Revista Catarinense da CIÊNCIA CONTÁBIL

ISSN 2237-7662, Florianópolis, SC, v. 21, 1-23, e3262, 2022

DOI: 10.16930/2237-7662202232622
Available in http://revista.crcsc.org.br

INFLUENCE OF POLLUTING POTENTIAL AND HISTORY OF ENVIRONMENTAL VIOLATIONS IN CORPORATE ENVIRONMENTAL EVIDENCE

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ABSTRACT

The aim of this article is to explain the influence of sectors of high polluting potential and with a history of environmental infractions in corporate environmental evidence. To this end, the Financial Statements and Sustainability Reports for the period 2017 to 2019 of the publicly held companies listed in the Brazil Broad-Based Index (IBrA) were examined. From the content analysis of 225 Sustainability Reports published by 78 companies and based on the conceptual structure of Rover et al. (2012), it was possible to identify that most of the environmental information disclosed in the reports refers to information on environmental policy, impacts of products and processes on the environment and environmental financial information. On average, 68.2% of the companies released a Sustainability Report in the period, of which 92% adopted some international methodology in its preparation. The mean level of environmental evidence was 29.03% in 2017; 30.26% in 2018 and 30.41% in 2019 and the basic materials and oil, gas and biofuel sectors showed higher mean levels of environmental evidence. The regression model with panel data with random effects showed that the variables size, sector and history of infractions positively influenced environmental evidence at a significance level of 1% and that the variables indebtedness, profitability, audit and board size did not have significant influence. The two research hypotheses were not refuted, indicating that companies in sectors with high polluting potential (H1) and with a history of environmental violations (H2) have higher levels of environmental disclosure. These findings are consistent with the Legitimacy Theory and the Voluntary Disclosure Theory.

Keywords: Environmental evidence. Sustainability Report. Environmental impacts.

Edited in Portuguese and English. Original version in Portuguese.

Approved at the 21st USP International Conference in Accounting, online, from July 28th to 30th, 2021.

Received on 02/15/2022. **Revised on** 08/23/2022. **Accepted on** 09/08/2022 by Professor PhD. Rogério Joao Lunkes (Editor-in-Chief). **Published on** 10/07/2022.

1 INTRODUCTION

Thinking about a sustainable and environmentally responsible world requires attitudes of change that incorporate the essence of socio-environmental concern. These attitudes should consider the impacts and degradation caused to the environment as a result of human and corporate actions. On the subject, accounting and environmental management cooperate with the environment and its preservation and with the accountability of companies that will act irresponsibly.

Studies on the topic in the accounting area takes up the concern for the disclosure of environmental information by companies, especially for the risks inherent in certain economic activities in generating some type of negative environmental impact, by the pressure exerted by society related to these risks and by the interest of companies with socio-environmental issues (Coelho, Ott, Pires & Alves, 2014; Parker, 2011; Giacomin, Ott & Grando, 2016).

Through the registration and disclosure of environmental information, although considered voluntary, organizations can inform the risks, effects and environmental impacts caused by their economic activities to the external public and stakeholders (Coelho *et al.*, 2014), disseminating practices and actions that highlight the issue of environmental *disclosure*, which provides benefits such as the social perception of an environmentally responsible and correct company (Rover, Borba, Murcia & Vicente, 2008b; Gubiani, Santos & Beuren, 2012).

In order to ensure compliance with their environmental responsibilities, companies adopt standards of transparency of their productive processes, policies, postures and risks of environmental degradation and pollution. To Coelho *et al.* (2014), the demand for this type of information arises from the growing occurrence of environmental degradation and pollution by companies, which cause damage both to the environment itself and to society, and to its income and property situation.

Studies on the subject aimed to identify factors and characteristics of the companies or the market that determine or explain the level of evidence of environmental information by the companies, such as those of Iatridis (2012); Burgwal and Vieira (2014); Giacomin *et al.* (2016); D'Amico, Coluccia, Fontana and Solimene (2016); Welbeck, Owusu, Bekoe and Kusi (2017); Heflin and Wallace (2017); Leal, Costa, Oliveira and Rebouças (2018); and Kouloukoui *et al.* (2019).

Other studies aimed to relate the following issues to the practice of environmental disclosure: (a) the fact that the activity carried out by the company is considered as environmentally sensitive or of high polluting potential, especially the studies by Hackston and Milne (1996), Rover, Murcia, Lima and Lima (2008a), Clarkson, Chapple and Overell (2011), Fonteles, Nascimento, Ponte and Rebouças (2013), Burgwal and Vieira (2014), Welbeck *et al.* (2017) and Leal *et al.* (2018); and (b) the existence of a history of environmental disasters or irresponsibilities that have generated fines, expenses and environmental expenses, such as the studies by Patten (1992), Cormier and Magnan (1997), Ferreira Neto *et al.* (2015), Heflin and Wallace (2017) and Elsayed and Ammar (2020).

These last two issues dealt with in previous studies are relevant in the field of environmental disclosure, because they consider that companies disclose environmental information not only taking into account the needs of users of information or by the interests of managers, but also by the benefits of disclosure, such as social legitimacy and the construction of a positive image before society.

The disclosure of voluntary information of an environmental nature aims at social legitimacy, which is discussed by the Legitimacy Theory (Machado & Ott, 2015). The Legitimacy Theory is "the lens that interprets a series of studies on corporate environmental reports and performance; [...] used as an explanation for companies' reactions to the threats of their legitimacy" (Vogt *et al.*, 2017, page 26). In the scope of this study, it is expected that companies that perform activities of high polluting potential and that have a history of environmental

violations present higher levels of environmental disclosure than those that are not in these conditions, since they are under greater vulnerability of legitimation, Based on the Legitimacy Theory and Voluntary Accreditation Theory.

In Brazil, there is no law that makes the disclosure of environmental information mandatory and the accounting standards that regulate them, although implicitly, have little detail (Rover *et al.*, 2008a; Rover *et. al.*, 2008b; Coelho *et al.*, 2014). Although there are efforts to regulate the obligation of such disclosure – such as the incentives of the National Electric Energy Agency (Aneel), the efforts of the Ibase Institute and the Securities and Exchange Commission (CVM), the creation of the Index S&P/B3 Brazil ESG of B3 and Technical Guidance OCP number 09/2021 –, the disclosure of environmental information by Brazilian companies is mostly voluntary.

Environmental disclosure is a factor that can explain the reactions of companies to situations that threaten their legitimacy, because from voluntary disclosure companies can project a positive socio-environmental image in an attempt to reduce risks, political costs and their exposure (Patten, 1992; Vogt *et al.* 2017; Hefflin & Wallace, 2017). Thus, belonging to a sector of high polluting potential and with a history of environmental violations can indicate greater environmental risks; and as a way these companies remain legitimate to society, they use more environmental disclosures in their sustainability statements and reports.

Thus, in order to contribute to the theme and contrast the findings of this research with those of previous research, the following research problem was proposed: **What is the influence of sectors with high polluting potential and with a history of environmental violations on the corporate environmental disclosure?**

To respond to the mentioned research problem, the general objective of the study is to verify the influence of sectors with high polluting potential and with a history of environmental infractions on the corporate environmental disclosure.

