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## ENVIRONMENTAL STRATEGIC PLANNING AND SUSTAINABILITY INDICATORS: BIBLIOMETRIC STUDY FROM 2009 TO 2021 IN THE ACADEMIC PRODUCTION

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### ABSTRACT

With the challenge of making sustainable development increasingly broad, studies that can spread the understanding of environmental management aimed at strategic environmental planning are necessary. With this, performing a sustainability management by means of indicators will have repercussions in raising the environmental quality and socioeconomic parameters of companies and institutions. Objective: to provide a review and analysis of the knowledge related to environmental strategic planning through sustainable indicators in the scientific academic production. This is a descriptive exploratory research, with review of articles on the ScienceDirect platform through the systematization of steps, seeking to identify the indicators of sustainability and environmental strategic planning through scientific productions. Next, bibliometrics was performed, employing a qualitative-quantitative approach, seeking the evaluation of scientific productions in the period from 2010 to 2021. An increase in scientific production was evaluated, especially in the years from 2016 to 2018, evidencing the thematic axis addressed in the research, presenting a growth trend in the numbers of articles over the 10-year period. The European continent had represented 62.8% of the published scientific research focused on sustainability indicators and environmental strategic planning. Another relevant factor was related to the analyzed classes that showed how intensely the vocabularies are similar among the data treatments. In view of the results, the studies on environmental strategic planning, which must be analyzed and studied for a better understanding of the processes, seek to help and guide the decision making process when directed towards sustainable issues.

**Keywords:** Environmental strategy; Environmental Management; Operational; Sustainable Practices.

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## 1. INTRODUCTION

The debate on corporate sustainability started at the end of the 20th century. In light of this, in recent years, the concept that aims to make the three dimensions of sustainability compatible (Elkington, 1998), and in the corporate context, have reached aspects focused on strategic planning and governance, which have received greater institutional attention (Yu; Guo *et al.*, 2018; Hussain *et al.*, 2018). With this, public policies are needed that can facilitate the process of organizing to mitigate the potential impacts and collaborate towards sustainable development.

In this sense, it is relevant to understand the role of organizations that have been making efforts to develop practices focused on greater social responsibility and positioning themselves as a unit of transformation and development, through sustainable actions (Bernardi and Stark, 2018). Thus, institutions demand more efficient management that meets the economic constraints for each sector. Adding to these socio-environmental issues and the need to increase the transparency of public actions, the optimization of the application of resources and the implementation of initiatives that address the dimensions of the Triple Bottom Line (Henchén *et al.*, 2019) and governance arise. In this sense, carrying out a sustainability management through indicators and strategic planning will have repercussions in the elevation of the environmental quality and socioeconomic parameters of companies and institutions.

Another relevant factor is the use of indicators that is increasingly becoming a useful tool for policymaking and public communication (Musa *et al.*, 2019). In this way, the said task can play an important role in determining the applicability or effectiveness of action plans and goals, making the need for sustainability indicators at the operational level relevant for strategic planning (Gao *et al.*, 2017; Feleki *et al.*, 2020).

In the strategic planning area, it is relevant that the studies are based on indicators, because it is a decision support technique that evaluates policies, plans, and actions, in addition to identifying the most appropriate interventions in different scenarios through data that allow analysis at various levels of sustainability (Sebestyén *et al.*, 2019). A support system for analyzing production and creating suggestions for product and process optimization needs to be anchored in commonly used sustainable indicators and decision-making methods (Zarte *et al.*, 2019 Yáñez *et al.*, 2019).

From this perspective, this article aims to provide a review and analysis of the knowledge related to environmental

strategic planning through sustainable indicators in scientific academic production. The referred review allowed addressing and understanding the dynamics of integration in the environmental, social, and governance (ESG) dimensions of sustainability in the academic sphere.

