

## INDEX OF ENVIRONMENTAL DISCLOSURE (IDA): ANALYSIS OF THE APPLICATION OF INDICATOR DEVELOPED FROM THE EXPERT PERSPECTIVE IN BRAZIL \*

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### ABSTRACT

Companies are concerned with disclosing environmental information in order to convey to stakeholders an environmentally sound "image". The study aims to apply the Environmental Disclosure Index (IDA) to Sustainability Reports in the paper and pulp sector in Brazil. This indicator was developed by Bachmann, Carneiro and Espejo (2013), with Brazilian researchers in the area of sustainability, using the Delphi technique. Characterized as descriptive and exploratory, the content analysis was performed using the Atlas.ti software from the IDA categorization. The results show that Sustainability Reports include both the categories and the items that make up IDA, except for Cia. Melhoramentos de São Paulo, which failed to show excerpts from the environmental financial information. The findings indicate that Celulose Irani was the organization whose environmental disclosure was more aligned with the indicator proposed by Bachmann et al. (64%), followed by Fibria Celulose (64%), Klabin (50%) and Cia. Melhoramentos de São Paulo (36%). It is concluded that the results of this research strengthen the IDA, favoring the theoretical and empirical consolidation of the aspects of environmental disclosure, while proposing a wider range of international discussion on the validity of this indicator aimed at sustainability. Therefore, it is observed the relevance of organizations to develop projects, indicators and initiatives aimed at the disclosure of environmental information, considering that investments related to the reduction of environmental impacts are beneficial to the entity and all information stakeholders.

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## 1 INTRODUCTION

Environmental accounting is a part of accounting that addresses the activities, methods, systems, reports of financial and ecological impacts within an economic system (Schaltegger & Burrit, 2000). From the perspective of the reports, the disclosure of environmental information in Brazil does not have a defined regulatory framework. However, the pressure imposed by stakeholders, especially in companies that have activities of high environmental impact, induces voluntary disclosure (Nossa, 2002).

Given the voluntary nature of environmental disclosure, it is important to understand the motivations for disclosure of environmental information (Yamamoto & Salotti, 2006), since this evidence contributes to the generation of added value increasing the trust towards and commitment with stakeholders (Borges, Rosa, & Ensslin, 2010). Additionally, disclosure of environmental information and economic performance has an intrinsic correlation; the institutional arrangements of the environmental information disclosure system necessarily promote the economic performance (Zhongfu, Jianhui, & Pinglin, 2011). In this scenario, Bovespa has developed the Corporate Sustainability Index (ISE), which includes companies concerned with the sustainable development of society (BM&FBovespa, 2014).

It should be noted that the implementation of sustainable processes is one of the greatest challenges of organizations. They aim at reducing pollution and minimizing the use of scarce natural resources (Souza, Rásia, & Jacques, 2010). Dalmoro, Venturini and Pereira (2009) report that the unruly quest by some companies for short-term economic results has caused great ecological impacts reflecting on related parties. In this sense, social and environmental issues at corporate level have influenced the increase of research in the field of environmental accounting, especially in those aspects related to disclosure (Nascimento, Santos, Salotti, & Murcia, 2009). The socially responsible action of entities has already surpassed the stage of mere trend, and sustainability has become a strategic vision of long-term business that incorporates the economic, social and environmental dimensions (Kassai, Ha, & Carvalho, 2011).

Costa and Marion (2007) have analyzed the environmental disclosure and observed that the absence of uniformity of information jeopardize the analysis of the reports. Souza et al. (2010) have investigated the environmental information of the companies that make up ISE in the segments of chemical, electric power and steel making and metallurgy. The results suggest that in the Corporate Balance there are greater environmental evidences compared to the Management Report and the Explanatory Notes; still, we observe that the use of environmental indicators is little explored in these business segments.

Roumeliotis and Alperstedt (2014) have analyzed the environmental principles and indicators of electric power generation companies in Santa Catarina (SC) in the Sustainability Reports, so as to meet GRI requirements. For such, they used content analysis. The results have demonstrated that the structure of the Report needs evolution, so that there is greater adherence to factors related to the principles and degrees of environmental indicators.

Bachmann et al. (2013) have listed environmental attributes, according to the degree of importance of disclosure for the composition of a Brazilian indicator that evaluated the quality of disclosure of environmental information. In this sense, the scientific contribution of the present investigation is the application of the Brazilian indicator, refereed to as Environmental Disclosure Index (IDA), to the pulp and paper segment.

Therefore, the question that guides this study is: **what is the application of the IDA in Sustainability Reports?** The purpose of the research is to present the results of the application of IDA to companies belonging to the paper and pulp sector. Thus, this research expects to check whether companies in pulp and paper segment consider the categories of analysis defined by IDA, as well as what content is being evidenced by these companies in their Sustainability Reports.

The relevance of this study is grounded on the fact that sustainability represents a new scope of research in the "business universe", and its performance optimizes the use of natural resources while contributing to the integrity of the planet (BM & FBovespa, 2014). Still, this research aims to collaborate to scientific knowledge, given the exclusivity of the applied indicator, as well as to disseminate it nationally in order to enable the broadening of the critical mass on the sustainability matter.