The studies of Patten (1992), Cormier and Magnan (1997), Ferreira Neto *et al.* (2015), Heflin and Wallace (2017) and Elsayed and Ammar (2020) relate the environmental history, measured by the occurrence of environmental disasters, to changes in the practice of the level of environmental disclosure of the companies responsible, but do not use the potential costs arising from the application of violations inherent to these disasters, that generate the history of environmental infractions as predictors of this disclosure reflecting the economic issue of sustainability, and this was the research gap filled with this study.

In this study, the analysis of the disclosure of environmental information focuses on the information related to the environment disclosed in the Sustainability Reports of the years 2017, 2018 and 2019 by Brazilian publicly traded companies listed in B3 and belonging to the Brazil Broad-Based Index (IBrA). The environmental information disclosed in Sustainability Reports during this period may have been influenced by the environmental disasters of Mariana (2015) and Brumadinho (2019).

The study is justified by aiming to analyze the content of this voluntary information and relate disclosure as a practice of social legitimation. The results of the research may contribute to the understanding of what leads organizations to evidence environmental information at a certain level. In addition, they may contribute, as well as previous studies, with the normative bodies in determining guidelines and practices for the dissemination of environmental information by companies.

The work is organized into five sections. In the first one is this introduction; in the second, the theoretical framework with an approach on legitimacy theory, disclosure of accounting and environmental information, review of empirical studies and formulation of hypotheses. In the third section, the methodological procedures used in the research are described; in the fourth section, the presentation, analysis and discussion of the results; and, in the fifth section, the conclusion and recommendations for future studies, followed by the references.

2 THEORETICAL BASIS

2.1 Environmental Accreditation and Social Security

In the broadest sense of the term, disclosure means providing information to users at an appropriate, fair and complete level, whether in the financial statements or in the accompanying materials (Hendriksen & Van Breda, 2010). The disclosure of accounting information includes the disclosure of quantitative and qualitative information that helps internal and external users to know the financial and economic situation of the company, provided by formal and informal communication channels and that make up a basic set of general use information allowing, including, that users adjust accounting reports at their convenience (Piacentini, 2004; Coelho *et al.*, 2014; Hendriksen & Van Breda, 2010).

Regarding the discussions about the existence of a Disclosure Theory, Verrechia (2011, page 98) mentions that "[...] there is no comprehensive or unifying theory of disclosure, or at least none that I felt comfortable in identifying as such [...], no well-integrated "theory" [...]". On this question, Dye (2001, page . 184) states that this impression of the non-existence of a theory of disclosure is partially correct, believing that "[...] there is no perceived theory about mandatory disclosures in accounting [...] But, in my opinion, there is a theory of voluntary disclosures." Piacentini (2004, page 51) understands voluntary disclosure as "means used by investors to analyze the strategies and critical success factors of the companies, both in the environment in which they are inserted, and in the competitive aspect of the economic scenario".

Contrary to mandatory disclosure – disclosure of accounting information required by law or other normative or regulation –, voluntary disclosure does not have this legal character. Dye (2001) considers that when an entity wishes to disclose voluntary information, it will tend to disclose those that are favorable to it. The voluntary disclosure information is generally evidenced in annual management reports, websites, Explanatory Notes, Administration Report, Social Balance Sheet, among other means that are relevant and viable to the organization (Piacentini, 2004; Giacomin *et al.*, 2016).

However, the mandatory disclosure and voluntary disclosure have an interdependence relation. Verrechia (2001) considers that when there is a high demand for mandatory disclosures, there is a tendency to increase incentives for voluntary disclosure due to the interdependence between the two of them.

As for the nature of the information that is disclosed by the companies, until the years of 1960 it had a significant financial character and nothing was said about information of a social and environmental nature. The 1970s marks the beginning of discussions and concerns about corporate social and environmental responsibility. In 1971, the German company STEAG Energy was a precursor in the dissemination of social report, and the French Singer published in 1972 the first known corporate balance sheet (Kolk, 2010; Borçato, 2017).

The environmental information differs from the financial information that is presented, for example, in the Standardized Financial Statements, first because of the non-mandatory disclosure and second because of measurement difficulties. In this scenario, accounting is an important mechanism for the disclosure of environmental information of companies toward society and *stakeholders*, acting in the measurement and disclosure of public and private information, financial and non-financial, "[...], quantitative and non-quantitative on the management of environmental issues of the company" (Burgwal & Vieira, 2014, page 62).

The set of environmental information may include the disclosure of information on environmental policies adopted by companies; amounts of fines and environmental compensation; actions to preserve and recover of soil, air and water; environmental costs and liabilities; use and exploitation of natural resources; expenses with risk management and environmental externalities; environmental expenses with compliance with legal determinations, among other information related to the company's activity with environmental issues (Nossa, 2002; Rover, Tomazzia, Murcia & Borba, 2012).

Although in Brazil environmental disclosure is voluntary, due to the incentives promoted by many agencies and institutions that regulate or supervise business activity, in whatever areas or activities, the practice of environmental disclosure is common, especially in annual and sustainability reports (Rover *et al.*, 2008b; Ribeiro, Bellen & Carvalho, 2011; Gubiani *et al.*, 2012).

In countries where this practice is not regulated, companies have lower levels or different levels of environmental disclosure. Whereas in regulated countries companies have a higher volume of environmental information disclosure, because it is mandatory (Hackston; Milne, 1996; Rover *et al.*, 2008b, Rover *et al.*, 2012; Gubiani *et al.*, 2012; Burgwal & Vieira, 2014).

In Brazil, entities such as the Securities and Exchange Commission (CVM), the Brazilian Institute of Social and Economic Analysis (Ibase), the Federal Accounting Council (CFC) and the Institute of Independent Auditors of Brazil (Ibracon) have made efforts to standardize and/or guide environmental disclosure.

OCPC Technical Guidance number 09/2021, approved by CTG 09/2021 of the CFC, guides the elaboration of the integrated report as standard for corporate reports, defined as a "[...] report on how the strategy, governance, performance and perspectives of the organization, in the context of its external environment, lead to the generation of value in the short, medium and long term" (Accounting Pronouncements Committee, 2021, page 3). According to the Guidance, the Integrated Report is more than a concise report of information contained in other reports – such as the Sustainability Report –, it highlights the integration and connectivity of information that communicate how the company generates value over time.

Internationally, the main guidelines for environmental disclosure through Sustainability Reports include the *Global Reporting Initiative* (GRI) Sustainability Report Standards and the *International Integrated Reporting Council* (IIRC) proposal.

Global standards for GRI Sustainability Reports allow companies to publicly disclose the economic, environmental and social impacts arising from their performance and show how they generate these risks and contribute to sustainable development. The first GRI Directive (G1) was launched in 2000; the second generation (G2) in 2002; the third (G3) in 2006; the G3.1 guidelines – an update and completion of G3 – in 2011; and, finally, the current guidelines (G4) in 2013 (Global Reporting Initiative, 2020).