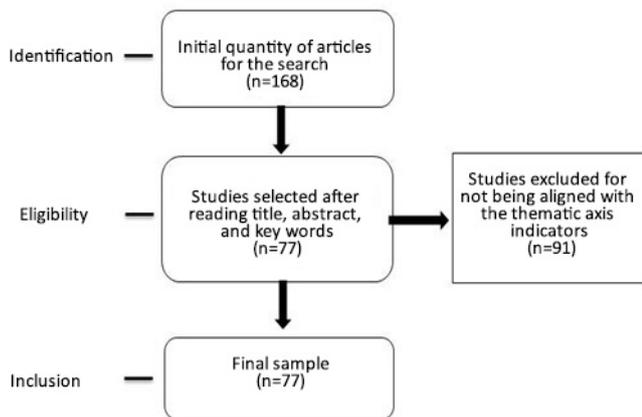
## 2. METHODOLOGY

For the development of this study, a bibliographic survey was conducted for an approximation of the thematic axis. This method consists of reading scientific journals and articles, raising the initial knowledge about the topic (Gil, 2017; Salvador *et al.*, 2020), as well as the determination of a bibliometric study, employing a quali-quantitative approach, which provides the research with a better quality in the description, evaluation, and monitoring of scientific productions (Martines-Lopez *et al.*, 2019; Marazitti *et al.*, 2021). According to the authors Liu *et al.* (2020), bibliometric analysis allows the researcher to get closer to the object of study, as well as making it possible to analyze the statistics of the academic literature from different perspectives.

Given the concept presented above, the article was structured by systematizing a set of steps in order to investigate the state of the art of works that apply the guidelines of sustainable strategic planning through indicators. The content analysis of the surveyed scientific productions focused on strategic planning and sustainable indicators of government institutions, aligning the following dimensions: Environmental, Social, and Governance (ESG). In view of this, the methodology of the article was broken down into three stages: (i) Data survey; (ii) Data treatment; and (iii) Data analysis (quali-quantitative of the bibliometric data).

### Data collection

The research was conducted in the ScienceDirect database, searching for scientific articles published from 2010 to 2021 in the first semester, using the platform of the Periodical Portal of the Coordination for the Improvement of Higher Education Personnel (Capes). For the query, it was used as search criteria the keywords “sustainable indicators” AND “strategic planning” AND sustainability. Then, 168 articles were located in English, totaling the search. To obtain more precise results, a filter was applied in which articles and scientific journals that were in accordance with the thematic axis of the research were selected, resulting in a total of seventy-seven (77) articles published and selected to proceed with the studies. The articles not used in the research served as support and basis for the discussion of this work (Figure 1).



**Figure 1.** Flowchart of the research with the thematic axes addressed

Source: The authors themselves

### 3. DATA TREATMENT

After selecting the articles, the collected data were analyzed and separated by categories such as year of publication, authors, institution, journal, and country. Then, the analyzed scientific articles were broken down by steps through formulas, and with the help of the Microsoft Office Excel program, enabling the data to be evaluated quantitatively and qualitatively, by means of descriptive statistics.

#### Data Analysis

As for this final stage, on the previous information of the research, graphs and charts were prepared to assist in the discussions of the textual analysis in a qualitative and quantitative way. The textual analysis was performed using the software Iramuteq (*Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires*). This program enabled the grouping of words according to repetition in the set of texts analyzed. Therefore, the analysis of similarity and Descending Hierarchical Classification (DHC) - profile analysis - were determined as methods of data treatment, referring to the titles, abstracts, and keywords of the articles analyzed (Camargo and Justo, 2018; Melchior and Zanini, 2019; Aragão Júnior *et al.*, 2021).