Research related to environmental sustainability in the pulp and paper sector is relevant, considering that this segment depends on nature, which has limited resources. In addition, if companies are not aware of the impacts generated in the industrial process, the continuity of the industry may be compromised (Gasparino & Ribeiro, 2007). Therefore, we have observed the need for a socially correct attitude by the entities.

Nossa (2002) have analyzed the content in environmental reports of the pulp and paper sector at international level. The findings of the study revealed that the environmental disclosure in pulp and paper companies is distinguished by size, country of location and type of financial or specific report. Following the same line of thinking, this research seeks to contribute to the progress of studies related to sustainability.

## **2 IDA AND ENVIRONMENTAL DISCLOSURE**

Environmental issues are often discussed (Zeng, Xu, Dong, & Tam, 2010; Zhongfu et al., 2011, Ashcroft, 2012, Momin, 2013, Lu & Abeysekera, 2014). Central aspects refer to the commitment of organizations to the environmental impacts arising from the business activities (Lu & Abeysekera, 2014). Nossa (2002) clarifies that environmental disclosure, also referred to as environmental disclosure, may be either mandatory or voluntary; The first refers to legal and normative impositions; while the volunteer, on the other hand, is the result of managers' choices.

In Brazil, there is no regulation on environmental disclosure. Therefore, disclosure by entities is voluntary. The Laws n. 6,404/76 and n. 11,638/07 is not specific in the disclosure of these aspects. However, Guideline of Brazilian Securities and Exchange Commission (CVM) Opinion no. 15/87, Auditing Standard and Procedure no. 11 from the Institute of Independent Auditors of Brazil (IBRACON) and Resolution no. 1,003/04 of the Federal Accounting Council (CFC), present the guidelines for dissemination of environmental information (Beuren, Santos, & Gubiani, 2013).

Bovespa, in December 2005, has created the Corporate Sustainability Index (ISE), which seeks to evaluate in an integrated manner different sustainability scopes, whose focus is to induce entities to good environmental practices. It should be noted that in the ISE composition, one of the aspects refers to the Triple Bottom Line that considers three perspectives of analysis: i) economic; (ii) social; And iii) environmental. The economic aspect analyzes the efficiency of the allocation of production resources; the social aspect considers the human development, specifically those related to the remuneration of employees, safe environment; and the environmental aspect focuses on matters related to the ecosystem and natural resources (BM&FBovespa, 2014).

In this sense, greater disclosure of environmental aspects contributes to creating an environmentally correct image, reducing capital cost and increasing of liquidity of shares. It is a differential for organizations to adopt this attitude (Rover, Murcia, Borba, & Vicente, 2008). Furthermore, the dissemination of environmental information favors the development of the corporate image (Gray & Bebbington, 2001) and contributes to competitive advantage (Porter 1993, Aaker 2001, Tachizawa 2002).

With regard to environment-oriented researches in Brazil, Ribeiro (1992) marks the beginning thereof, when investigating the profile of the dissemination of environmental information by accounting in the national and international scope. Nossa (2002) have analyzed environmental disclosure in Brazilian and foreign companies within the pulp and paper sector. The findings are in line with the theory, considering that the variation of environmental disclosure occurs according to the size and the country of the company.

Borba, Rover and Múrcia (2006) have compared Brazilian and U.S. environmental information evidence. The results have shown discrepancies in the volume of information released by these countries. Rover et al. (2008) have analyzed the voluntary environmental information disclosed by companies belonging to high-impact sectors. For this purpose, categories of analysis were established. Their results corroborate the Voluntary Disclosure Theory that refers to the disclosure beyond the regulation recommendations representing a free choice by managers to communicate additional information to the decision making process of internal and external users (Murcia & Santos, 2009).

"Accounting, Auditing and Accountability Journal" made special editions on issues concerning the environment (Rover et al., 2008). Table 1, below, presents studies from the perspective of environmental disclosure as of 2010.

**Table 1**  
**International Studies**

International Studies	Author(s)
Corporate Environmental Information (FDI) refers to information related to the natural environment, environmental protection and use of resources. Such information was analyzed in 871 industries listed on the Chinese stock exchange. In the discussions the relations between the FDI are presented compared to the industrial sector, size of the company and ownership of the entity. The results reveal the negative relationship between FDI and the level of commercialization.	Zeng, Xu, Dong and Tam (2010)
This research finds that the dissemination of environmental information has a positive effect on economic performance. Therefore, companies that sufficiently disclose their environmental information perform better.	Zhongfu, Jianhui and Pinglin (2011)
This study was carried out in companies from the United States and Canada, with the purpose of discussing the influences for the elaboration of the environmental disclosure. The content of the environmental disclosure of the annual reports was evaluated based on the environmental reporting guidelines published by the American Institute of Chartered Accountants and the Canadian Institute of Chartered Accountants. The results indicate that US companies have a higher level of environmental disclosure compared to Canadian companies.	Ashcroft (2012)
This article explores the perceptions of Corporate Social Disclosure (CSD) in non-governmental organizations in the context of a developing country: Bangladesh. Semi-structured interviews were conducted in selected social and environmental NGOs. The results suggest that companies need to engage in social development to improve their social performance in order to meet their social and environmental responsibilities for the people of Bangladesh.	Momin (2013)
The influence of stakeholders and the social and environmental characteristics of Chinese companies listed as socially responsible were analyzed. The results have indicated that the disclosures related to social and environmental aspects have a positive and significant association with company size, profitability and industry classification.	Lu and Abeysekera (2014)