The proposal of *the International Integrated Reporting* Council (IIRC), which emerged in 2010, aims to establish integrated reports on the main practices of public and private sector companies. The proposal for an integrated IIRC report was published in 2013 and emerged from the concerns of GRI and sustainable accounting regarding excessive consumption of finite resources, climate change and corporate social and environmental accountability. The proposal includes a structure based on three requirements: the fundamental concepts, the guiding principles and the content (Flower, 2014; Dumay, Bernardi, Guthrie & Demartini, 2016).

The practices of disclosure of environmental information have been used in an attempt to minimize exposures to possible political and social costs and companies use environmental disclosure to design an image of environmental awareness and of socially responsible, as explained in the Legitimacy Theory addressed below (Patten, 1992; Hefflin & Wallace, 2017).

2.2 Legitimacy Theory

Legitimacy is a perception or assumption that the actions of a company are desirable, appropriate or corresponding to a system of standards, values and socially constructed beliefs. Legitimizing an action of a company or the management of a company is therefore confirming it as desirable and corresponding to what is believed to be valid, correct and consistent with a system of established social values (Suchman, 1995).

Thus, for the Legitimacy Theory, if the continuity of the operations of an organization depends on it acting in order to meet the interests of society, it is hoped that it will strive for its activities to be accepted and perceived as legitimate, which for Deegan, Rankin and Vought (2000)

and Deegan (2002) is a motivator for organizations to disclose social and environmental information to legitimize their position in society.

In this context, companies use environmental disclosure to project an image of environmental awareness and socially responsible, in an attempt to minimize exposure to possible political and social costs (Hefflin; Wallace, 2017). Watts and Zimmerman (1978) state that companies operating in sectors with higher environmental risks have higher political costs and greater pressure from society. As a measure of remaining legitimate to this society, companies rely on a higher volume of environmental *disclosure* in financial reports.

When unable to achieve a legitimacy of their activities, companies face pressures from *stakeholders* and may result in government intervention. The costs resulting from these interventions end up being an incentive for the continuous search for legitimacy (Rover *et al.*, 2012). Not achieving this alignment expected by society can broaden the legitimacy gap, because it generates absence of "[...] correspondence between the ways in which society believes that an organization must act and how it is perceived that the organization acted [...]" (Elsayed & Ammar, 2020, page 256).

Legitimacy Theory has been commonly used as a theoretical basis to explain the dissemination of voluntary information, especially the socio-environmental information. For example, studies developed by Patten (1992), Gray, Kouhy and Lavers (1995), Deegan (2002), Patten (2019), and Elsayed and Ammar (2020) aimed to relate the application of the Theory to the practice of voluntary socio-environmental *disclosure*.

The explanation given by the Legitimacy Theory that companies tend to maintain or increase their level of disclosure of environmental information as a way to seek or preserve legitimation on the part of society, is basic to substantiate the understanding of the research problem of this study, as this aims to demonstrate the factors that are statistically related to the level of environmental disclosure and to identify if companies with high polluting potential and with a history of environmental infractions maintain higher levels of environmental disclosure, factors that, if not rejected, align with the Legitimacy Theory.

Some environmental disclosure practices were analyzed in Brazilian and international studies that underlie the problem of this study. Next, we present the empirical review of these studies, their objectives and results and the formulation of research hypotheses.

2.3 Previous studies and hypothesis formulation

Previous studies on the disclosure of environmental information have sought to explain the practices of voluntary disclosure based on the variables determining for such disclosure, or identification of which and what types of environmental information are disclosed, or from the currents of the Legitimacy Theory and the Voluntary Accreditation Theory.

Patten (1992), based on the Legitimacy Theory, analyzed the effects caused by the Exxon Valdez oil spill on environmental disclosures of other companies in the same sector. The author identified that after the occurrence of the environmental accident there was a significant increase in the environmental disclosures of the companies, in addition to the relation with the size of the company. It identified that companies tend to increase environmental disclosure as a way of not losing their legitimacy.

Cormier and Magnan (1997) tested the relation that establishes that the higher the volume of pollution of a company, the higher the volume of its environmental liabilities. According to the authors, the more companies under study pollute, the greater the extent of their implicit environmental liabilities. They also identified that the higher the level of pollution of companies, the lower their valuation in the stock market and that most companies have undisclosed liabilities.

Rover *et al.* (2008a) analyzed the voluntary environmental disclosure reported in the 2006 financial statements of companies in the sectors of high environmental impact and identified that the variables size, audit company and participation in the Corporate Sustainability Index (ISE)

were significant to explain the environmental disclosure. In another study, Rover *et al.* (2012) identified that other variables, such as the Sustainability Report publication, are also relevant to the explanation of *the disclosure* of environmental information of Brazilian potentially polluting companies.

Clarkson *et al.* (2011) examined the nature of environmental information disclosed by Australian companies and whether it was related to environmental performance. The results indicate that companies with greater tendency to pollution have disclosed more environmental information and this information is more verifiable and objective in relation to those disclosed by less prone companies.

Ferreira Neto *et al.* (2015) investigated the impact of environmental accidents on the volume of *disclosure* and socio-environmental investments of Brazilian companies from 1997 to 2015. They identified that in the case of the occurrence of relevant socio-environmental accidents, there are strong indications that the companies causing the accidents report a higher volume of socio-environmental *disclosure* in the five years after the occurrence of the accidents compared to the previous five years.

Ortas, Alvarez and Etxeberria (2015) aimed to identify the financial variables that influenced the extension of the corporate environmental sustainability report of 3,931 companies operating in 51 industrial sectors and in 59 countries. The hypotheses that claim that larger companies, with higher leverage rates, higher performances and higher volume of investments in innovation have greater extensions of environmental sustainability report, were not rejected by the study.

The study by Vogt *et al.* (2016) analyzed the among between determining factors of the disclosure of information on the environmental impacts of 97 Brazilian companies, based on the analysis of the Sustainability Report and Annual Reports. The variables "size, audit company and adoption of GRI model" are associated with disclosure, but the corporate sustainability index, pollution potential, governance, actions, return on assets and return on equity did not show a significant explanatory relation.

Welbeck *et al.* (2017) aimed to examine the type of environmental information that companies disclose in Ghana. The level of disclosure by environmentally sensitive companies is higher than the less sensitive companies and the study considers that the size of the firm, type of auditor, age of the company and type of industry are significant predictors of the companies' environmental disclosure practices.

The study by Mercês and Sampaio (2017) verified the evolution in the volume of environmental information disclosed by mining companies, at the national and international level, after the environmental disaster event of the rupture of Samarco Mining tailings dam in Mariana in 2015. They took as sample 36 mining companies from twelve different countries, of which 32 make up the group of the forty largest mining companies in the world and four Brazilian. They analyzed the content of the Annual, Sustainability and Integrated Reports from 2013 to 2015. The findings show a positive change in the level of environmental disclosure of the investigated companies, mainly due to the environmental disaster.

Kolsi and Attayah (2018) used a sample of 61 companies listed in the United States ADX from 2010 to 2014 to analyze the variables that explain the disclosure of corporate social responsibility information. The results indicate that the listing history, government sector, board size, financial leverage and firm size have a positive impact on the disclosure of Sustainability Reports.

