

## The panorama of scientific productions regarding environmental accounting in the years 2011 to 2021: A bibliometric review



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### ABSTRACT

This article aims to map and analyze the configuration of international scientific production

on environmental accounting, using the international databases ISI Web of Science (Wos) and Scopus. The methodology of bibliometric literature review was used and following the laws of Bradford, Lotka and Zipf the results that addressed the theme were analyzed. R and Excel software were used to treat the data. According to the results the authors who stand out most internationally are Matias Laine, Collin Dey and Tung Dao Nguyen and most of the authors who publish on the subject are from the United Kingdom and Italy with a total of 24 and 17 publications respectively. The publications on the subject have a significantly positive trend, but in some years observed there was a decrease in the number of publications.

**Keywords:** Environmental Accounting, Sustainable Development, Bibliometrics.

## 1 INTRODUCTION

The concern with the environment is one of the subjects most addressed by the literature in the last decades, contemplating all areas of knowledge. In the area of accounting, the introduction of such an approach was due to the need for effective practices of environmental management controls, seeking to minimize or eliminate the negative effects caused in the environment by business activities (TISSOTT et al., 2021). To respond to these challenges, environmental accounting was implemented (TISSOTT et al., 2021), and thus, [...] "many organizations have sought to introduce it as a way to make a profit in a sustainable way, in order to protect scarce natural resources" (SILVA; LEPRE; Smith, 2015, p. 40). Thus, environmental accounting aims to identify, measure and disclose the internal and external impacts related to the use of natural resources and the production of polluting waste.

Nowadays, information regarding environmental responsibility is disclosed by companies in a much higher proportion than in the early 90s (RIBEIRO, 2012). Companies use this information as marketing, seeking to reach an audience increasingly interested in environmental responsibility. Through the study by Lima et al. (2012), which analyzed the "Biggest and Best" Brazilian companies



of the year 2009 published by Exame magazine, the author found that most companies have been showing concern with environmental issues and using Environmental Accounting.

"Environmental Accounting has been growing and conquering space within companies, because natural resources have been increasingly scarce, and also because society has increasingly demanded a socio-environmental posture from organizations" (ABREU; SILVA; FERRACINI, 2021, p. 3189). Thus, understanding the importance of the subject, a research problem was developed to guide the study and is presented as follows: What are the characteristics of the international scientific production regarding environmental accounting in the period from 2011 to 2021?

The study aims to map the international scientific production on the subject between the years 2011 and 2021. Complementing the general objective, the specific objectives are: to analyze the main results and characterize the peculiarities of this scientific production. To answer the research problem in question and achieve the proposed objectives, the method used for the research was the bibliometric literature review. Bibliometrics, as a quantitative method, consists of the application of mathematical and statistical methods in order to quantify and describe the panorama of scientific productions of a given subject (HOLGADO-SILVA et al, 2017). The following text is organized as follows: the methodological procedures, presentation and discussion of the results, final considerations and references.

## 2 METHODOLOGICAL PROCEDURES

The methodology used for the article was the bibliometric review, seeking to quantify the scientific production related to the theme of environmental accounting in the period from 2011 to 2021. The bibliometric research proposes to critically analyze the results expressing aspects such as main authors, main journals and countries of origin, among other important points referring to the scientific production of a given subject (CARMO et al., 2016). "Bibliometrics is governed by a set of empirical laws and principles and is associated with Information Science. The founding laws are: Lotka's law of author productivity; Bradford's law of dispersion of periodicals; and Zipf's word frequency law" (HOLGADO-SILVA, 2017, p. 2046).