**Note.** Source: the authors, based on works refereed to (2017).

The scope of international studies on environmental issues are observed (Zeng *et al.*, 2010; Zhongfu *et al.*, 2011; Ashcroft, 2012; Momin, 2013; Lu & Abeysekera, 2014). In order to contribute to the scientific progress of the Brazilian researches related to environmental disclosure, the following is the composition of the Environmental Disclosure Index, named IDA, which has been developed by Brazilian researchers.

The study by Bachmann et al. (2013), published in the Journal of Accounting and Organizations, led to this research. From the perception of accounting and sustainability specialists, the authors, through Delphi rounds, have created IDA, an indicator composed of ten aspects of environmental characteristics. According to experts, these attributes, in ascending order, reflect on the practicality and representativeness of the quality of environmental information.

Table 2  
**Composition of the Environmental Disclosure Indicator (IDA)**

IDA Composition
1 - Environmental impacts of products and processes (air, water, noise, visual pollution)
2 - Debris and waste information
3 - Establishment of environmental goals and objectives
4 - Environmental management program (long term)
5 - Declaration of environmental business policies
6 - Water efficient use / reuse
7 - Environmental auditing
8 - Accounting practices of environmental items
9 - Environmental protection reserve
10 - Environmental costs and / or expenses

**Note.** Source: Bachmann, R. K., Carneiro, L. M., & Espejo, M. M. dos S. B. (2013). Evidence of environmental information: proposal of an indicator based on the perception of experts. *Revista de Contabilidade e Organizações*, 7(17), 36-47.

For the authors, the study makes it possible to understand the environmental aspects that must be disclosed. It also reveals that qualitative aspects, such as "environmental impacts of products and processes" and "waste information", were of high importance. As a perspective of further studies, the authors suggest that the IDA can be validated in a number of companies. This suggestion is aligned with the purpose of the present study.

### 3 RESEARCH METHODOLOGY

This research is characterized as descriptive and exploratory, as it seeks to identify the application of the IDA to sustainability reports. Only companies within the paper and pulp sector listed on BM&FBovespa were evaluated, as shown in Table 3.

Table 3  
**Bovespa Pulp and Paper Portfolio**

Celulose Irani	Santher Fab. de Papel Sta. Therezinha
Cia. Melhoramentos de São Paulo	Suzano Holding
Fibria Celulose	Suzano Papel e Celulose
Klabin	

**Note.** Source: BM&FBovespa. (2014). *Business Sustainability Index (ISE)*.

After selecting the companies, and in order to operationalize this study, the data were collected in the Sustainability Report for the year of 2013. These reports were obtained in October 2014 on the companies' websites. The Sustainability Report, also known as Integrated, reports the information and results related to social, environmental and corporate governance aspects. Its differential consists in being a quick mean for accessing information (BM&FBovespa, 2014).

At that moment, it was found that the company Santher Fab. De Papel Sta. Therezinha has failed to publish this report and on Suzano's website, therefore, only the Sustainability Reports were available up to the year 2012. Based on the foregoing contact with Suzano Papel e Celulose was made via e-mail. However, no return was obtained. As a result, four companies were obtained as final sample: i) Celulose Irani; ii) Cia. Melhoramentos de São Paulo; iii) Fibria Celulose; and iv) Klabin.

In order to analyze the application the IDA to the Sustainability Reports, we have used the content analysis technique, which seeks to reveal the description of messages contents

based on systematic and objective procedures (Bardin, 2004). Fauzi (2009) and Nossa (2002) have also used this methodology in their studies, when discussing matters concerning the environment.

Thus, as proposed by Bachmann et al. (2013), the 10 components of IDA were distributed in four environmental categories: i) impact of products and processes; (ii) environmental policies; (iii) environmental management systems and; iv) environmental financial information, as shown in Table 4.