The study by Kouloukoui *et al.* (2019) examined the extent and content of the disclosure of climate risk information in the Sustainability Reports of 67 companies listed in B3 and that released the GRI Model Sustainability Report from 2009 to 2014. They identified that disclosure has significant and positive relations with the size of the company, the financial performance and the origin of the country and negative association with the level of indebtedness.

Elsayed and Ammar (2020) understand that sustainability governance practice grew after oil leakage in the Gulf of Mexico in 2010 to manage the British Petroleum's legitimacy. The authors were based on records and documents from 2008 to 2017 and verified the role of sustainability governance in enabling responses to the company by adopting legitimacy practices after an environmental incident.

The level of polluting potential of a company, that is, its potential for environmental degradation, depends on the activity it develops. Based on the revised empirical studies, it is expected that companies with high polluting potential will commit greater efforts to reduce environmental risks and environmental degradation and, therefore, present a higher level of environmental disclosure than companies with lower impact, whether it is due to intentional motivations for the search or maintenance of social legitimacy or political pressures.

Thus, the first research hypothesis establishes that companies that develop activities of high polluting potential tend to present a higher level of environmental disclosure, as found in the studies of Hackston and Milne (1996), Carneiro *et al.* (2008), Clarkson *et al.* (2011), Fonteles *et al.* (2013), Burgwal and Vieira (2014), Welbeck *et al.* (2017) and Leal *et al.* (2018).

H_1: Companies that carry out activities of high polluting potential have higher levels of environmental disclosure than those that do not perform this type of activity.

When environmental degradation or infractions occur, the companies involved or companies in the same listing sector of a company involved increased the level of their environmental disclosure in the period following the event as a way to legitimize their actions or to be environmentally responsible or, even, after the occurrence of an environmental disaster, according to Patten (1992), Cormier and Magnan (1997), Deegan *et al.* (2000), De Villiers and Van Staden (2011), Ferreira Neto *et al.* (2015), Heflin and Wallace (2017) and Elsayed and Ammar (2020), and Mercês and Sampaio (2017).

The second research hypothesis provides a possible relation between the level of environmental disclosure of companies and their history of environmental violations.

H_2: Companies with environmental infractions have a higher level of disclosure of information related to the environment than those that do not present this history.

Next, the methodological procedures adopted are described in the research development in order to achieve the defined objectives and the resolution of the proposed problem, as well as to perform the tests of the hypotheses formulated above.

3 METHODOLOGICAL PROCEDURES

3.1 Sample and Data Collection

The research initial sample was composed of Brazilian publicly traded companies with shares traded in Brasil Stock Exchange, Bolsa, Balcão (B3) and belonging to the Brazil Broad-Based Index(Ibra), composed initially of 141 companies.

26 companies belonging to Ibra that are listed in the financial sector were excluded from this population; 5 because they have both preferred and common shares listed in the portfolio, generating duplicity, and 32 others that did not disclose Sustainability Report in any of the three years analyzed (2017, 2018 and 2019). This resulted in a final sample of 78 companies.

Secondary sources were used for data collection, namely: Sustainability Reports; Accounting Statements; Reference Forms and Environmental Audits Report of Ibama. The environmental information contained in the Sustainability Reports was collected and classified into categories and subcategories using the conceptual structure of Rover *et al.* (2012), according to Table 1, and Bardin Content Analysis technique (2006).

Table 1
Conceptual structure of Rover *et al.* (2012)

Categories	Subcategories
1. Environmental Policies	• Statement of current and future policies/practices/actions; • Establishment of environmental goals and objectives; • Statements that indicate that the company is (or not) in compliance with environmental laws, licenses, standards and bodies; • Environmental partnerships; • Awards and participations in environmental indexes.
2. Environmental Management Systems	• ISO 14.000; • Environmental audit; • Environmental management.
3. Impacts of Products and Processes on the Environment	• Wastes/Residues; • Storage process (packaging); • Recycling; • Development of ecological products; • Impact on the land area used; • Odor; • Efficient use/Reuse of water/Effluent treatment; • Leaks and spills; • Repairs to environmental damage.
4. Energy	• Conservation and/or more efficient use in operations; • Use of wasted materials in energy production; • Discussion about the concern about the possible lack of energy; • Development/Exploration of new energy sources.
5. Environmental Financial Information	• Environmental investments; • Environmental Costs/Expenses; • Environmental liabilities; • Environmental accounting practices; • Environmental insurance; • Tangible and intangible environmental assets.
6. Education and Environmental Research	• Environmental education (internally and/or community); • Environmental related research.
7. Carbon Credit Market	• Clean Development Mechanism (CDM) Projects; • Carbon Credits; • Greenhouse Gases (GHG)/Atmospheric emissions; • Certified Emissions Reduction (CER).
8. Other Environmental Information	• Mention on sustainability/Sustainable development; • Forest management/Reforestation; • Conservation of biodiversity; • Landscaping and gardening (*landscaping*); • Relationship with stakeholders.

Source: Rover *et al.* (2012).

Data on the variables size, profitability and indebtedness were collected in the Economical Base® and in the Standardized and Consolidated Financial Statements, available in B3, for the financial years 2016, 2017 and 2018.

For the variables Audit and Size of the Board of Directors, the database "Corporate Governance of Companies listed in B3_2010-2018" of the Laboratory of Finance and Risk of

FEA/USP was used primarily. Secondarily, for the missing data, the Company Reference Forms were used. The following were considered as independent audit firms that make up *the* Big *Four Accounting Firms* group: Ernst & Young (EY), KPMG, PricewaterhouseCoopers (PwC) and Deloitte.

For the data collection that identify the level of pollution potential by the companies it was necessary, initially, to identify the sectors and subsectors of the company's activity informed in the theoretical portfolio of the IBrA of B3 and, subsequently, verify the classification of these activities according to Annex VIII of Law number 6.938/1987 (National Environment Policy), included by Law number 10.165/2000. In addition to the identification of sectors with high potential polluter, the normative Instruction Ibama number 06/2013 and subsequent amendments were also used.

The identification of the existence of environmental infractions took place from the Public Consultation of Environmental Audits and Embargoes made available by the Brazilian Institute of the Environment and Renewable Natural Resources (IBAMA). The consultation was carried out from the CNPJ (National Register of Legal Entities) in the years 2016, 2017 and 2018. It was identified the existence of 351 infractions from 10 different companies and the values and types of infractions were collected.

3.2 Study Variables

The research dependent variable is the level of Environmental Accreditation (NEA). The conceptual framework for identifying and classifying the environmental information of Rover *et al.* (2012) is structured into 8 categories and 38 subcategories. When observing the Sustainability Reports through content analysis, the following equation was used to define the NEA (Environmental Accreditation Level):

$$NEA_{t+1} = \frac{NSO}{NSE - SNA} \quad (1)$$

Where:
NEA – Level of environmental disclosure in time $t + 1$;
NSO – Number of subcategories observed;
NSE – Number of expected subcategories (38);
SNA – Subcategories not applicable.

