, and social problems (BELLEN et

al., 2016). In the year 1972, the group released a report called "The Limits to Growth", which preached the freezing of the economic growth of nations as an instrument to preserve the environment (ZAZO et al., 2018).

> The first report released (The Limits to Growth, 1972), was prepared by an MIT team, hired by the Club of Rome and headed by Donella Meadows, made a huge impact on the scientific community when, using mathematical models, it presented alarming scenarios of what the planet would look like if the pattern of development prevailing at the time persisted. (PETRASSI, 2016)

This report had a great repercussion in the scientific and global community at the time, so its proposals were debated that same year at the United Nations Conference on the Human Environment, organized by the United Nations (UN), held in Stockholm, Sweden (UN, 1972). Understood as the first large meeting to address environmental issues and the development of the planet, it created 26 principles and 109 approved recommendations on the environment (SCHLEE et al., 2018).

That conference highlighted the differences between developed and undeveloped countries: the former concerned about industrial pollution, the scarcity of energy resources, the decay of their stock markets, and other problems inherent in their development processes; the second, with poverty and the possibility of developing in the molds they had known until then (KOVALSKI, 2016). Since then, other reports often warned of the need to change the current pattern of development (BELLEN et al., 2016).

As a result of that meeting, the production of the *Stockholm Declaration* established principles and concerns regarding international environmental issues in the management of natural resources, pollution prevention, and the relation between environment and development. This element also brought about disparities between developed and emerging countries. In their view, freezing became an obstacle to their economic development, as this measure indirectly helped capitalist powers in a greater state of industrialization.

In 1987, through a commission constituted by the UN, and under the presidency of the Prime Minister of Norway, Gro Harlem Brundtland, it was developed the report called "Our Common Future", also known as the Brundtland report, which defended the idea of bringing development closer to the environment, implementing the concept of sustainable development (MARQUES et al., 2014).

Subsequently, the conferences Rio 92 (1992), Rio+10 (2002), and Rio+20 (2012) introduced a new view of the concept of sustainable development, based on the tripod of economic, social, and environmental dimensions; established an implementation plan to accelerate and strengthen the application of sustainable development; and defined a sustainable development agenda for the coming decades, introducing two very important themes: the green economy in the context of sustainable development and the institutional structure for sustainable development (CNO, 2021). It may also be said that problems related to global warming, as well as disasters that occurred in Chernobyl, were factors taken into account in the late nineteenth and twentieth-century for a more appropriate discussion on the idea of sustainable development.

Brazilian scenario

Brazil is the fifth largest country in the world in territorial extension, with continental dimensions, occupying about 8,516,000 km². Brazil is the result of environmental diversity, which must be preserved and

has, since the nineteenth and twentieth centuries, drawn attention to researchers and environmentalists to the need for preservation and development of sustainable policies. The repercussions of these global demonstrations on the environment in the 1970s, presented in the previous item, influenced Brazil on the need for sustainability with the natural wealth of its territory. At that time, it was created the Special Secretariat for the Environment (SEMA), coordinated by the Ministry of the Interior in 1973, which assumed the assignment of establishing norms and patents related to environmental preservation (BRASIL, 2021). The SEMA acted receiving complaints with problems related to Industrial, Urban, and Burning Pollution. This body acted in conjunction with the autarchy Brazilian Institute of Forest Development (IBDF), established by Decree No. 289 in 1967.

In the year 1981, Law No. 6938/81 was created. This law, still in force, focuses on aspects related to the environment, to exercise a balance between economic development and sustainability. According to some authors, such as Di Pietro (2016), this law was one of the pillars for the beginning of Public Procurement in Brazil, so that the government started to exercise its regulatory force in the market. In this respect, see this excerpt:

> Art 13 - The Executive Branch will encourage activities focused on the environment, aiming at:I - the development, in the country, of research and technological processes to reduce the degradation of environmental quality; II - the manufacture of antisolvent equipment; III - other initiatives that provide the rational use of environmental resources.

With the enactment of the Federal Constitution of 1988 (CF OF 88), the Magna Carta was concerned about sustainability, turning to what may be called possible environmental crimes committed against the Union's resources (Forests, Rivers, Seas, etc.). This is the example of Article 225, whose *caput* states that "everyone is entitled to an ecologically balanced environment, which is good for the common use of the people and is essential for a healthy quality of life, and which the public authorities and community have a duty to defend and preserve for current and future generations" (CF, Article 225).

This balanced environmental term reflects the seek to reconcile economic interests with environmental preservation so that both the State and the Society ensure this through cooperation. The article also imposes punishments on environmental offenders, setting out that, in paragraph 3, "procedures and activities considered as harmful to the environment shall subject the offenders, individuals or legal entities, to penal and administrative sanctions, without the obligation to repair the damage". In this way, the right to a healthy environment becomes a constitutional guarantee.

Over the years, mainly guided by the CF of 1988, new sustainability laws have been emerging in the country, showing a certain improvement in this aspect. The Environmental Convention that took place in Brazil in 1992, Rio de Janeiro, known as Eco 92, also helped the preservationist mentality in the country.

> After the advent of the aforementioned law and on the aegis of the Federal Constitution of 1988, other legal and infralegal norms were enacted to regulate different aspects of sustainability, such as Law No. 9,605/1998 (Environmental Crimes Law), Law No. 10,295/2001 (it establishes the National Policy on Conservation and Rational Use of Energy), Law No. 11,284/2006 (provides for the management of public forests for sustainable production), the Complementary Law No. 123/2006 (National Statute for Small and Micro Companies) and Law No. 12,187/2009 (Brazilian National Policy on Climate Change). (FERRAZ, 2021)

In 1999, the Environmental Agenda in Public Administration (A3P) was established, a program of the Ministry of Environment (MMA) which even today aims to encourage public institutions in the country to implement sustainability practices. The program is intended for public institutions of the three power spheres. It is a voluntary accession agenda that enables the partner institution to promote environmental preservation while optimizing the use of public resources. Among the central ideas, in which the program is structured, are the Sustainable Public Procurement and the Awareness and Training of Servants (MMA, 2021).