To achieve the objectives, we sought to map and analyze what was produced in the area of administration and accounting on environmental accounting, in international journals in the years 2011 to 2021. Thus, the two databases were chosen, the main collection of *the Web of Science* and *Scopus*. The keywords used for the two databases were "environmental Accounting", with the following frameworks: a) in the *Scopus database*, only fully open access articles were searched in the areas of study of "Business, Management and Accounting, Economics, Econometrics and Finance, Environmental Science, and Social Science", searching for the term in the title, keyword, and abstract. On this basis, through these frameworks the result was obtained 184 articles. b) in the *Web of Science*



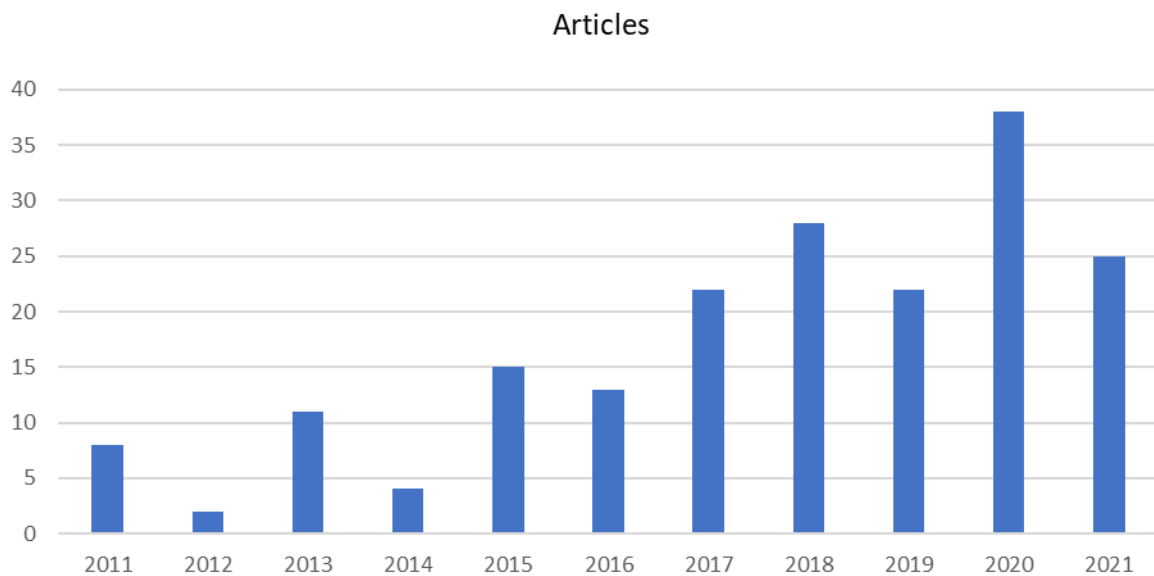
database, only fully open access articles were searched in the study areas (WOS categories) of "Business Finance, Green Sustainable Science Technology, Environmental Sciences, Business, Environmental Studies, Environmental Engineering, Management", searching for the term in the title, keyword and abstract. A total of 16 articles were obtained.

The two databases were exported in Excel file and joined for analysis. Duplicates were excluded, thus resulting in 188 results for analysis. Where the R software was used to develop the bibliographic analyses through the Biblioshiny package.

### 3 PRESENTATION AND DISCUSSION OF RESULTS

According to Figure 1, which represents the evolution of publications on this topic, it can be seen that there was a great growth in the number of publications. Going from 8 publications in the year 2011 to 38 in the year 2020, and falling to 25 publications in the year 2021 (the survey was conducted on December 11, 2021. Considering that the year 2021 has 20 more days, if the survey is conducted the following year, perhaps there may be changes in the number of publications in the year 2021). Although the publications have a growth trend we also see that this growth is not constant, with decreases in some years.

Figure 1 – Distribution of publications by year.