As for the DHC analysis, the following class categories were established as inclusion criteria: frequency greater than twice the average occurrence in the text corpus and association with the class determined by the chi-square value equal to or greater than 3.84, considering that the calculation is defined according to degree 1 and significance of 95% ( $p < 0.0001$ ). It is noteworthy that the contextualiza-

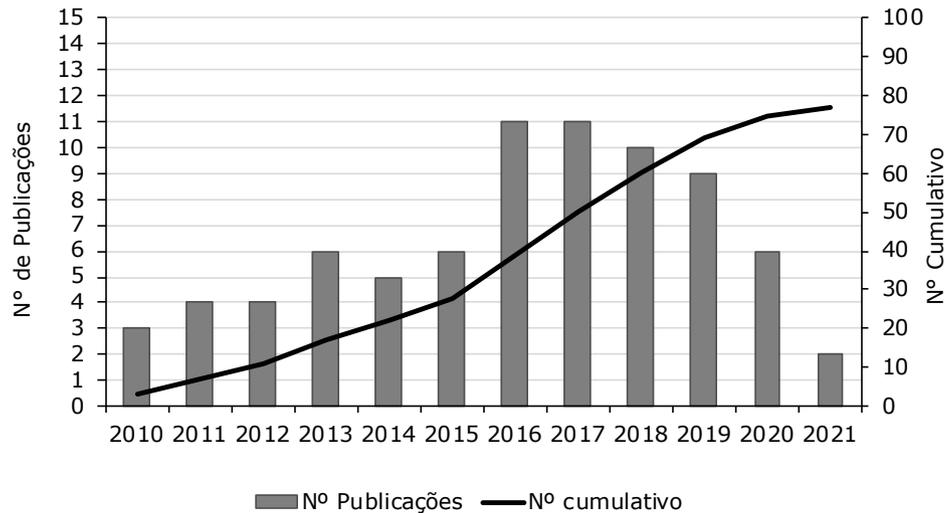
tion of each class denotes the theoretical reflection about the content, according to the indicators established to develop the study from the researcher's analysis (Salvador *et al.*, 2020).

Following another criterion for data analysis, a network mapping was performed using the VOSviewer software, which allowed observing the relevance of the articles in their periodicity (Elaheh *et al.*, 2018; Ferreira and Silva, 2019).

### 4. RESULTS AND DISCUSSIONS

Research interests in the area of sustainability have increased significantly. Several studies have investigated sustainability implementation from various points of view, thus incorporating numerous concepts, including sustainability indicators, strategic management, system implementation success factors, and project management (Chofreh *et al.*, 2018). Many authors (Galbreath, 2009; Engert *et al.*, 2016; Calabrese *et al.*, 2019) argue that integrating sustainability into strategic planning is key to achieving an organizational balance, considering that these attempts should address the dimensions of corporate sustainability along with impacts and interactions. Thus, it is observed that there was a significant increase in production in the years 2016, 2017, and 2018 in the thematic axis. Moreover, analyzing the cumulative quantity of publications in the period from 2010 to 2019, the years from 2017 to 2019 stand out with a gradual increase in the quantity of publications (Figure 2). During the last ten years, from 2010 to 2019, there was an increase in the interest of the scientific community on sustainable indicators, strategic planning, and sustainability, showing a concern in this context, since sustainability has as a principle to produce and use only the necessary resources (Melkonyan *et al.*, 2017; Braun *et al.*, 2019). In this sense, the studies reveal a positive trend as to the scientific interest in this subject, and the number of publications is a key indicator to measure the work done on the analyzed theme (Van-Nunem *et al.*, 2018).

The evolution of the thematic axis focused on organizational sustainability over the years is notorious. It is understood that the relationship between technology, innovation, and environment is necessary to achieve sustainability in the field of institutional strategic planning. From this, the various uses of natural resources are resulting in a more accentuated degradation of the environment; therefore, some changes must be considered as a source and solution for many environmental issues related to human activities. Facing this issue, academic studies began in the 1990s, when several authors discussed the viability of economic, environmental, and social growth, realizing the importance of guidelines for sustainability (Franceschini *et al.*, 2016).