Taking into account the concerns of sustainability, the Brazilian State has also turned its attention to the bidding process, so that the bids have a look at environmental preservation. As already pointed out in the introduction of this work, the State has great purchasing power, with the ability to regulate the market and, in this case, provide a great opportunity to add environmental aspects to public procurement processes. This is due to the existence of the procurement process - as mentioned in the Introduction. The Public Biddings may be understood by Law No. 8,666 of June 21, 1993, which is aimed at selecting the most advantageous proposal for the public administration.

The bidding procedure is intended to ensure compliance with the constitutional principle of equality, the selection of the most advantageous proposal for the government, and the promotion of sustainable national development and shall be processed and judged in strict accordance with the basic principles of legality, impersonality, morality, equality, publicity, administrative probity, binding to the summoning instrument, objective judgment, and those related to them (BRASIL, 1993).

Initially, it is not wrong to say that the bidding proposal had a purely economic focus. However, as a result of sustainable issues, as described by social trajectory and, at the same time, legislative impacts; There was the incidence also in the Bidding Law so that in December 2010, this law was altered to express the sustainability character focused on the bidding process. Through law No. 12,349/2010, there was an increase in the expression of the element of sustainability, expressed as follows, modifying Article 3.

The purpose of the bidding is to ensure compliance with the constitutional principle of isonomy, to select the most advantageous tender for the government, and to promote sustainable national development and it will be prosecuted and judged in strict accordance with the basic principles of legality, impersonality, morality, equality, advertising, administrative probity, binding to the convening instrument, the objective judgment and those related to them (BRASIL, 2010).

In 2011, subsequently, Federal Law No. 12,462/2011, by establishing a differentiated regime of public procurement, brought in its text a mention of national sustainable development, in terms of bidding and contracts.

> Article 3 - The bids and contracts carried out in accordance with the RDC (Differentiated System of Contracts) shall follow the principles of legality, impersonality, morality, equality, publicity, efficiency, administrative probity, economy, and sustainable national development. They shall also be binding to the bid public notice and follow the principle of objective judgment.

The similarity of that article with law 12,349/2010 shows an influence on the sustainability issue of public procurement. However, although we could see the increase in the 2010 text with the concern for

Sustainability, in addition to this article of Federal Law No. 12,462/2011, there was still a lack of a discussion that could deal with SPP more comprehensively. Finally, on April 1, 2021, Law No. 14,133/21 was published, which came to replace the general bidding law – Law No. 8,666/1993. The new standard on sustainability has dealt with the subject in a much more complex and detailed way.

Unlike the innovation brought by Law No. 12,349 of 2010, which only added sustainability in the normative body of its article 3, the new law exposes and deals with the subject throughout its text, from the draft stage of the bidding process. For example, article 6, XXIV highlights the minimum elements that the preliminary draft must have to carry out the bidding process, including: "(e) parameters of adequacy to the public interest, the economy in use, ease of implementation, environmental impact and accessibility" (BRASIL, 2021).

Moreover, in addition to Law No. 12,349, at all subsequent stages of the event, which include a basic project (article 6, XXV), notice (article 25, §§5 and 6), the judgment of proposals (article 34, §1) and contract (article 124, §2, 137, VI, §2, 144 and 147, II and III); The question of sustainability is treated in detail and individualized (BRASIL, 2021). Therefore, we can conclude that the development of the topic of sustainability, which has been discussed globally, has brought repercussions in Brazil both on the issue of Laws with a view to environmental care and also on the issue of Sustainable Public Procurement.

Sustainable public procurement: definitions, previous studies, motivations, and barriers

Conceptually, the authors dealing with the subject have a similarity regarding the SPP definitions: their care for the environment. For Lindström et al (2020), sustainable public bidding can be understood as a purchasing process in which the public authority strives to acquire goods, services and works with a lower environmental impact, based on life cycle costs, compared to the non-green alternative that would, otherwise, be purchased. Conforming to Campelo et al. (2020), SPP would be a bidding process in which, in addition to the criteria normally used by the administration to select suppliers, the products or services that generate fewer negative impacts on the environment are added as criteria.

According to Cypreste (2013), SPP lies in the purchase process that includes the benefits to society, the economy and reduces the environmental impact. For Alarcão et al., 2018, sustainable public procurement can be understood as:

> The term sustainable procurement applies to that business relationship in which a supplier of goods, products, or services seeks to offer its customer, along with the main object of the transaction, one or more qualifying elements that were added to it during production or distribution, and which have, as a characteristic, the production of economic, social and environmental advantage for society, and must directly or indirectly promote global sustainability. (ALARCÃO et al., 2018)

State's inductive power in sustainable public procurement (SPP) can stimulate the market to invest in innovative solutions, whether at the technological or organizational level, with the potential to transform the public bidding market into an environmental policy instrument capable of bringing benefits to both the private and the public sector (PAES et al. 2019).

In spite of the consolidation of CPS in the public sector, it is necessary to understand the existing

barriers to its implementation, as well as the dissemination of solutions that have already been found by the public sector.

Cheng et al. (2018), in a recent review of the literature, showed that the main motivations for the acquisition of green goods and services are: qualification, training, and awareness of the staff in the contracting institution. "The organization's efficiency, incentives (better working conditions, for example), and stakeholder pressure provided ideal opportunities for motivation and adoption of GPP practices" (CHENG, 2018). He also indicates that the consolidation of the legislation is important for the institute's implementation.