**Table 4**  
**Conceptual structure for environmental disclosure**

Environmental Categories	IDA Composition
Impact of Products and Processes	1 - Environmental impacts of products and processes (air, water, noise, visual pollution)
	2 - Debris and waste information
	6 - Water efficient use / reuse
Environmental Policies	3 - Establishment of environmental goals and objectives
	5 - Declaration of environmental business policies
Environmental Management Systems	4 - Environmental management program (long term)
	7 - Environmental auditing
Environmental Management Systems	8 - Accounting practices of environmental items
	9 - Environmental protection reserve
	10 - Environmental costs and / or expenses

**Note.** Source: Adapted from Múrcia, F. D. R., Rover, S., Lima, I., Fávero, L. P. L., & Lima, G. A. S. F. de. (2008). 'Green Disclosure' in financial statements: Characteristics of environmental information and possible explanations for voluntary disclosure. *Accountancy, Revista UnB Contábil*, 11, 260-278; Bachmann, R. K., Carneiro, L. M., & Espejo, M. M. dos S. B. (2013). environmental information Evidence: proposal of an indicator based on the perception of experts. *Revista de Contabilidade e Organizações*, 7(17), 36-47. (2013)

Atlas.Ti software version 7.5.2 was used for associating environmental disclosure with IDA indicators and their categories to companies within the pulp and paper sector. This software made it possible to categorize and interconnect the environmental information presented in Sustainability Reports, through the creation of a project in the so-called hermeneutics unit that composes primary documents (P-Docs), quotations (Quotes) and Codes. Based on these elements, Atlas.Ti enables the illustration of relations observed by the researcher through the construction of relationship networking. Therefore, to obtain these results, the Sustainability Reports were read and the excerpts of the text classified as to the ten aspects that make up IDA. It is worth mentioning that some categories were segregated as they addressed different approaches. Table 5 shows the composition of ADI (segregated) used for content analysis.

**Table 5**  
**IDA Segregation for content analysis**

IDA Composition	Segregated IDA Composition
1 - Environmental impacts of products and processes (air, water, noise, visual pollution)	1.1 - Air pollution
	1.2 - Water Pollution
	1.3 - Noise Pollution
	1.4 - Visual pollution
2 - Debris and waste information	2.1 - Debris
	2.2 - Waste
3 - Setting of environmental goals and objectives	3.1 - Environmental goals

**Continue**

**Table 5 (continuation)**

IDA Composition	Segregated IDA Composition
4 - Environmental management program (long term)	4.1 - Environmental program
5 - Declaration of environmental business policies	5.1 - Environmental policies
6 - Water Efficient use / Reuse	6.1 - Reuse of water
7 - Environmental auditing	7.1 - Environmental audit
8 - Accounting practices concerning environmental items	8.1 - Environmental accounting practices
9 - Environmental protection Reserve	9.1 - Environmental reserve
10 - Environmental costs and / or expenses	10.1 - Costs and expenses

**Note.** Source: Adapted from Bachmann, R. K., Carneiro, L. M., & Espejo, M. M. dos S.B. (2013). Evidence of environmental information: proposal of an indicator based on the expert perspective. *Revista de Contabilidade e Organizações*, 7(17), 36-47.

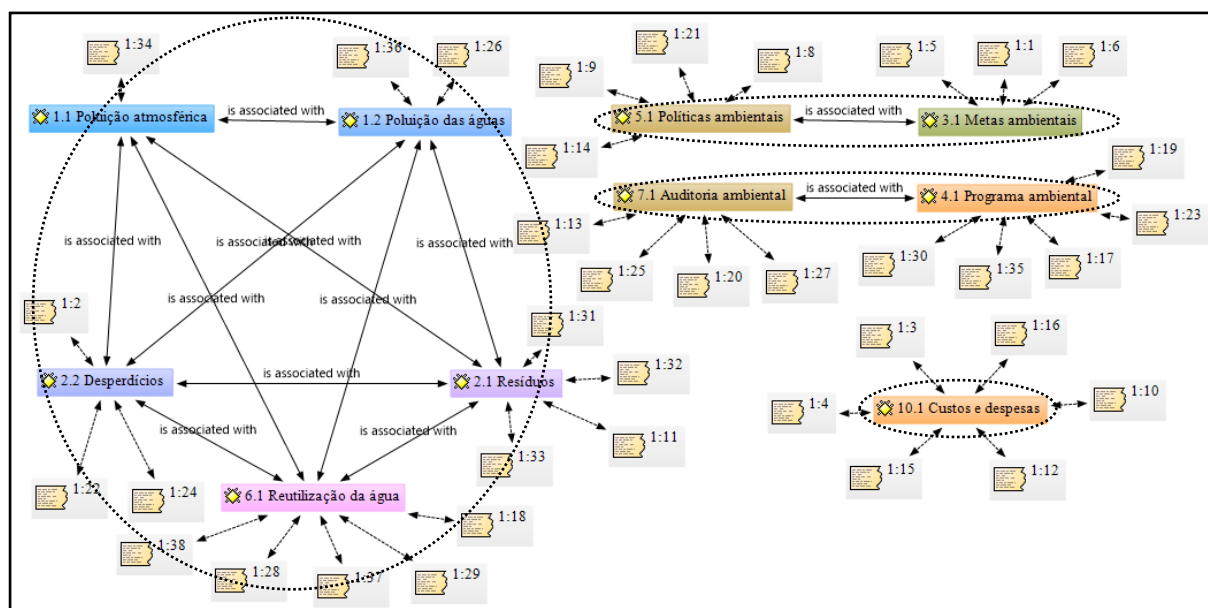
To the light of the aforementioned methodological path, the final purpose of this study has been met, as described below.