The explanatory variables of interest of the research are: Activity Sector (SETOR) and Environmental Infringement History (HIST), defined based on research hypotheses.

Companies can be classified according to the activities they perform as high, medium or small polluting potential, according to the National Environment Policy and IBAMA. In this sense, it was sought to verify, through the variable activity sector (SETOR), whether companies considered to be of high polluting potential have higher levels of disclosure of environmental information, according to the hypothesis H_1, as well as was identified in the studies of Hackston and Milne (1996), Clarkson *et al.* (2011), Fonteles *et al.* (2013), Burgwal and Vieira (2014), D'Amico *et al.* (2016), Welbeck *et al.* (2017), Leal *et al.* (2018) and Kolsi e Attayah (2018).

The variable History of Environmental Infringements (HIST) examines, according to the hypothesis H_2, whether the existence of environmental infractions determines the level of disclosure of the companies under study. Cormier and Magnan (1997), Ferreira Neto *et al.* (2015) and Heflin and Wallace (2017), in their respective studies, identified that on the occasion of the occurrence of environmental irresponsibilities, it is noticed that the company tends to increase its level of environmental disclosure.

As control variables, company size, profitability, debt, audit and board size were analyzed.

The variables used in the research are presented in Table 2, defined from the review of previous studies and data collection.

Table 2
Research variables

Variable		Description/Signal Expected	*Proxy*	Source	Period
Dependent	NEA	Level of Environmental Accreditation	$NEA = \frac{NSO}{NSE-NSA}$	Sustainability Reports, from the conceptual structure of Rover *et al.* (2012)	2017 to 2019
Variables of Interest	SETOR	Sector of Activity (+)	1 for sectors with high potential polluter and 0 in other cases.	National Environment Policy and Ibama	2016 to 2018
	HIST	History of Environmental Infractions ( )	1 for the existence of environmental infraction and 0 in other cases.	Ibama	2016 to 2018
Control Variables	TAM	Size of Company (+)	Natural logarithm of the Total Asset.	Financial and Economatica Statements	2016 to 2018
	RENT	Profitability (+)	Return on Asset (ROA) = Net Profit / Total Asset	Financial and Economatica Statements	2016 to 2018
	ENDIV	Debt (+/-)	Participation of Third Party Capital = Total Requirement / Equity	Financial and Economatica Statements	2016 to 2018
	AUD	Audit (+)	1 if the company was audited by a *Big Four* and 0 otherwise.	Reference Form and Laboratory of Finance and Risk of FEA/USP	2016 to 2018
	CONS	Size of the Board of Directors ( )	Number of effective members of the Board of Directors.	Reference Form and Laboratory of Finance and Risk of FEA/USP	2016 to 2018

Source: Authors (2020).

3.3 Empirical Model

Since the data were collected and analyzed for several companies and over a period of two or more years, the most appropriate data treatment is the regression model with panel data, which is characterized by analyzing the same unit of analysis in two or more periods of time, combining time series data with cross-sectional data. There is a spatial and temporal dimension (Gujarati; Porter, 2011).

As for panel data modeling, there are many models and estimators that can be used, but in accounting and finance studies involving panel data, the regression models with fixed effect and the regression model with random effects are more used (Duarte; Lamounier; Takamatsu, 2007; Gujarati; Porter, 2011).

Because the variable SETOR, which measures whether or not the company has potentially polluting activity, is a *dummy* variable and that these data are invariable in the period of analysis, the model with fixed effects is inadequate. Therefore, the regression model with random effects was the model used in the hypothesis test of the research.

Thus, the following econometric regression model was used with panel data:

$$NEA_{it+1} = \beta_0 + \beta_1 SETOR_{ti} + \beta_2 HIST_{ti} + \beta_3 \ln\text{TAM}_{ti} + \beta_4 \text{RENT}_{ti} + \beta_5 \text{ENDIV}_{ti} + \beta_6 AUD_{ti} + \beta_7 CONS_{ti} + \varepsilon_{it} \quad (2)$$

Where:
NEA_{it+1} – level of environmental disclosure of company *i* in time *t 1;*
$SETOR_{ti}$– company activity sector *i* in time *t.*;
$HIST_{ti}$ – history of environmental infractions of the company *i* in time *t.*;

$\ln TAM_{ti}$ – natural logarithm of company size *i* in time *t;*
$RENT_{ti}$ – profitability of the company *i* in time *t.*;
$ENDIV_{ti}$ – indebtedness of the company *i* in time *t.*;
AUD_{ti} – auditing of the company *i* in time *t.*;
$CONS_{ti}$ – size of the company's board of directors *i* in time *t.*;
β_0 – constant beta coefficient;
β_1 to β_7 – beta coefficients that measure the variables sensitivity.

4 RESULTS

4.1 Disclosure of Environmental Categories and Subcategories

In this subsection, the disclosure practices of the companies are described and analyzed according to the conceptual structure of Rover *et al.* (2012), which classifies environmental information into eight categories and thirty-eight subcategories.

Of the methodologies adopted in the elaboration of the Sustainability Report, on average, 92% of the companies adopt some international standard (GRI and/or IIRC). In the study period, the categories disclosed totaled 2,496 observations. Of this total, 809 in 2017 (32.4%), 825 in 2018 (33.1%) and 862 in 2019 (34.5%). It is noticed a growth over the period in the number of observations and environmental disclosure practiced by companies.

Environmental policy was the most evidenced category in the period, as observed in the study by Rover *et al.* (2012) and Giacomin *et al.* (2016). A total of 684 (27.4%) observations were identified in the period, of which 238 were evidenced in 2017 (29.4%); 224 in 2018 (27.2%) and 222 in 2019 (25.8%).

In this category, the most evidenced information refers to statements about future and current environmental policies, practices and actions; a statement that indicates whether or not the company is in compliance with environmental laws, licenses, standards and bodies and on setting environmental goals and objectives.

The category Environmental Management Systems presented 163 observations in the period, representing 6.5% of the total of 2,496 observations. Of the 163 observations, 53 (32.5%) were evidenced in 2017; 54 (33.1%) in 2018 and 56 (34.4%) in 2019. The most evidenced subcategories referred to environmental management, followed by information on environmental auditing and ISO 14 000 series certification, which deals with environmental management system.

The third category, which deals with the environmental impacts arising from the products manufactured and the processes used in the companies, was the second most evidenced, with 577 (23.2%) observations in the period under analysis.

Of the 577 observations, 193 (33.4%) were evidenced in 2017, 190 (32.8%) in 2018 and 197 (34.0%) in 2019. In the Sustainability Reports analyzed there is a greater volume of information about waste and residues. Then, information on impact on the land area used and on the development of ecological products, the latter being at similar levels of evidence.

The Energy category includes 211 observations (8.5% of the total observations) in the period, of which 67 (31.7%) were evidenced in 2017, 66 (31.3%) in 2018 and 78 (37.0%) in 2019. The most evidenced subcategories were: conservation and/or more efficient use in operations; discussion about the concern about the possible lack of energy and development/exploitation of new energy sources. It was noticed that the information in this category is evidenced mostly by the companies of the electricity subsector, the public utility sector of B3.