Among other benefits, point out Paes et al. (2019) the engagement of stakeholders in the implementation of sustainability in the management of the institution, in addition to the incorporation of sustainable public procurement in planning, strategy, and setting goals to be implemented. The authors note the importance of the engagement of the entire institution and at all levels so that sustainable public procurement is implemented, because, "by adopting sustainable practices, organizations foster sustainable production and promote sustainable development, contributing to the environment, the social fabric and the economy" (PAES et al., 2019).

Between existing barriers to the implementation of SPP in public organizations, Testa et al. (2016) show the lack of information on the actual environmental impact of products, the difficulty of finding suppliers, and defining guidelines for purchases. Parallel to this, Paes et al. (2019) further clarifies that financial concern is still the biggest barrier to sustainable public procurement, with the public sector resisting paying more to buy in a sustainable way. The author points out this is due to two factors: the budget limitation of several public bodies and the discussion on the aspect of the most advantageous proposal for the government, which is often limited to the lowest cost as a result of regulatory reasons. In this way, the means of removing existing barriers to spread good practices is extremely related to the dissemination of the theme of sustainable public procurement and the sharing of their information.

METHODOLOGY

The methodology used in this article will be drawn in an exploratory approach of descriptive nature, with the quantitative and qualitative examination of the data through the use of the bibliometric study, thus allowing the analysis of the state of the art of scientific productions constant in a database (ATAMANCZUK, 2017; SOARES et al., 2016; SALADO et al., 2017; CHUEKE et al., 2015). In order to obtain the research data, the search was ordered in five stages, in search of the result.

The collection began with a systematic examination of Brazilian and foreign scientific publications in the database of native platforms of *ScienceDirect (Elsevier)*, *Scopus*, and *Web of Science*, having as temporal cut the period from 2011 to 2021 - the first semester. The choice of these platforms was because they were considered the world's leading databases of complete peer-reviewed texts (BURIN et al., 2020).

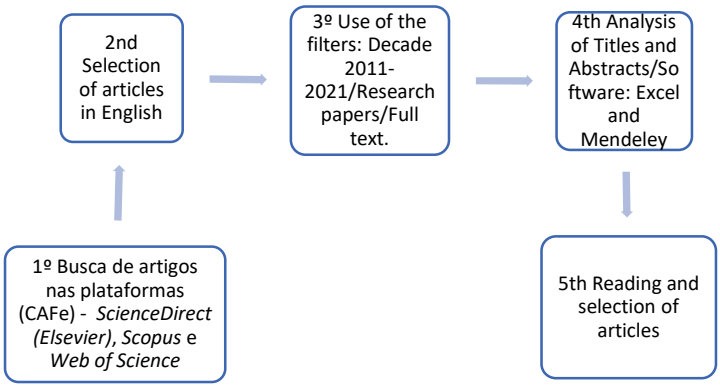

Figure 1: Flow chart showing the stages of data collection

The period chosen was to bring the research closer to the current time, not to mention the fact that in this last decade the use of environmental criteria in public biddings was sharply spread, as stated in Testa et al. (2012).

The language defined for the search on the platform was English because it is the most used language in scientific papers published in journals (SWALES, 1997). Data collection occurred between the months of December 2020 to June 2021, through the Capes Journal Portal, using remote access of the Federated Academic Community (CAFe), provided by Pernambuco Institute of Technology Association (ITEP). Initially, the search focused on titles, abstracts, and keywords of scientific articles (TITLE-ABSTRACT-KEYWORDS). The search sequence was the combination of more than one chain of terms related to the research object, generating three fragments: “SUSTAINABLE PROCUREMENT” AND “PUBLIC” AND “BARRIER” AND “DRIVERS”; “GREEN PROCUREMENT” AND “PUBLIC” AND “BARRIER” AND “DRIVERS”; “GREEN PURCHASING” AND “PUBLIC” AND “DRIVERS” AND “BARRIER”.

The purpose of building more than one chain of words has proved important to avoid the exclusion of any expression from the English language used by the scientific community that could harm the construction of the textual body.

After the initial search of the articles, the application of the filters was also carried out: delimitation of publication time for the range of 2011-2021 (first semester), full text, research articles, and the use of Mendeley software, in an effort to make the search more specific.

Excluding the filtered articles, a qualitative analysis of the titles and abstracts was performed, with the manual removal of the articles outside the main theme. After these steps, there was, in fact, the direction of the articles for the production of the research proposal.

After data collection and delimitation, the Excel program was used to systematize the selected scientific articles and, from these, perform a quantitative and qualitative analysis of the collected material. Regarding the quantitative analysis, the investigation of the results found resulted in the production of tables and graphs, in order to demonstrate how the scientific productions on the subject were developed,

respecting the precepts of bibliometrics. To this end, it was done a statistical analysis of the affiliation institutions related to the first five authors of the selected articles, the years of publications, the countries, and the continents in which the papers were produced.

For the stage of the bibliometric study that treated the data from a qualitative perspective, the scientific journals were analyzed considering the two main international and national journal rankings by quality. First, the Impact Factor (IF) was observed, published annually in the Journal Citation Reports (JCP), and considered the metric most utilized by researchers, based on the number of citations that articles in a journal receive (SOUZA et al., 2018). The second was Qualis, maintained by the coordination of improvement of higher-level person - CAPES and that is an instrument for evaluating the scientific production of postgraduate courses in Brazil. Qualis acquired relevant importance when it has become one of the evaluation criteria of post-graduate programs since 1998. (CUETO, 2019). For the latter, it was used the ratings from the 2013-2016 period.

The importance of the analysis of these rankings is relevant because, even indirectly, it indicates the thermometer, the relevance, and the prestige that the scientific community is giving to the studied theme and the publications in its journals (SOUZA et al., 2018). Then, the software was chosen to perform the bibliometric analysis. Among the most used software for the bibliometric study: VOSviewer, CiteSpace, Iramuteq among others, the present study used Iramuteq because the software provides a better graphical visualization of the body of the data studied, besides better adapting the search platforms used.