## 4 ANALYSIS OF SUSTAINABILITY REPORTS

### 4.1 Celulose Irani

Celulose Irani has gone public in 1977. Its activities are focused on the production of paper for packaging, boxes and corrugated cardboard sheets, all biodegradable and 100% recyclable, as well as resins. Its industrial units are located in the cities of Vargem Bonita (SC), Balneário Pinhal (RS), Indaiatuba (SP) and Santa Luzia (MG). While the administrative offices are located in Joaçaba (SC) and São Paulo (SP), and the headquarter in Porto Alegre (RS) (Celulose Irani Sustainability Report, 2013).

Regarding the environmental categories that make up IDA, it was verified that all were highlighted in the Sustainability Report, according to Figure 1. However, some items were not mentioned, such as noise pollution, visual pollution, environmental reserve and environmental accounting practices.



**Figure 1.** IDA Application to Celulose Irani

Key: 1.1 - Air pollution; 1.2 - Water Pollution; 1.3 - Noise Pollution; 1.4 - Visual pollution; 2.1 - Debris; 2.2 - Waste; 3.1 - Environmental goals; 4.1 - Environmental program; 5.1 - Environmental policies; 6.1 - Reuse of water; 7.1 - Environmental audit; 8.1 - Environmental accounting practices; 9.1 - Environmental reserve; 10.1 - Costs and expenses.

Source: The authors (2017).

With regards to the category of impact of products and processes, it was found that in the disclosure related to atmospheric pollution the company removes more carbon from the atmosphere than its emissions, so its activities are carbon neutral. With regards to water pollution, in 2013 the Resins Unit presented problems at the Effluent Treatment Station (ETE). It is verified that the company adopts specific procedures for the collection, storage and proper destination of the waste generated throughout the processes, by hiring specialized services for this purpose.

From the waste perspective, Celulose Irani seeks the continuous improvement of the products' Life Cycle Analysis (LCA) indicators, in order to avoid waste and identify new opportunities for cost reduction. There are excerpts that show the practice of reusing water, in which Celulose Irani states that water consumption has been reducing over the years; In addition, the new technologies implemented allowed the reuse of water in some processes making use of closed circuits.

In the environmental policies category, Celulose Irani demonstrated that one of its environmental goals is to maintain a balance between the environment and society. In parallel, the company seeks creativity and commitment to continue making progress in reducing environmental impacts, especially with a focus on recycling products and by-products. From the perspective of environmental policies, the company ensures commitment to sustainability in its actions, as well as believing that sustainability is a conditional factor for innovation.

Regarding the category of environmental management systems, the company has defended aspects related to environmental auditing and environmental programs. Concerning the audit, the company shows adequacy of procedures to international standards of sustainability. Internal and external audits are also carried out. Specifically in ETE, the monitoring comprises the analysis of several parameters and constant actions that are developed aiming at reducing the effluent volume.

The development of some programs such as: i) Family Garden Program: grow health at home", (stimulates the grow of organic foods and quality of life for residents); ii) Solid Waste Management Program (prioritizes the reduction, recycling and reuse of waste); iii) Fixed-Source Emissions Program (aim at periodically monitoring the points of emission of its industrial units).

The environmental financial information category features disclosure aspects regarding the costs / expenses. The company states that it seeks gains from productivity and cost reduction in processes. In 2013, the devaluation of Real has boosted the productive chain to face new challenges from the cost perspective. In the same year, the company saved R\$ 3,500.00 reais by reusing substrates from the production of Pine and eucalyptus seedlings for producing native seedlings.

#### **4.2 Cia. Melhoramentos de São Paulo**

Cia. Melhoramentos de São Paulo prepares, since 2011, the Sustainability Report. The company operates in the editorial segment, of forest management, pulp and cellulose fiber, distributed in 3 units. In addition to the administrative headquarters in São Paulo, in the region of Lapa, the management is carried out at Fazenda Florestal, in Caieiras (SP) - with 5 thousand hectares; at Fazenda Santa Marina, in Bragança Paulista (SP) - with 650 hectares; and at Fazenda Levantina, in Camanducaia (MG) - with approximately 12 thousand hectares. In the latter, besides the forest management practiced in only 50% of the total area, the remaining 50% is preserved as native forest (São Paulo Improvements Report, 2013).

Data analysis has revealed that three environmental categories - impact of products and processes, environmental policies and environmental management systems - are included in the Sustainability Report of Cia. Improvements of São Paulo, 2013. As to the category of impact of products and processes, the company issued a note on actions addressing the reuse of



water, noting that after water is used it is treated in ETE. Moreover, it made evident that investments were made in ETE, thus increasing its treatment capacity from 10m<sup>3</sup>/h to 20m<sup>3</sup>/h.