**Figure 2.** Publications focused on sustainable indicators, strategic planning, and sustainability during the period from 2010 to 2021

Source: The authors themselves

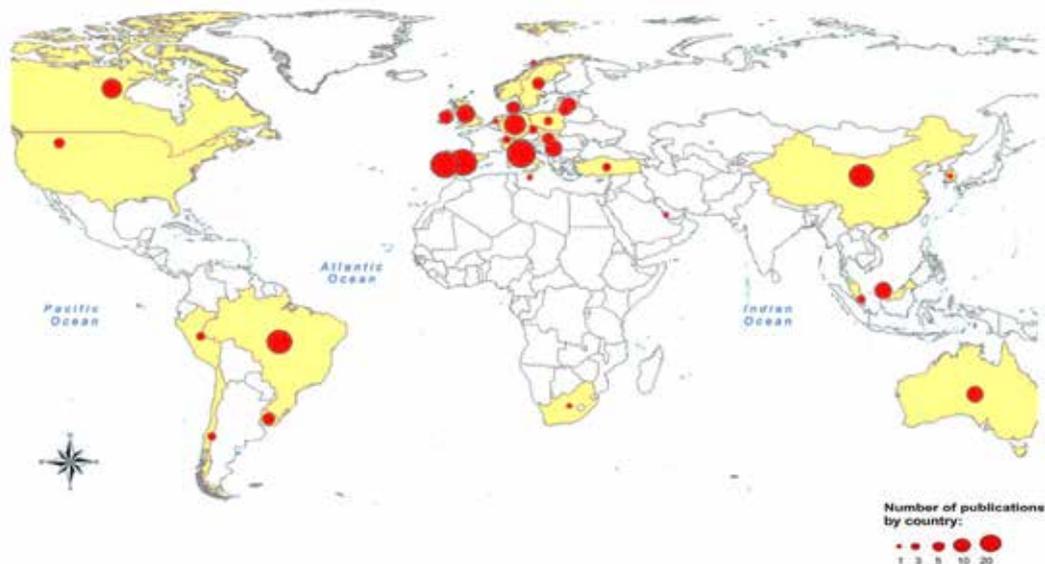
As the research field has evolved, the scope of literature on innovation and sustainability, organizational and institutional aspects have increased according to different perspectives, including determinants for minimizing environmental impacts (Pang and Zang, 2019). For the authors, studying the interrelationship between sustainability and strategic planning plays an important role in improving business operations and achieving development goals, in the long run (Wichaisri and Sopadang, 2017; Zemigala, 2019).

The scientific productions regarding the established indicators encompassed 93 institutions, from 33 countries and 223 authors represented by certain continents. The 18 countries of the European continent represent 62.8% of the scientific research published in ScienceDirect, while Asia had a result of 14.8%, South America 12.4%, North America 6.4%, Oceania 3.4%, and Africa 0.5% (Figure 3). This prevalence shows interest by academic researchers in studies in the dimensions of environmental and economic management, contributing to the advancement of science from a spatial perspective (Wang *et al.*, 2019). According to Paolliti *et al.* (2019), the European Union is the main reference point when it comes to sustainability policies, where they must combine economic, social, and environmental considerations in an integrated manner. Italy and Spain are European countries in which development has been concentrated in a few major “urban hubs”, generating different levels of sustainability within the country.

Regarding the results generated from the profile analysis (DHC), the five classes arising from the groupings of seventy-seven (77) corpuses of the segment of texts, according to the thematic axis of the research, are denoted. Given this,

the divided classes showed how intensely the vocabularies are present in the text corpus; thus, it is perceived that the ESG dimensions are grouped together, since they present similar vocabularies among the data treatments, but differ in the correlation of the segments of the texts, according to the scope of the analyzed context. According to Alsayegh, Abdul Rahman, and Homayoun (2020), studies that can ensure efficiency and evaluate corporate behavior to ensure sustainability practices and with respect to decision-making are relevant. With this, it becomes a more solid structure when the triple bottom line and the ESG dimensions are adjusted.