THE IRAMUTEQ was used to generate a cloud of the most mentioned words in the set of texts used in the research, in addition to analyzing the similarity of the terms. The word cloud was used as a tool to highlight the most prominent terms based on their frequency in the text (MELCHIOR, 2019). Thus, the higher the frequency of the word in the text, the larger the size of the word in the cloud. Therefore, this tool emphasizes the most significant terms, according to the analyzed content. The most frequent terms stand out and characterize the main keywords related to the subject in question.

Furthermore, the use of IRAMUTEQ is justified as a tool in the processing of qualitative data because it allows establishing a relationship between the conceptual elements of the productions in the period mentioned so that it is possible to establish the relationships existing in the publications that are being developed on the theme addressed (SOUZA et al., 2018).

After that, through the complete reading of the articles of the sample body, all the motivators and barriers indicated by the authors were identified in their work, with the construction of tables systematizing what these elements would be and how often they were pointed out in the selected articles.

RESULTS AND DISCUSSIONS

Descriptive Analysis: Scientific production, textual body

In Table 1, there are the search fragments and the results found according to the keywords pointed out in the methodology.

Table 1: Searches performed in the database: World scientific production.

Keywords	ScienceDirect	Scopus	Web of Science
Sustainable procurement	56101	2365	1419
Green procurement	47341	1203	867
Green Purchasing	285807	1698	3237
Sustainable procurement AND public	17304	115	611
Green procurement AND public	79046	102	355
Green Purchasing AND public	826	51	391
"Sustainable procurement" AND "public" AND "barrier" AND "drivers"	135	1	19
"Green procurement" AND "public" AND "barrier" AND "drivers"	205	3	13
"Green purchasing" AND "public" AND "barrier" AND "drivers"	277	0	6

On the ScienceDirect platform, it was observed the largest quantitative of articles with the sum of 56,101 publications for the theme of Sustainable procurement (Sustainable purchases). Taking into consideration the themes Green Procurement and Green Purchasing, there were 47,341 and 285,807 publications respectively. As for the combination of the previous expressions with the word public, the sum found was 17,304, 79,046, and 826 publications, respectively.

Finally, considering the combination of research fragments: “Sustainable procurement” AND “public” AND “barrier” AND “drivers”; “Green procurement” AND “public” AND “barrier” AND “drivers”; “Green purchasing” AND “public” AND “drivers” AND “barrier” were extracted the number of 617 articles in the platform database ScienceDirect (Elsevier) the amount of 617 articles. As for the other platforms observed, considering the small sample body seen in their databases, the relevance of their use was removed.

In the next step, after applying the filters: delimitation of the publication time for the interval 2011-2021 (first semester); complete text; and research articles, it has reached 147 exclusions, resulting in 470 articles.

Then, the remaining 470 articles were submitted to a qualitative analysis of the titles and abstracts, with the manual removal of articles that were not part of the central theme understudy, ensuring that all selected articles focused specifically (in general or in significant part) on the discussion of barriers and solutions for the implementation of SPP. For example, many surveys were focused on the private sector, and others that discussed sustainable public purchase were excluded when the research did not address the specific purpose of the paper - barriers and solutions. Based on this approach, there was a significant reduction of works, identifying 83 articles related to the theme. Following, the use of Mendeley software to better systematize and analyze the remaining articles, the sample was restricted to 65 articles that were finally identified and analyzed.

Distribution of publications over the period (2011-2021)

The time chosen for the search for publications was from 2011 to 2021 - the first six months - (Figure 3). The initial range of the research represents the time when literature addresses the barriers and solutions on SPP with priority (MICHELSEN et al., 2011; GIUNIPERO et al., 2012; CORREIA et al., 2013). This period confirms, in fact, consistency in the emphasis of the analysis of barriers and solutions for the implementation of SPP. Despite the discussion of SPP effective elements to be a relatively new area of research, it was observed a steady upward trajectory in the SPP literature over the 11-year research period (Figure. 02). Most

articles have been published in the last five years.

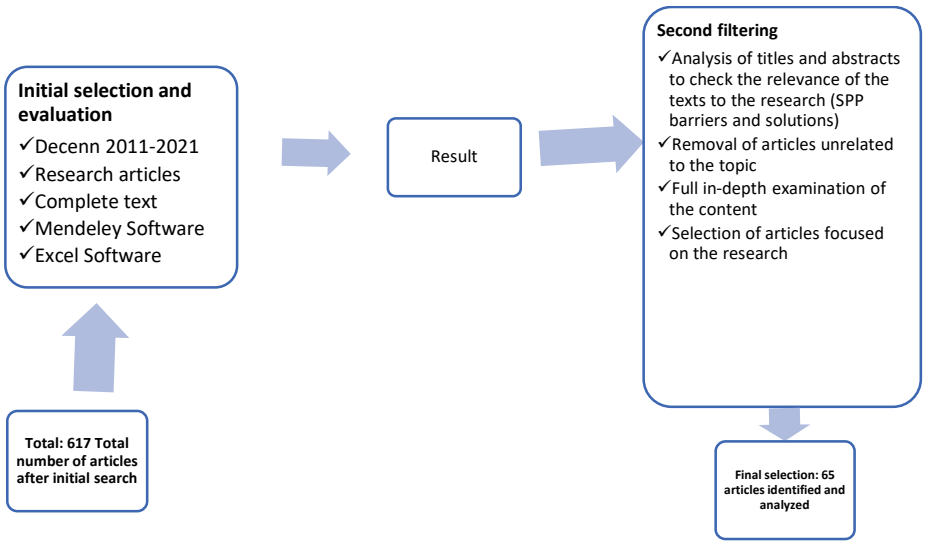

Figure 2: Illustrates the sequence of steps and the result obtained.