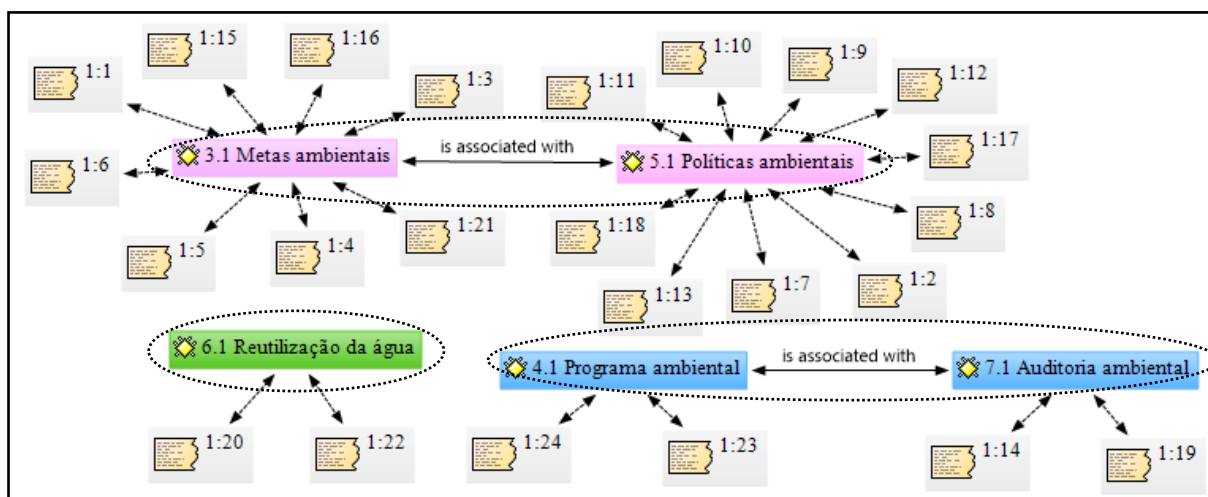
In the environmental policies category, Cia. Melhoramentos de São Paulo has presented in its Sustainability Report the excerpts of goals and environmental policies. It is observed that with regards to the goals, the company seeks to become a benchmark in socio-environmental responsibility, positioning itself as the largest high-yield fiber producer for the world market by 2025, in addition to seeking to neutralize the environmental impacts in its operations, always concerned with the preservation and monitoring of the biodiversity present in its management areas.

With regards to environmental policies, it is noted that the organization is based on the ideal of respect for the environment and protection to ecosystems. Therefore, according to the reports, the entity is involved in socio-environmental practices. From customers' perspective, its policy focuses on creating value in the sustainable packaging chain.

Another approach identified in Cia. Melhoramentos de São Paulo corresponds to the environmental management system. In this category, the entity has demonstrated aspects of environmental auditing and participation in environmental management programs. As part of the audit, the company follows strict rules established by the Forest Stewardship Council (FSC), and conducts audits regularly. Another remark, verified in 2013 by the annual audit, refers to the maintenance of the Green Seal at Fazendas de Camanducaia, which guarantees the traceability of the wood from raw material to final consumer.

To the light of environmental programs, the content of information disclosed states that the organization has a genetic improvement program, whose purpose is to select and obtain clones adapted to weather conditions, which contributes to the production of high-yield fibers. Additionally, it can be seen that Cia. Melhoramentos de São Paulo participates in cooperative programs linked to the Institute of Research and Forestry Studies, whose focus is to improve the embedding of its clones.

Regarding the environmental categories of IDA, Cia. Melhoramentos de São Paulo was the one that presented the smallest amount among the entities under study. Through the analysis in the Sustainability Report, some items, such as air pollution, water pollution, noise pollution, visual pollution, debris, waste, environmental accounting practices, environmental reserve and costs and expenses, were not mentioned.



**Figure 2.** Application of IDA to Cia. Melhoramentos de São Paulo

Key: 3.1 - Environmental goals; 4.1 - Environmental program; 5.1 - Environmental policies; 6.1 - Reuse of water; 7.1 - Environmental audit.

Source: The authors (2017).