As for the classes, it was observed that classes 2 (21.1%), 3 (17%), and 4 (18.1%) were stable in all dimensions, that is, composed of text segments with similar vocabulary. On the other hand, classes 1 (20.2%) and 5 (23.6%) differ in the environmental and social dimensions, which demonstrates a greater comprehensiveness regarding the contextualization of the typical vocabulary of each class, becoming different from the text segments of the other classes and similar to each other. This allows us to interpret the formations of each class, as well as to understand the approximations and divergences in the grouped classes. The percentage analyzed corresponds to the occurrence of the word in the text segment in the classes in relation to the text corpus. The  $\chi^2$  corresponds to the associations of the words with the classes of the common-use term (Chart 1). Studies developed by Silva and Abreu (2018) who, using DHC analysis, identified the lexical content and text segments may show relevance with institutions’ corporate social responsibility actions depending on the analysis developed.



**Figure 3.** Gradation by number of scientific publications registered in ScienceDirect by country

Source: The authors themselves

It is thus observed another analysis performed that proves the studies of the ESG dimensions aligned to environmental strategic planning and sustainability indicators, with greater grouping in cluster 2 (analysis group), focused on the characteristics aligned to governance. This denotes a prerequisite to ensure the research that addresses the indicators focused on strategic planning and sustainability (Figure 4), considering the occurrences of the words, stakeholder, Implementation, and Framework. It is noticeable that in cluster 1, the word indicator makes connections with the others, where it includes strategic planning, sustainability, and impact, and is a grouping aligned with the thematic axis of the research.

From the knowledge through the indicators, organizations can trigger and develop sustainability in the vision, mission, and business strategy, which allow the centralization of all sustainable activities in a system so that they can monitor institutional performance (Chofreh *et al.*, 2018). Research data is essential to develop sustainability; therefore, institutions are motivated by the performance of the results in identifying and solving the problems they seek to impact positively, using this information in organizational decision making.

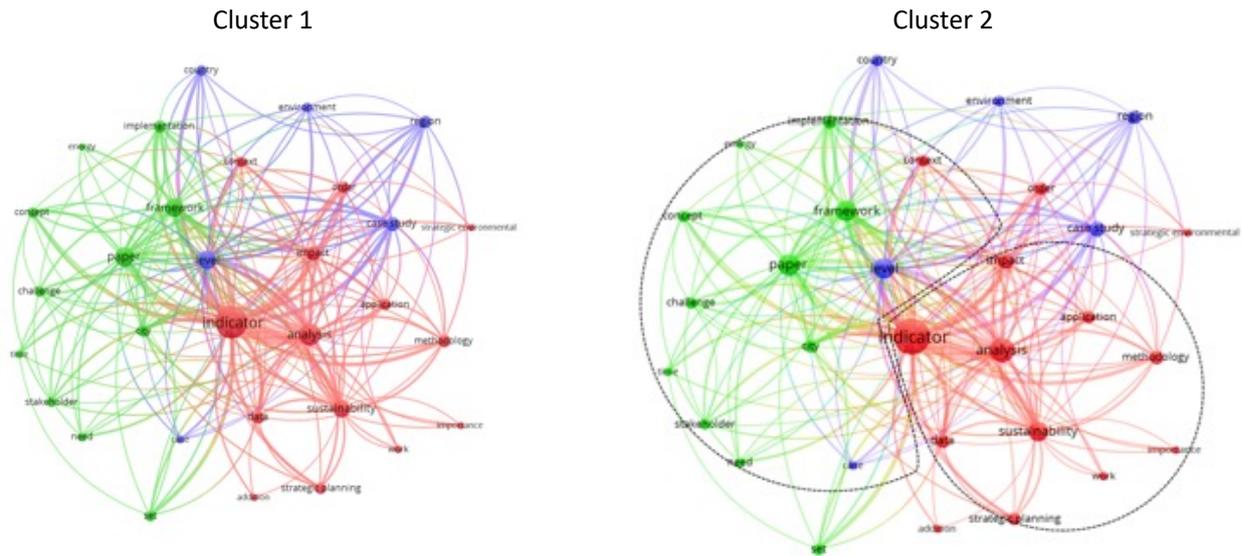
As for the similarity analysis, the occurrence between words was observed, generating clusters and ramifications, highlighting among them: "indicator", "plan", "sustainability", "management", "strategic", "environmental", "assessment", and "sustainable development", which form a connection between groups of words, joined by halos, and