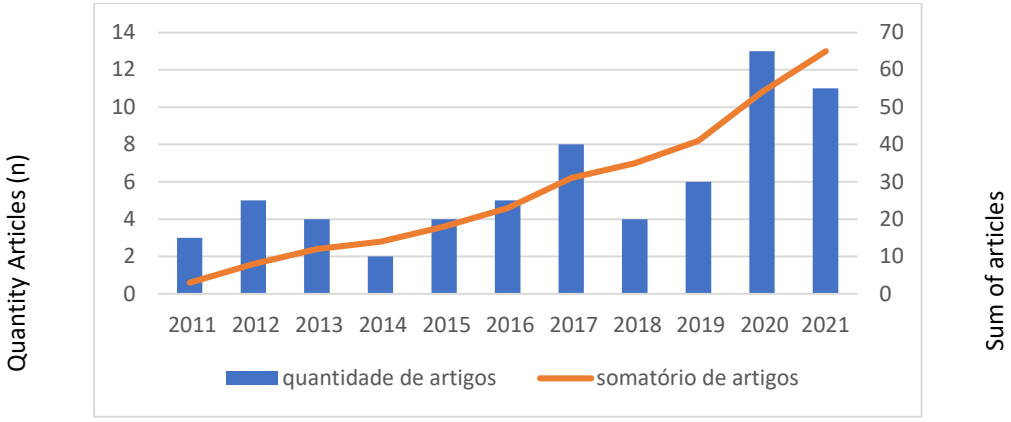

Figure 3: Number of publications and accumulated on Sustainable Public Procurement.

Before 2017, the number of articles was limited to a range of two to five per year. However, a greater number of publications were found for the period 2017 to 2021 (52 Articles), which corresponds to 80% of the publications. In particular, during the last two-year period (2020 and 2021), there were 24 contributions. The final survey was conducted through July 2021. It recorded a peak in 2020, showing a strong increase in research by the scientific community, probably related to the objective of better discussing the elements of effectiveness of SPP. It is important to note that in the first half of 2021, 11 articles had already been published, with a strong possibility of overcoming the quantitative of the year 2020 as the highest period of articles published on the subject until then.

Distribution of publications by journals

Table 2 provides the list of selected journal sources, along with information about the moment and relevant measures (Qualis and IF). In 65 articles obtained, 19 scientific journals were identified that had publications on the topic addressed. Of these, 9 journals do not have Qualis in any area of knowledge researched, representing 47,36%, while the rest of the selected journals were classified in Qualis A1, A2, or B1. The area that observed the highest relevance in Qualis was Environmental Sciences, emphasizing the

importance of the sustainability topic and incorporating 39 articles published in different journals. As for the Impact Factor as a measure of relevance of scientific journals, it is observed that the largest number of articles (29 papers) was published in the "Journal of Cleaner Production (JCP)" as a transdisciplinary journal.

Table 2: Classification of journals (2013/2016) for Engineering I and Environmental Sciences and Impact Factor 2020.

Magazines	Publications	Qualis 2013/2016 Engineering I	Qualis 2013/2016 Environmental Sciences	Impact factor 2020
Applied Soft Computing Journal	1	A1	A1	6,725
Ecological Economics	3	No Qualis	No Qualis	5,389
Environmental Impact Assessment Review	1	No Qualis	No Qualis	4,549
Industrial Marketing Management	1	A1	A1	6,960
International Journal of Production Economics	1	A1	A1	7,885
Journal of Business Research	1	No Qualis	No Qualis	7,550
Journal of Cleaner Production	29	A1	A1	9,297
Journal of Environmental Economics and Management	1	No Qualis	No Qualis	4,624
Journal of Environmental Management	4	No Qualis	B1	6,789
Journal of Purchasing and Supply Management	11	No Qualis	No Qualis	5,500
Proceedings of the Institution of Civil Engineers: Engineering Sustainability	1	A1	A1	1,795
Research Policy	1	A1	A1	8,110
Resources, Conservation & Recycling	3	No Qualis	No Qualis	10,204
Science of the Total Environment	1	No Qualis	A2	7,963
Socio-Economic Planning Sciences	2	No Qualis	No Qualis	4,923
Sustainable Futures	1	No Qualis	No Qualis	7,550
Sustainable Production and Consumption	1	B1	No Qualis	5,032
Technological Forecasting and Social Change	1	No Qualis	No Qualis	8,593
Technovation	1	No Qualis	No Qualis	6,725

As already pointed out, the Journal of Cleaner Production stands out as the journal that published the most scientific articles on the researched theme - 29 articles, which represents 44,61% of the total amount of 65 articles analyzed. The articles in this journal present, as the main theme of approach, the level of influence that the barriers and solutions have on the implementation of SPP, besides clarifying the moment when these elements are most frequently presented (LEAL et al., 2019; ALNUAIMI et al., 2019; FANG et al., 2020; GRANDIA, 2016). Also, a recurring subject, it is a question of understanding the most comprehensive determinants, at macro-level and meso-level, in addition to the most specific elements of the award of goods and services (ROSEL, 2021; CERVAVTES et al., 2020).

As the second journal with more publications, the Journal of Purchasing and Supply Management appears with 11 publications, representing 16,92% of total publications. This journal discusses in detail the main barriers and solutions that affect SPP processes (BALDUS et al., 2020; WANG et al., 2020; CORREIA et al., 2013). With a similar approach, the Journal of Environmental Management appears as the third main journal on the subject with 04 publications, with a percentage of 6,15% of the total analyzed. These publications mainly address external influence on the application of SPP (SIMCOE et al., 2014; MICHELSEN et al., 2011).