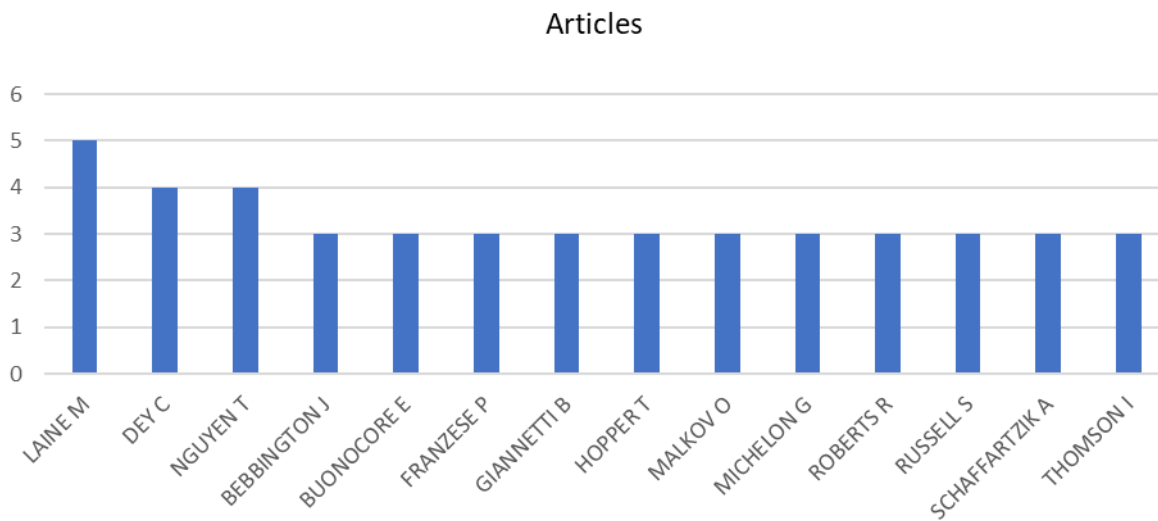
Source: Prepared by the author (2021)

After the analysis of the number of publications per year, described in the previous figure, Figure 2 represents Lotka's Law, which expresses the productivity in numbers of publications per author. In this figure are classified the 14 main authors, highlighting the author Matias Laine, with 5 published articles, followed by Collin Dey and Tung Dao Nguyen with 4 publications, and the rest with publications less than 4. The Environmental Accounting theme does not Has none author



from great expression, considering only the number of publications. But one cannot draw any conclusions without assessing the quality of the articles, even if numerically they are insignificant.

Figure 2 – Productivity per author.



Source: Prepared by the author (2021)

Table 1, which represents the most cited articles, highlights the article "Environmental Accounting for Pollution in the United States Economy" published in the American Economic Review in 2011, by the authors Nicholas Z. Muller, Robert Mendelsohn and William Nordhaus, where it was cited 258 times. Then by the article "Achieving the United Nations Sustainable Development Goals: An enabling role for accounting research" published in the journal Accounting, Auditing & Accountability Journal in 2018 by authors Jan Bebbington and Jeffrey Unerman totaling a total of 226 citations. In third place is the article "Benefit relevant indicators: Ecosystem services measures that link ecological and social outcomes" published by the journal Ecological Indicators in 2018 by the authors Lydia P. Olander and nine other authors, with a total of 104 publications.

The article "Growth in Environmental Footprints and Environmental Impacts Embodied in Trade: Resource Efficiency Indicators from EXIOBASE3" published by the Journal of Industrial Ecology in 2018 by authors Richard Wood, Konstantin Stadler, Moana Simas, Tatyana Bulavskaya, Stefan Giljum, Stephan Lutter and Arnold Tukker totaled 93 citations. In fifth place is the article "Globalisation, accounting and developing countries" published by the journal Critical Perspectives on Accounting in 2017 by authors Trevor Hopper, Phillippe Lassou and Teerooven Soobaroyen with 91 citations.



Table 1 – Most cited articles.