Environmental financial information is included in category five of the structure and represents 13.9% of the total observations, being the third most evidenced category by the companies. Of the total of 347 observations in the period (13.9% of the total observations), 114 observations (32.8%) were verified in 2017; 113 (32.6%) in 2018 and 120 (34.6%) in 2019. The most evidenced environmental financial information refers to environmental costs, expenses and liabilities, followed by information on assets, investments and environmental accounting practices.

The category of Environmental Education and Research is the category with the lowest number of observations: 34 throughout the period, representing 1.4% of the total. Of the 34 observations, 10 observations were identified in 2017 and 2018 (29.4% each year) and 14 (41.2%) in 2019. It is noticed that companies develop few actions related to incentives to education and environmental research.

Regarding the observations for the carbon credit market category and its sub-categories, of the 157 observations recorded in this category, 45 (28.7%) were disclosed in 2017; 56 (35.7%) in 2018 and 56 (35.6%) in 2019.

The eighth category, which deals with other environmental information, contains 319 observations (12.8% of the total). Of these, 89 (27.9%) disclosed in 2017; 112 (35.1%) in 2018 and 118 (37.0%) in 2019.

4.2 Level of Environmental Disclosure of Companies

The percentage of companies that disclosed Sustainability Report in the period by sector and year and the percentage of disclosure in relation to the initial sample is shown in Figure 1.

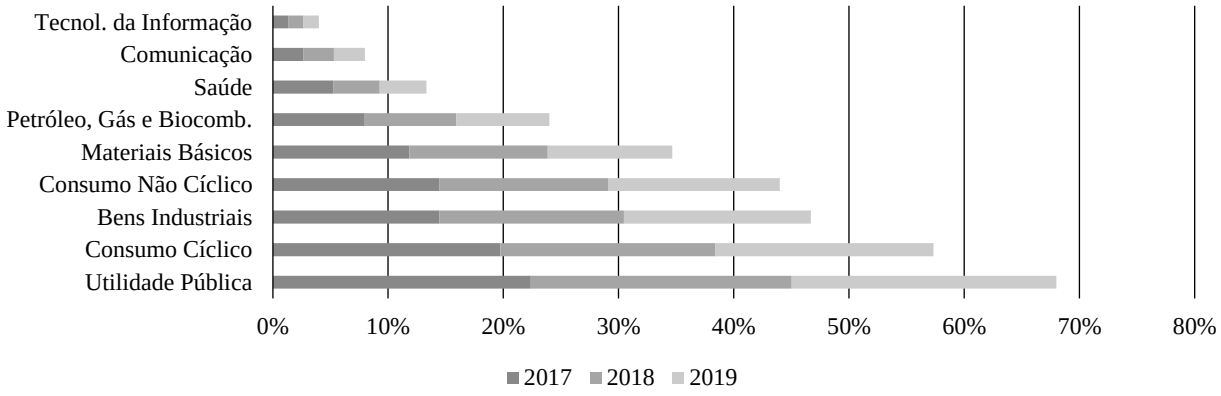

Figure 1. Percentage of companies that disclosed the sustainability report by sector and year
Source: Search data (2020).

The sector with the highest percentage of companies that published a report in the period is the public utility sector: 22.4% in 2017; 22.7% in 2018 and 23.0% in 2019, compared to the total sample companies. In this sector, the companies in the electricity subsector are responsible for 82.4% of disclosure, while the water and sanitation companies for 17.6%.

Table 3 shows the levels of environmental disclosure calculated from the conceptual structure of Rover *et al.* (2012) and with the application of equation 1.

Table 3
Level of environmental disclosure by sector and year

Sector	2017				2018				2019			
	n	*Mean*	*Min*	*Max.*	*n*	*Mean*	*Min*	*Max.*	*n*	*Mean*	*Min*	*Max.*
Industrial goods	11	0.18	0.08	0.30	12	0.20	0.11	0.30	12	0.19	0.11	0.27
Communication	2	0.20	0.16	0.24	2	0.18	0.13	0.24	2	0.22	0.16	0.29
Cyclic consumption	15	0.15	0.53	0.24	14	0.17	0.05	0.27	14	0.16	0.03	0.26
Non-Cyclic consumption	11	0.29	0.11	0.57	11	0.29	0.11	0.57	11	0.29	0.08	0.62
Basic materials	9	0.51	0.29	0.67	9	0.54	0.32	0.54	8	0.56	0.34	0.69
Oil, gas and biofuels	6	0.44	0.33	0.65	6	0.45	0.33	0.65	6	0.47	0.36	0.65
Health	4	0.14	0.05	0.24	3	0.16	0.05	0.26	3	0.15	0.05	0.26
Information Technology	1	0.05	0.05	0.05	1	0.05	0.05	0.05	1	0.08	0.08	0.08
Public utility	17	0.37	0.18	0.64	17	0.37	0.16	0.61	17	0.38	0.18	0.61

Source: Search data (2020).

It is possible to identify that the basic materials sector has the highest annual mean of disclosure, the latter being 51% in 2017; 54% in 2018 and 56% in 2019. In the sector, the subsectors of wood and paper, chemicals and mining are listed. The subsector with the highest level of evidence is wood and paper, followed by mining and chemical. Next, the oil, gas and biofuels sector stands out with a mean disclosure of 44% in 2017; 45% in 2018 and 47% in 2019.

The public utility sector has a mean of 37% in 2017 and 2018 and 38% in 2019. In the sector the subsectors of water and sanitation and electricity are listed that show, respectively, NEA means of 29.41% and 39.33% in the period.

The other sectors have means of environmental disclosure in the period ranging from 6.0% (information technology sector) to 29.0% (non-cyclical consumption sector). The mean of annual disclosure of all companies is 29.3% in 2017; 30.26% in 2017 and 30.41% in 2019, which results in a mean disclosure of 29.89% throughout the period.

It is important to highlight that the companies' NEA indicators have high amplitude (minimum of 2.63% and maximum of 72.2%) and deviate from the mean by up to 17.02%, as shown in the following section, which deals with descriptive statistics of the variables.

4.3 Descriptive Statistics

Table 4 presents the descriptive statistics of the study variables.

Table 4
Descriptive statistics of quantitative variables

	NEA	TAM[1]	RENT	ENDIV	CONS
Mean	0.2989	38.95	2.8204	281.4194	9.5724
Median	0.2632	15.38	4.0189	152.9556	8.7500
Maximum	0.7222	860.47	36.1831	16649.90	30.000
Minimum	0.0263	0.64	-144.9927	-4358.992	3.0000
Standard deviation	0.1702	102.83	13.9257	1179.828	4.3219
Jarque-Bera	21.3111	4.2738	48728.9700	258368.2	509.5152
Probability	0.0000	0.1180	0.0000	0.0000	0.0000
Remarks	225	225	225	225	221

Note. 1 – In millions of reais; NEA – Level of Environmental Accreditation; TAM – Size; RENT – Profitability; ENDIV – Indebtedness; CONS – Size of the Board of Directors.
Source: Research data – EViews (2020).