Distribution of publications in geographical areas

Table 3 provides data on the Regions/Countries in which the 65 articles were published. Divided among five continental regions, the publications cover 30 countries. The first five authors were highlighted, when present, making the research more faithful as possible, which totaled 190 researchers from different

nationalities.

Table 3: Distribution of scientific productions by geographical regions.

Geographic Region	Authors	Contribution
Africa	**9**	**4,21%**
Ghana	3	1,58%
Morocco	3	1,58%
Uganda	2	1,05%
North America	**13**	**6,84%**
Canada	1	0,53%
USA	12	6,32%
South America	**7**	**3,68%**
Brazil	5	2,63%
Chile	1	0,53%
Peru	1	0,53%
Asia	**37**	**19,47%**
Saudi Arabia	1	0,53%
China	21	11,05%
China	1	0,53%
United Arab Emirates	6	3,16%
India	3	1,58%
Malaysia	1	0,53%
Pakistan	4	2,11%
Europe	**110**	**58,42%**
Germany	1	0,53%
Austria	1	0,53%
Belgium	3	1,58%
Denmark	6	3,16%
Spain	11	5,79%
Greece	1	0,53%
Netherlands	5	2,63%
Ireland	2	1,05%
Italy	17	8,95%
Norway	14	7,37%
Portugal	3	1,58%
United Kingdom	21	11,05%
Sweden	20	10,53%
Oceania	**14**	**7,37%**
Australia	13	6,84%
New Zealand	1	0,53%

It was verified that more than half of the researchers - 58,42%, were from the European continent, highlighting the United Kingdom with (11,05%) of the number of writers, followed by Sweden (10,53%) and Italy (8,95%).

Asia was the second continent with the highest percentage of authors (19,47%), with China standing out, matching the United Kingdom's percentage with (11,05%) of the number of writers. Third in the rankings, Oceania had the percentage of (7,37%) of writers, with Australia having the percentage of almost all writers (6,84%). North America had the percentage of (6,84%) writers, with the US representing (6,32%) of the writers. The African continent represented the percentage of (4,21%) writers. South America had the lowest percentage observed (3.68%), with Brazil standing out with (2.63%).

Different from what was found in the percentage of authors by continents/countries, there was a certain homogeneity of subjects and approach by the writers of the various nationalities. Both comprehensive knowledge of the importance of SPP and discussion of barriers and solutions to public procurement were very similar (LEAL et al., 2019; MCMURRAY et al., 2014; LIU et al., 2019; GRANDIA, 2020; ORUEZABALA et al., 2012; AHSANE et al., 2017). However, there is an important difference in the results of

the studies when the economic/social context of the countries/cities analyzed is taken into account. At this point, concerning developed countries, a greater relevance on the environmental issue occurs when discussing the implementation of SPP. In developing countries, the focus is more on the economics of SPP implementation. (BAKIR et al, 2018; PACHECO et al., 2016; RAJ et al., 2020).

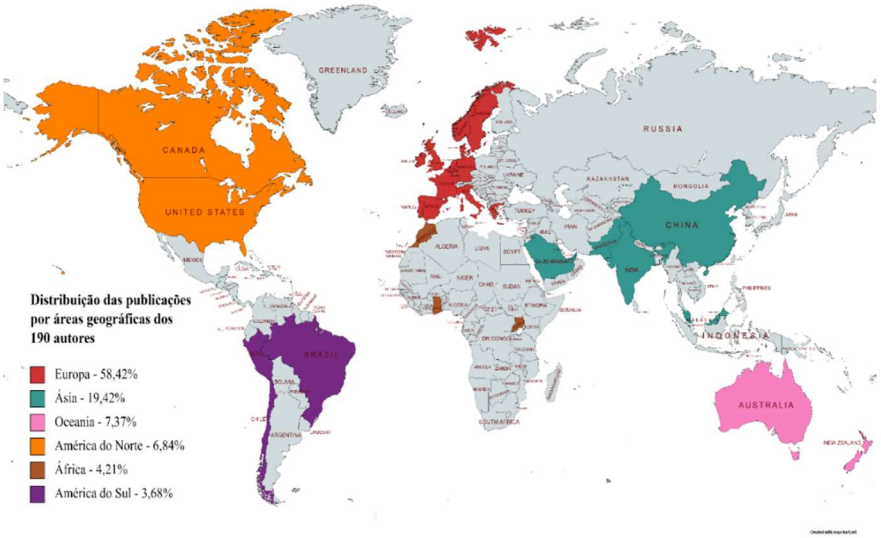

Figure 4: Distribution of publications by geographical areas of the 190 authors

Content Analysis

Iramuteq analysis results are composed of a map of similitude (Figure 4) and a word cloud (Figure 5).

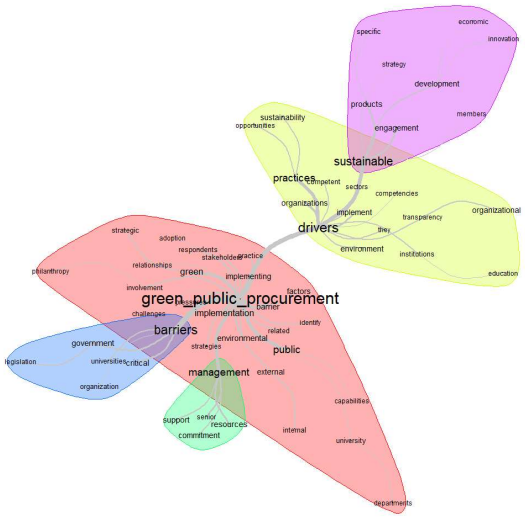

Figure 5: Word set represented by similitude analysis.