together bring a connection with the theme addressed. It is relevant to highlight the contextualization in the discourse made between the words through the formation of six clusters and the significance. In this sense, a connection is noted between plan, strategic, and environmental, thus reaffirming the synthesis of the co-occurrence of the DHC analysis. Similarly, the other ramifications are observed, denoting the thought of the study addressed, in which the indicators analyzed are linked to a correlation between the areas of study and theoretical views on the subject (Figure 5).

## 5. CONCLUSION

The development of a strategic environmental planning based on sustainability indicators presents itself as an object of interest in science, which denotes a number of published articles. Some studies were evaluated quantitatively. As for qualitative analyses, there were greater results in the areas of strategic planning and sustainability. Thus, according to the thematic axes, understanding the bibliometric analysis is relevant, because the result along the years demonstrates the dimension that this theme is taking in each region, with a significant increase over the years. However, they demonstrate that studies are important to portray the concern with sustainable development on the part of institutions.

In the accumulated result in the period studied, a significant increase in publications was registered in the last 10 years, especially in the European continent. These publications are in journals with different impact factors. In view



**Figure 4.** Network map analysis and clustering through the indicators of the thematic axis of academic research in the period 2010 to 2021

Source: The authors themselves

of the results, the studies on the thematic axis should be further researched so that this theme can be better understood and to help in the development of a more sustainable and balanced institutional environment, based on ways to improve the quality of life and ensure that decision making is done through the study of indicators.

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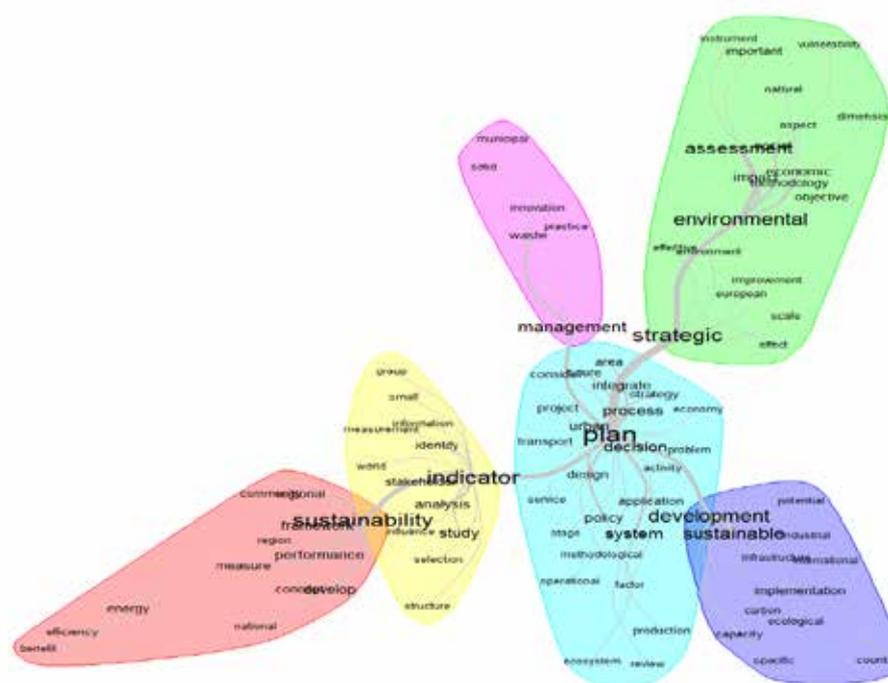


Figure 5. Similarity analysis through the indicators of the thematic axis of academic research in the period 2010 to 2021

Source: The authors themselves

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