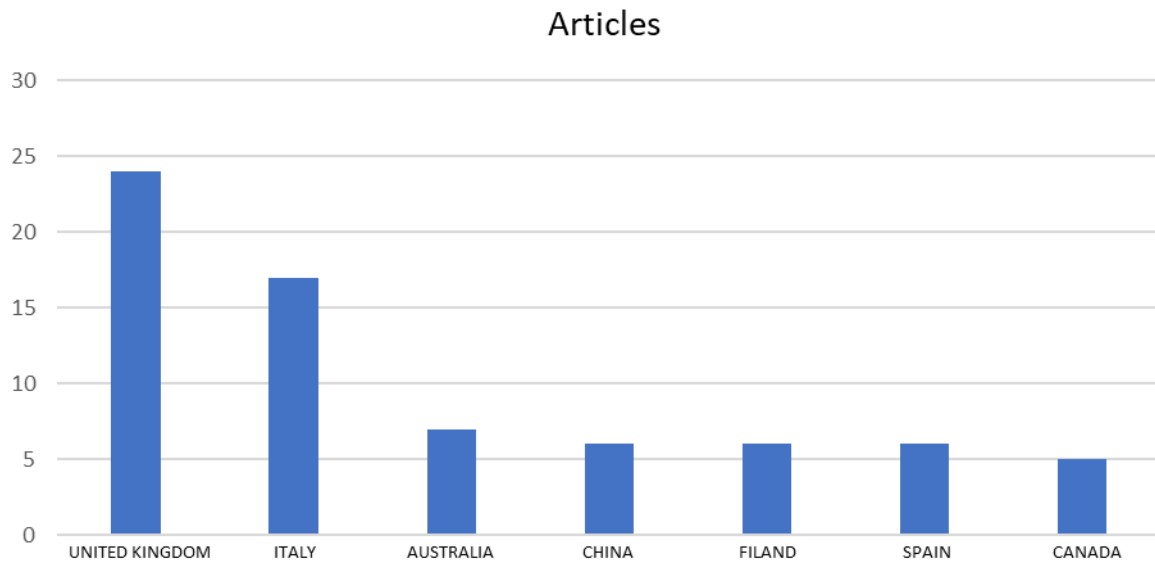
References	Article title	Periodic	Total Citations
MULLER NZ, 2011, AM, ECON REV	Environmental Accounting for Pollution in the United States Economy	American Economic Review	258
BEBBINGTON J, 2018, ACCOUNTS AUDIT ACCOUNT J	Achieving the United Nations Sustainable Development Goals: An enabling role for accounting research	Accounting, Auditing & Accountability Journal	226
OLANDER LP, 2018, ECOL INDIC	Benefit relevant indicators: Ecosystem services measures that link ecological and social outcomes	Ecological Indicators	104
WOOD R, 2018, J IND ECOL	Growth in Environmental Footprints and Environmental Impacts Embodied in Trade: Resource Efficiency Indicators from EXIOBASE3	Journal of Industrial Ecology	93
HOPPER T, 2017, CRIT PERSPECT ACCOUNT	Globalisation, accounting and developing countries	Critical Perspectives on Accounting	91

Source: Prepared by the author (2021)

A Figure 3 Represents the concentration of Articles by country of its corresponding authors. In this figure the 7 main countries were expressed. With 24 published articles, authors from the United Kingdom stand out, followed by Italian authors with 17 published articles. In third place are Australian authors with 7 published articles, followed by authors from China, Finland and Spain with 6 published articles each and Canadian authors with 5 publications. The rest of the countries have authors who total publications of less than 5.



Figure 3 – Number of articles per country of their corresponding authors.