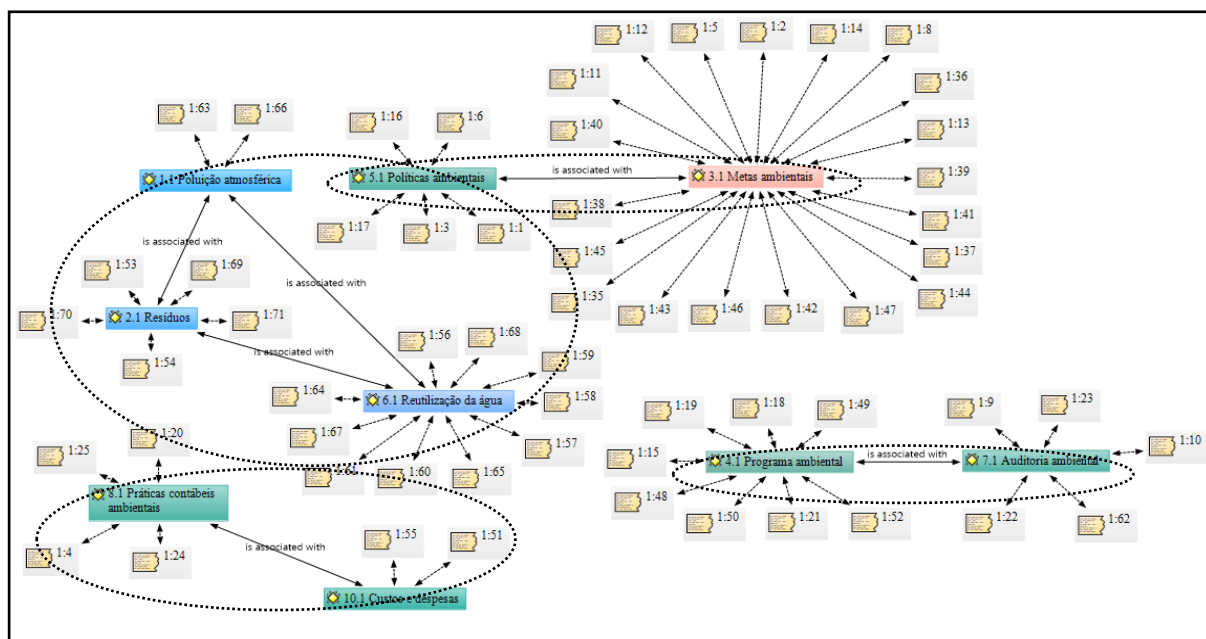
Figure 2 represents the categories identified in the analysis of Cia. Melhoramentos de São Paulo.

### 4.3 Fibria Celulose

Fibria Celulose was created in 2009, from the acquisition of Aracruz Celulose SA by Votorantim Celulose e Papel S.A. It is the world's largest producer of short-fiber eucalyptus pulp - raw material for the manufacture of papers for printing, writing, personal hygiene and special uses. The wood is processed in the company's factories in Aracruz (ES), Três Lagoas (MS) and Jacareí (SP). Fibria is present in 242 municipalities, in 7 Brazilian states, namely: Rio Grande do Sul, São Paulo, Rio de Janeiro, Espírito Santo, Mato Grosso do Sul, Minas Gerais and Bahia. The company also maintains a fourth Industrial Unit, Veracel, in partnership with the Swedish-Finnish group Stora Enso (Fibria Celulose Sustainability Report, 2013).

Based on Figure 3, we observe that all environmental categories comprising the IDA were identified in Fibria's Sustainability Report. It should be noted that some items of these categories were not identified in the analysis performed, namely: i) water pollution; (ii) noise pollution; (iii) visual pollution; (iv) waste; and v) environmental reserve.

With regards to the category of impacts of products and processes, the entity has showed aspects of air pollution, debris and water reuse. Some sections emphasize that the total area affected by fires was 7,950 hectares, of which 4,445.1 hectares of burned forests were in preservation areas. With regards to waste, the company emphasizes that one of its priorities in industrial processing is to make the most efficient use of solid waste and, by 2025, to seek a reduction of 91% in the volume of waste intended for industrial landfills. Jacareí Unit, for example, reuses waste (fiber), which used to be disposed of, thus increasing the productivity of the plant and providing annual savings of around R\$ 500,000. Additionally, the company uses the soil corrective from the use of industrial waste, which results in economy to the company.



**Figure 3.** Application of IDA to Fibria Celulose

Key: 1.1 - Air pollution; 1.2 - Water Pollution; 1.3 - Noise Pollution; 1.4 - Visual pollution; 2.1 - Debris; 2.2 - Waste; 3.1 - Environmental goals; 4.1 - Environmental program; 5.1 - Environmental policies; 6.1 - Reuse of water; 7.1 - Environmental audit; 8.1 - Environmental accounting practices; 10.1 - Costs and expenses.

Source: Authors (2017).

The concern of Fibria Celulose regarding the efficient use of water is observed. In the sections of the Sustainability Report, it is perceived that the entity seeks to guarantee the quantity and quality of water necessary for its forestry and industrial activities, always ensuring the supply to the communities. In 2013, Fibria has expanded the monitoring of water resources in order to identify bottlenecks that could interfere with the water supply to communities. It is noteworthy that in 2013, an innovative project was developed, reducing by half the water consumption in Aracruz seedlings nursery, for which rainwater harvesting and effluent treatment

were used. Fibria is part of the Water Footprint Network (WFN) and monitors the use of water at all stages of production to identify optimization opportunities.

Another category identified refers to environmental policies. Based on the analysis, it was verified that Fibria's goals are environmental, with emphasis added to the large number of excerpts that refer to this aspect of IDA. In addition, the entity have also presented some environmental policies, such as the identification and monitoring of environmental impacts throughout the entire value chain, so as to act in harmony with society. Once again, the text makes it clear that Fibria's policy focuses on prioritizing local communities, since they are the most affected by the organization's operations. Finally, from the suppliers' perspective, Fibria requires them to comply with environmental policies.