Analyzing the NEA variable, it is noticed that the companies have a mean environmental disclosure level of 0.2989, that is, on average, 29.9% of the expected categories are observed in the environmental disclosure of the companies under analysis. The lowest environmental disclosure rate is 2.63% and the highest 72.2%. The standard deviation shows a variation of 17.02% of the data regarding the mean.

The companies under study have an medium size (TAM) of R$ 38.95 million and standard deviation of R$ 102.83 million. The largest and lowest value of the variable are presented for the year 2018: maximum of R$ 860.47 million and minimum of R$ 0.64 billion.

Profitability (RENT) has a mean of 2.82% and a median of 4.02%. The variable presents high amplitude, perceived by the difference between minimum and maximum and by the deviation of the mean of 13.92. Same behavior is perceived in the variable indebtedness (ENDIV): standard deviation of 1179.83 from the mean of 281.42%.

ROA, measure of the variable profitability, presents 44 negative observations, from 225, ranging from -0.19 to -144.99. And the share of third party capital, as measured by the variable ENDIV, presents 6 negative observations ranging from -269.85 to -4,358.99.

The variable measuring board size indicates that companies have, on average, 9.6 members on their boards of directors, with a standard deviation of 4.32. The minimum number of perceived members is 3 and the maximum is 30.

The number of observations of the CONS variable is lower than that of the others because two companies do not present a Reference Form for the year 2016 and another for the years 2016 and 2017, with four observations missing for the variable.

The AUD variable has a mean of 0.92, which indicates that most observations (92%) for this variable indicate that the companies are audited by Big Four companies, which is confirmed by the 207 observations for the proxy 1.

The SETOR variable, which identifies whether the company has activity of high polluting potential, has a mean of 0.6578, which indicates that most (65.8%) of companies perform activities related to sectors with high pollution potential.

The HIST variable presents a mean of 0.0622, indicating that only 6.22% of the observations for the variable represent a history of environmental violations. Of the 78 companies under study, only 10 presented a history of environmental violations in the period.

It was identified the application of 351 infringements to 10 different companies. The amount of the infractions is R$ 39.26 million, with a mean of R$ 111.54 thousand. The highest identified value is R$ 14.29 million and the lowest R$ 1.3 thousand.

In 2016, 47 infractions applied to six companies were identified, totaling R$ 6.98 million; in 2017, 31 infractions applied to three companies, in the amount of R$ 22.8 million and in 2018 other 273 infractions, amounting to R$ 9.5 million. Three companies (Dommo, Petrobras and Sanepar) have suffered violations in more than one period. The types of infractions applied are related to the Federal Technical Register, the Environmental Control and to typology Others. Petrobras is responsible for R$ 34.2 million of the total infractions applied.

To identify the absence of multicollinearity among the variables, that is, the absence of perfect linear relationship or high correlations between two or more independent variables, the Pearson correlation matrix is presented in Table 5.

Table 5
Correlation matrix

	TAM	RENT	ENDIV	CONS	AUD	SETOR	HIST
TAM	1						
RENT	0.0272	1					
	0.007						
ENDIV	0.0335	-0.0331	1				
	0.620	*0.625*					
CONS	0.2467	0.1164	0.0041	1			
	0.000	*0.083*	*0.870*				
AUD	-0.0943	0.0629	-0.2019	-0.0541	1		
	0.162	*0.352*	*0.003*	*0.385*			
SETOR	0.1791	-0.0497	-0.0754	0.2127	0.0979	1	
	0.008	*0.462*	*0.264*	*0.002*	*0.147*		
HIST	0.2418	-0.2136	-0.0179	0.1029	-0.1365	0.0594	1
	0.000	*0.001*	*0.791*	*0.140*	*0.043*	*0.378*	

Note. TAM – Size; RENT – Profitability; ENDIV – Indebtedness; CONS –Size of Board of Directors; AUD – Auditing; SETOR – Activity Sector; HIST – History of Environmental Infractions. Significance: * (10%). ** (5%) and ***(1%).
Source: Research data – EViews (2020).

A Pearson correlation coefficient is measured from -1, indicating strong negative correlation, A 1, indicating strong positive correlation. If the correlation coefficients between two

independent variables (regressors) are greater than 0.8, Gujarati and Porter (2011) consider the presence of multicollinearity due to the high degree of correlation among the variables.

The highest positive correlation coefficient identified is 0.2467 and negative of -0.2136. Therefore, the independent variables do not have strong correlation, which indicates that these variables do not have a linear relationship, being possible to affirm the absence of multicollinearity from the correlation coefficients observed.

4.4 Determinants of Disclosure and Discussion of Results

All the variables of the econometric model initially proposed were tested to verify which would present the most representative betas for the explanation of the level of environmental disclosure and, after the tests, the results are presented in Table 6.

Table 6
Regression with panel data: random effects

Dependent variable: NEA
Method: Panel data with random effects
Periods: 3
Total panel observations (unbalanced): 221

Variable	Coefficient	Standard error	Statistics t	Prob.
SETOR	0.168983	0.029793	5.671854	0.0000
HIST	0.050217	0.009547	5.260256	0.0000
TAM	0.034892	0.008417	4.145576	0.0000
RENT	0.000193	0.000428	0.451151	0.6523
ENDIV	4.47E-07	1.41E-06	0.316313	0.7521
CONS	0.001969	0.001567	1.256245	0.2104
AUD	-0.004558	0.053409	-0.085344	0.9321
Intercept	-0.406940	0.149163	-2.728152	0.0069
R^2	0.298292	Durbin-Watson	1.8595	
R^2 adjusted	0.275231	F-statistic	12.9350	
		Prob. F	0.00000	

Note. TAM – Size; RENT – Profitability; ENDIV – Indebtedness; CONS –Size of Board of Directors; AUD – Auditing; SETOR – Activity Sector; HIST – History of Environmental Infractions.
Source: Research data – EViews (2020).

The adjusted R^2 and R^2 test the percentage of variation in the dependent variable that is explained by the independent variables, that is, the coefficient of regression determination that, based on the regression results, are 29.83% and 27.52%, respectively.

The variables SETOR and HIST have coefficients of 0.168983 and 0.050217, respectively. In the analysis of the p-statistic it is noticed that the variables are statistically significant in the 99% confidence interval, perceived by the p-value 0.0, that is, the variables are predictors and are statistically related to the level of Environmental Disclosure of the companies.

The research hypothesis H_1, That states that "companies that carry out activities of high polluting potential have higher levels of environmental disclosure than those that have medium or small potential" was not rejected by the regression test and the finding corroborates and is consistent with the studies of Hackston and Milne (1996); Clarkson *et al.* (2011); Fonteles *et al.* (2013); Burgwal and Vieira (2014); D'Amico *et al.* (2016); Welbeck e*t al.* (2017); Leal *et al.* (2018); and Kolsi e Attayah (2018).

The second hypothesis, H_2, which states that "companies with a history of environmental violations present a higher level of disclosure of information related to the environment than those that do not present this history" was also not rejected. The result corroborates studies by Patten (2012); Cormier and Magnan (1997); Deegan *et al.* (2000); Ferreira Neto *et al.* (2015); Heflin and Wallace (2017); Mercês and Sampaio (2017); e Elsayed and Ammar (2020).