Figure 5 shows a visual map of the discussion of the SPP analyzed in the textual body set, with groups of concepts being easily discerned. In this map, it is observed that the link between words occurs according to their mutual relevance. Circles and their interconnections show the most likely connections between the concepts and the correlation between them. The size of a concept circle, on the other hand, describes the frequency of occurrence of that concept (the more prominent the concept/word, the more it was mentioned in the dataset). "GREEN_PUBLIC_PROCUREMENT" seems to be the most prominent and relevant

concept/word presented throughout the textual body. "BARRIERS" and "DRIVERS" are directly linked to "GREEN_PUBLIC_PROCUREMENT", with more branched connections for expressions such as: "Legislation", "organization", "economic", "innovation", "external", "stakeholders", "transparency" and "members". These last expressions refer to the types of barriers and solutions pointed out by researchers in the selected articles. Despite this, most barriers and solutions effectively pointed out by the researchers in the articles do not appear on the map. In the course of this work, these data will be clearer.

However, through the analysis of the "tree" of similarity, it can be considered through the connections that "there is a significant variation of barriers" (MCMURRAY et al., 2014), being "government legislation", "stakeholders" (ZAIDI et al., 2019), "internal obstacles", "external obstacles" (FANG et al., 2020) and the "financial restriction" (SOURANI et al., 2011), indicators which make it difficult to apply SPP.

Also, the analysis by Iramuteq reveals that "the innovation capacity of the organization has a positive influence on the implementation of green procurement" (BAKIR et al., 2018) and that "institutional pressures and citizens attitudes towards sustainability impact the level of adoption of sustainability in public procurement(...)" (RAJ et al., 2020). Research also points out that " sustainability education should be a mandatory part of the curriculum and employees should receive regular training on sustainability" (ZAIDI et al., 2019).

The content analysis presented in figure 5 represents a digital graph (word cloud) that shows the degree of frequency of the main keywords cited by the authors in the articles. The more words are used, the more striking is the representation of that word in the figure.

Figure 6: Word cloud of the textual body.

What is observed is that the most prominent keywords in the 65 articles of the textual body have been green_public_procurement, often 487 times (supplement form); drivers, frequency of 91 times; barriers, frequency of 76 times, sustainable, frequency of 68 times; management, frequency of 49 times; practices, with a frequency of 42 times; green, frequency of 57 times; stakeholders, frequency of 14 times; engagement frequency of 16 times; the financial frequency of ten times; government frequency of 17 times; and implementation frequency of 28 times. The results demonstrate that the search criteria in the databases are well aligned with the purpose of the research.

The fact that the words sustainable public procurement, barriers, and solutions appear frequently and prominently, indicates the interest of researchers in turning their attention to such factors as relevant

to the solution and development of a sustainable culture in public administration. As for the less prominent words: engagement, financial, internal education, stakeholders, and competencies, direct to the identification of the barriers and solution of SPP implementation.

The next results were constructed to identify and punctuate the main barriers and solutions found by researchers in their articles, in addition to the frequency in which they were identified. It is worth highlighting a reasonable diversity of indicators found in the studies, with most of the analyzed researches pointing out both barriers and facilitating/motivating elements for the practice of SPP. As for the facilitating elements, 12 distinct types were identified, listed in Figure 7.

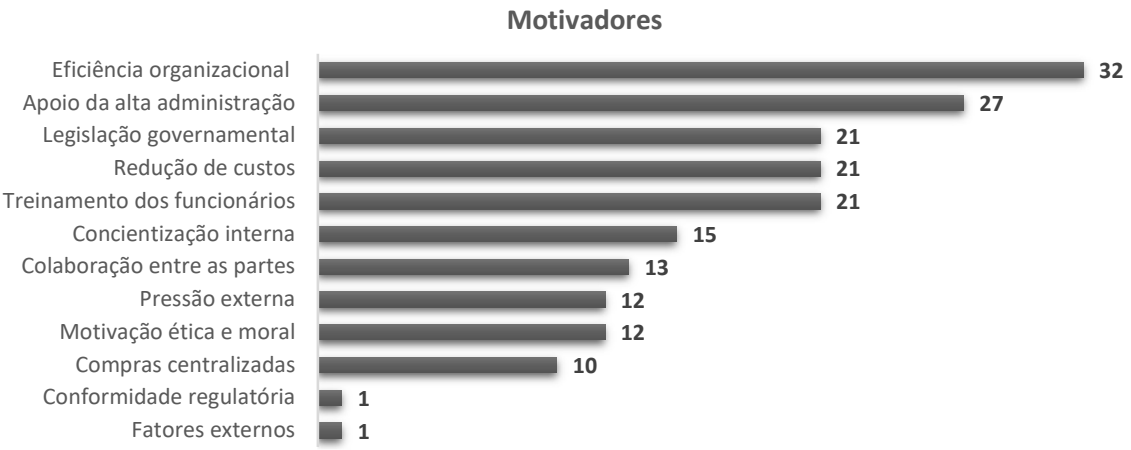

Figure 7: Facilitating Elements

The five most mentioned practices in the analyzed articles represented 65,59% of this category. When dealing with organizational efficiency, the facilitating element most observed by researchers, the articles describe that this element is constructed through cooperation between the various internal organs of public administration, where they channel their focus on the purpose of search for sustainability in public procurement (ALNUAIMI et al., 2019; DOMINGUES et al., 2017). Baldus et al. (2020) identified that the standardization of practices for public procurement was the element that emerged the organizational efficiency of public agencies in the USA. Sönnichsen et al. (2020) report that long-term internal cultural change has made the public bodies studied more efficient in reviewing their work.

Regarding top management support, articles report that such engagement presents itself as a strong indult for the effectiveness of the SPP. Roman (2017), identifies that public organ, which until then did not have an adequate view of sustainability, with the effective support of organizational leaders, led to a broad transformation towards the SPP.