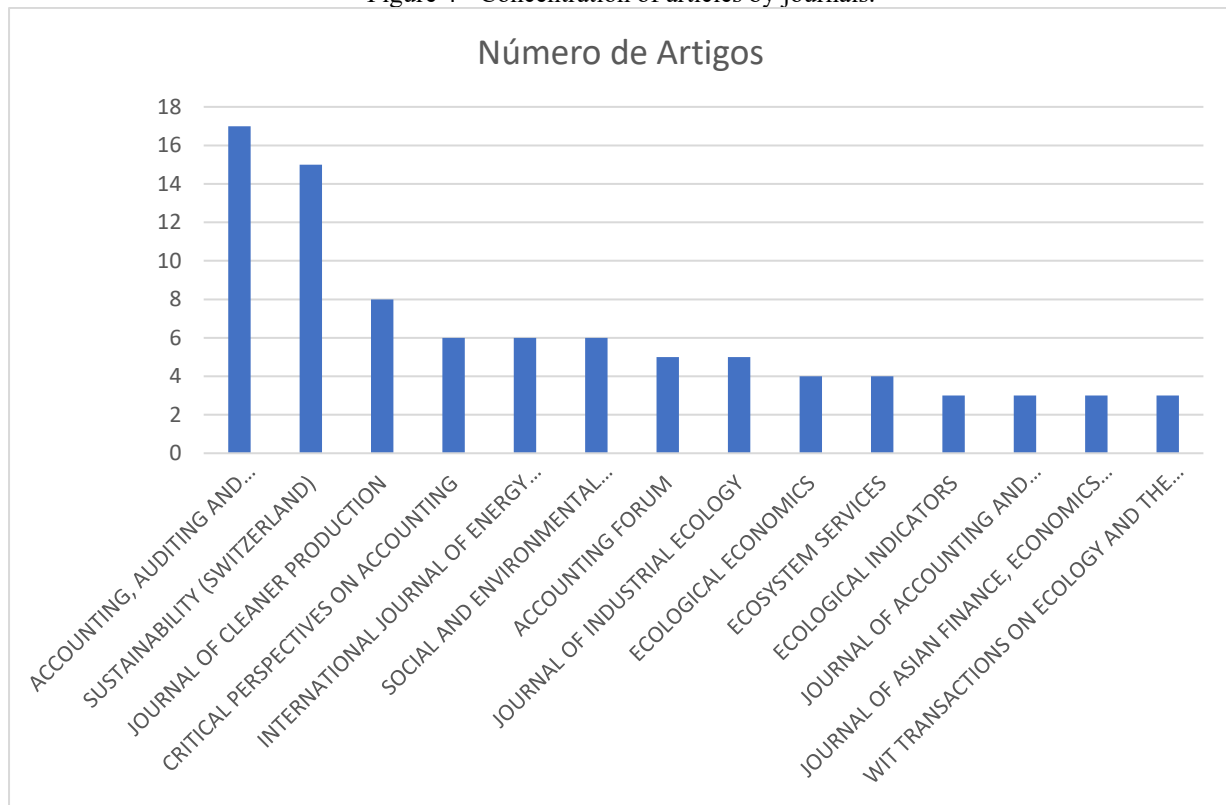


Source: Prepared by the author (2021)

Figure 4 in which it expresses the concentration of articles by journals, representing Bradford's law has the following configurations: firstly, the journal Accounting, Auditing and Accountability Journal stands out with 17 publications referring to environmental accounting. In second place is the journal Sustainability (Switzerland) with 15 articles published on the subject. Followed by the Journal of Cleaner Production with 8 published articles. With 6 articles published are the journals Critical Perspectives on Accounting, International Journal of Energy Economics and Policy and Social and Environmental Accountability Journal. The rest of the journals have publications of less than 6.



Figure 4 - Concentration of articles by journals.



Source: Prepared by the author (2021)

Figure 5 represents the keywords with the highest occurrence in the articles searched, representing Zipf's Law. The words are: sustainable development (*sustainable development*) that was repeated 22 times among the articles, *environmental impact* (*environmental impact*) 20 times, followed by *environmental economics* (*environmental economics*) 18 times, *environmental accountings* (*environmental accounting*) 17 times, *sustainability* 14 times, *environmental management* 12 times, *accountability* 11 times, *economics* 10 times, *input-output analysis* 8 times, *decision making* (*decision making*) 7 times and the rest with a frequency of less than 7 repetitions.



Figure 5 – Most cited keywords.



Source: Prepared by the author (2021)

#### 4 FINAL CONSIDERATIONS

This article aimed to present an overview of the international scientific production on Environmental Accounting, in the period from 2011 to 2021, through descriptive research using bibliometric techniques.

The results show that the main authors considering the number of publications and the number of citations are Jan Bebbington with 3 publications and with one publication that was cited 226 times and Nicholas Z. Muller, Robert Mendelsohn and Willian Nordhaus, with only one publication which was cited 258 times. Other authors with more publications may be considered of lesser relevance because they are not among the most cited. The authors from the United Kingdom and Italy stand out for concentrating a greater number of publications on the subject. The scientific production on the subject has developed widely in recent years, but with some decreases. The keywords most used by the authors are *sustainable development*, *environmental impact*, *environmental economics*, *environmental accountings* among others. And the article that stood out the most was "*Environmental Accounting for Pollution in the United States Economy*" published in the *American Economic Review* in 2011, by authors Nicholas Z. Muller, Robert Mendelsohn and William Nordhaus where it was cited 258 times. Finally, it is suggested to deepen the research by evaluating other databases and qualitatively analyzing the results. Thus enhancing the theoretical and methodological analysis of publications on the subject.





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