Failure to reject hypotheses may be associated with the Legitimacy Theory, which understands that companies tend to increase their level of environmental disclosure if they are exposed to the probability of loss or reduction of social legitimation, which may occur when applying an environmental infringement or for exercising potentially polluting activities, and the Voluntary Disclosure Theory, which considers that an organization discloses voluntary information that is favorable to it.

Thus, if the social legitimacy of an organization depends on it acting according to the interests and expectations of society, the voluntary dissemination of social and environmental information may be motivated by this interest (Patten 1992; Deegan *et al.*, 2000; Deegan, 2002).

Regarding the control variables, the RENT, ENDIV, CONS and AUD coefficients were not significant or predictors of the level of Environmental Disclosure (NEA) of the analyzed companies.

Whereas the TAM variable presented a coefficient of 0.034892 and p-value 0.0, being significantly and positively related to the NEA variable in the 99% confidence interval. The result shows that the size of the company influences environmental disclosure. The expected signal and significance for the TAM variable were found in the research, indicating that the company size can positively influence the level of environmental disclosure. According to Patten (2012), larger companies are more exposed to social and political pressures and therefore have greater transparency and evidence of social and environmental information. The findings of the research confirm the results of studies by Patten (1992); Rover *et al.* (2008a); Rover *et al.* (2012); Fonteles *et al.* (2013); Coelho *et al.* (2014); Fernandes (2013); Burgwal and Vieira (2014); Ortas *et al.* (2015); Giacomin *et al.* (2016); Vogt *et al. (*2017); Ganapathy and Kabra (2017); and Leal (2018). The influence of company size on environmental disclosure is consistent with the Legitimacy Theory (Patten, 2012; Ortas; Alvarez; Etxeberria, 2015).

For the variables ENDIV, CONS and AUD, positive and significant relations were expected and, for the RENT variable, positive or negative and significant relations were expected regarding the NEA dependent. However, the expected statistical significance was not found with the application of the model.

Regarding indebtedness, companies with higher debt rates tend to maintain a higher level of disclosure, according to Verrecchia (2001). This relation was not noticed in the present research, which corroborates the studies of Rover *et al.* (2012); Coelho *et al.* (2014); Giacomin *et al.* (2016); Kolsi and Attayah (2018) ; and Kouloukoui *et al.* (2019).

According to studies by Jensen (1993), Ganapathy and Kabra (2017) and of Kolsi and Attayah (2018), companies with more members on the Board of Directors are more subject to conflicts of interest and, therefore, have greater transparency and greater level of disclosure. This relation was not perceived in the study, in which the size of the board did not present a significant statistical relation with the level of environmental disclosure.

Companies audited by audit firms belonging to the Big Four group have higher levels of evidence according to studies by Rover *et al.* (2008a); Rover *et al.* (2012); Vogt *et al.* (2017) and Welbeck *et al.* (2017). The study by D'Amico *et al.* (2016) identified a statistically significant but negative relation between the presence of large audit firms and environmental disclosure, which reveals that the presence of these companies reduces the environmental disclosure. In this research, no significant relations were identified between the presence of large audit companies and environmental disclosure.

Profitability (RENT), measured by ROA, can explain a higher level of environmental disclosure from the understanding of Samaha and Dahawy (2010), who claim that companies with higher profitability aim to differentiate themselves from others from mechanisms of reduction of information asymmetry and agency costs, as the practice of higher level of transparency and disclosure. This finding was confirmed by the studies of Iatridis (2013); Ortas *et al.* (2015); Kouloujoui *et al.* (2019). However, in this research profitability was not significant enough to

explain environmental evidence, being in line with the findings of Rover *et al.* (2012); Coelho *et al*. (2014); Giacomin *et al.* (2016) and Vogt *et al.* (2017).

5 CONCLUSION

The study aimed to verify the influence of sectors with high polluting potential and with a history of environmental violations in the corporate environmental disclosure. For this, the Sustainability Reports (RS) of 78 (seventy-eight) publicly-traded companies listed in the Índice Brasil Amplo (IBrA[Brazil Broad-Based Index] of Stock Exchange *Brasil Bolsa Balcão* were analyzed in the period from 2017 to 2019.

To meet the general objective and solve the research problem, three important steps were developed, namely: from the conceptual structure of Rover *et al.* (2012) the categories and subcategories of voluntary environmental information that was disclosed by the companies were verified. Based on this identification, the level of Environmental Accreditation (NEA) of the environmental information disclosed in the Sustainability Reports was measured and the factors statistically related to this Level of Accreditation were identified.

During the study period, 2,496 observations were identified regarding the subcategories of voluntary environmental information, of which 32.4% were disclosed in 2017; 33.1% in 2018 and 34.5% in 2019. The categories with the highest volume of observations were information on environmental policies and impacts of products and processes on the environment, and those with the lowest volumes of disclosure concerned carbon credit market and environmental education and research.

Regarding the Level of Environmental Accreditation, the companies presented a mean NEA of 29.89%. The lowest level of disclosure was 2.63% and the highest level was 72.2%. The largest NEAS were observed in the basic materials sectors and in the oil, gas and biofuel companies, which are sectors classified as high polluting potential.

The two tested research hypotheses state that companies from sectors with high polluting potential (H_1) and with a history of environmental violations (H_2) have higher levels of environmental disclosure.

The hypothesis test showed that the variables size, sector and history positively influenced environmental disclosure at a significance level of 1%, confirming the research hypotheses, and that the variables indebtedness, profitability, audit and board size did not show significant influence.

These findings are consistent with the Legitimacy Theory and the Voluntary Disclosure Theory. The first due to understand the factors that determine the practice of voluntary environmental *disclosure* and the reasons that lead companies to maintain or increase their level of environmental disclosure as a way to seek or maintain legitimation in society. The hypotheses of confirmed research are therefore consistent with the assumptions of this theory.

With regard to the Theory of Voluntary Accreditation, the high variation among the levels of disclosure practiced, the fact that external factors to the company influence voluntary environmental disclosure and the variable size is confirmed as a determining variable, are consistent with the precepts of this theory, by understanding that companies tend to disclose voluntary information that is favorable to them.

As a research limitation, it is highlighted the short-term analysis carried out, since it was investigated the three-year period and the influence of the variables of interest and control on the level of the company's environmental disclosure of the following year. An additional analysis for future studies is to verify whether the trend of companies that have a history of environmental violations is present higher levels of environmental disclosure for an immediate period of infringement or constant, contemplating a more comprehensive investigation period.

It is also recommended for future research to carry out studies that aim to evaluate the quality of environmental information present in the Sustainability Reports of the companies and

the construction of a metric that considers the materiality of the indicators for each sector of activity. It is also suggested, for future studies, a comparison among other conceptual structures, such as those of Gray *et al.* (1995b), Hackston and Milne (1996) and Nossa (2002); comparison with other countries and other periods and verify if after the approval of OCPC Technical Guidance number 09/2021 there were changes in the environmental disclosure of the Brazilian companies.

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