The reduction of costs, which initially translates into immediate financial savings in the public procurement process, has shown an evolution in its concept, particularly in its relationship with PSCs. Most recent works have shown a change in the narrow focus on prices paid for a broader perspective based on value, covering, in the latter, the concepts of sustainability, environment, innovation, and life cycle (MEEHAN et al., 2017). Work conducted at the United Kingdom National Health Service indicates that, in the long term, value-based public procurement shows better regulatory compliance.

Another practice treated repeatedly in the articles is the government legislation used in the SPP. Both

the way that local and national legislation is promulgated and the interpretive form given by public bodies, are fundamental to the dissemination of sustainability issues (SMITH et al, 2016; CHIARINI et al., 2017).

The other practices mentioned are of great importance, some more recurring, for example, employee training for environmental issues; In addition: centralized buyings, ethical and moral motivation are reported more punctually on more specific issues. With the articles reporting some kind of barrier/obstacle to the implementation of the SPP, the main element observed was the financial restriction. Figure 8 presents 11 identified barriers.

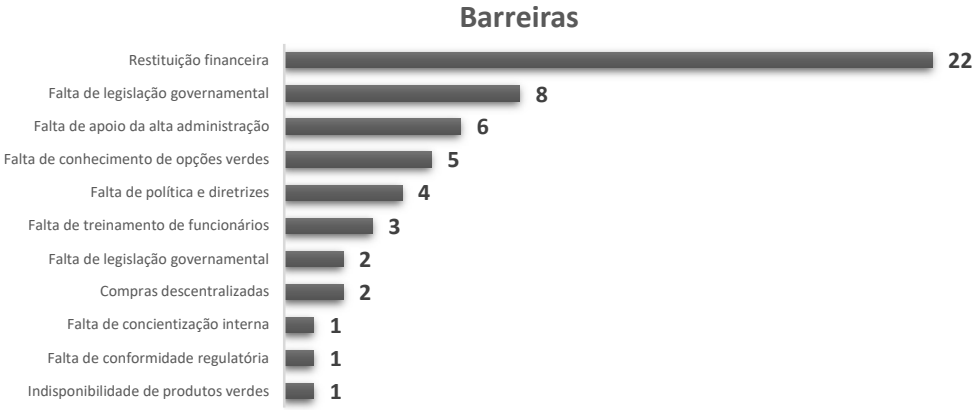

Figure 8: Barriers Identified.

The analysis of the authors on the financial restriction provides some evidence that deserves to be highlighted. Some of the works point to the comparison of the cost of common products with sustainable products, with the latter usually at a higher cost. In many cases, public organizations have no interest in sustainable procurement, taking into account the economic and legal barriers (AHSAN et al., 2017; SOURANI et al., 2011). Furthermore, which refers to the other part of the work, it relates to the relationship between the economic development of the countries studied and the use of SPP practices. Raj et al. (2020), point in their paper that:

> According to the 2018 Environmental Performance Index (EPI) report, Switzerland, member of the high income developed economy group, is at the top of the ranking of the EPI; Most developing economies is near the deep end. Similarly, in the SDG index, Sweden occupies first place, while India occupies a low position of 116 between 157 countries.

This observation points to the fact that public institutions in developing economies face budget constraints and acquisition costs above developed countries, which directly reflects their level of engagement in sustainable public purchases.

Zhu et al. (2013), when researching the impact of SPP on the Chinese public sector, identified that the economic factor is a sensitive element for SPP choices in that country. They point out that China has had fast economic and industrial growth, and became one of the global leaders in public purchases, with spending in 2011 of about 762,5 billion dollars. However, for being an economy still in development, with a population of over one billion people, it still faces a great challenge in implementing the SPP.

In addition to the unequal financial capacity of developed economies, developing economies differ from factors such as inadequate regulatory regime for sustainability (lack of government legislation) and lack

of consumer awareness as said (ASIF et al., 2020).

Other important dichotomies found in developing economies are related to the lack of training of government officials for sustainable acquisitions, lack of internal awareness, and unavailability of green products, as indicated by Zhu et al. (2013).

CONCLUSIONS

This paper, it was conducted a broad literature search on SPP between the years 2011 and 2021 to identify the main barriers and facilitating elements for its implementation. By conducting a bibliometric study, it was found through descriptive analysis that research topics and locations were relatively broad, with marked growth in works on sustainable purchases. It was identified publications between 30 different countries on five continents. The literature on SPP is spread among the main scientific journals and with relevant prestige among the scientific community, much by recognizing the importance of sustainability for the balance of the planet. It was also noted that the area of SPP has been growing in recent years, but still partly investigated, with 65 analyzed articles, 52 of these published between 2017 and 2021.

About the first survey question - QP1: What are the main barriers that complicate the implementation of sustainable public procurement (SPP)? -, 11 elements that make difficult the implementation seem to have formed most of the research interest in these 11 years of investigation. The results of the content analysis suggest that the obstacle of financial restriction was the element most observed by researchers in this period studied. The other elements had less repercussion, despite their importance. Many studies point to the comparison of costs between common products and sustainable products, the latter with a higher cost. The relationship between the economic development of the countries studied and the use of SPP has also been identified.

As for the second question of the research - QP2: What are the facilitating elements for the implementation of SPP by public institutions? –, 12 elements pointed out by the researchers were identified in the papers. Different from what was observed about the barriers, there was a relative homogeneity of percentage among the elements found in this second category. Nevertheless, the organizational efficiency element stood out, with the other elements presenting their relevance.

For future research trajectories on the barriers and solutions of SPP implementation, and to deepen the level of evidence of this topic, additionally to promote further debates, it would be very interesting to conduct a systematic review of the subject to bring a more detailed view on the issue. More specifically, given the scenario of economic imbalance between developed and developing countries, more detailed research into the impact of these "barriers and solutions" elements in these economies would bring an important theoretical contribution.

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