With regards to environmental goals, these were found to be aligned with the environmental policy defined by the company. Some of the goals identified in the analysis of the Sustainability Report include: reducing by one third the amount of land required for the production of pulp by 2025; consolidating the forest business as a renewable and sustainable source of life; strengthening the work of the Internal Sustainability Commission (CIS), which has as one of its objectives the function of monitoring the execution of commitments assumed by the company; prioritizing the implementation of a solid supplier management policy, conduct on-site audits with a focus on sustainability, and develop a Code of Conduct for suppliers.

The environmental management systems category, comprised of environmental programs and audits, have demonstrated that the company has some environmental programs, such as: i) Territorial Rural Development Program (PDRT) (focus: community empowerment to manage sustainable agroforestry projects); ii) Beehives Program (aim to contribute to the improvement of the life quality of beekeepers); iii) Environmental Education Program (PEA) (actions for residents, schools, leaderships, community groups and companies from Barra do Riacho); iv) Forest Restoration Program; V) Forestry Learning Program (qualifies labor for forest harvesting area in partnership with Senai and Kolping Institute); Vi) Forest Savings Program (offers financing in exchange for guarantee of timber supply); (vii) Odor-Perception Network Program (aims to reduce the emission of odor during the industrial process based on reports of the residents surrounding the plants).

It was observed that Fibria has issued in its Sustainability Report excerpts on costs / expenses and environmental accounting practices, items that integrate the environmental category named environmental financial information. With regards to costs and expenses, the evidence focuses on the search for new alternatives to reduce the volume of inputs in the processes of cooking and bleaching, whose purpose is to lower pulp production costs.

In turn, the company's discourse, in line with accounting practices, refers to the sales of 207 thousand hectares of land to a Brazilian investment fund, generating revenue of R\$ 1.65 billion. Fibria was involved in two actions related to losses from Aracruz Celulose derivatives, which occurred in 2008. These actions resulted in agreements, which were settled in the first quarter of 2013.

#### 4.4 Klabin

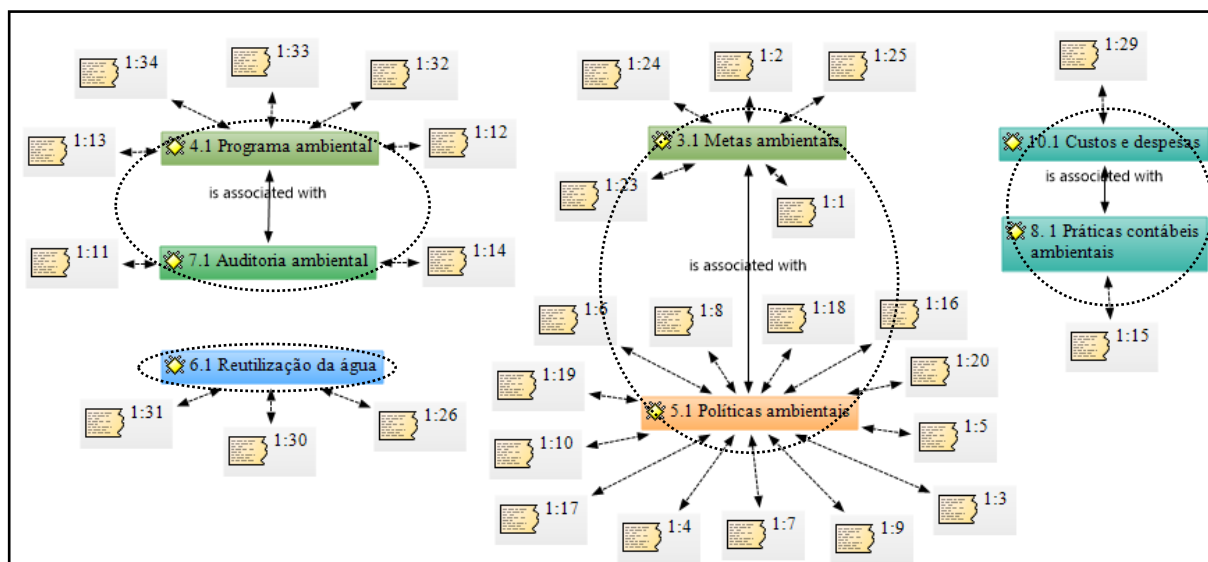
Klabin has three business units, forestry, paper (letter, Kraft and recycled papers) and conversion (corrugated cardboard boxes and industrial bags). Klabin currently has 15 units distributed in 8 Brazilian states, and 1 unit in Argentina (Klabin Sustainability Report, 2013). Figure 4 demonstrates that Klabin presented all the environmental categories integrating the IDA in 2013 Sustainability Report. The category impacts of products and processes presented sections on the efficient use of water, not mentioning aspects related to air pollution, water pollution noise pollution, visual pollution, debris and waste.

As to the reuse of water, we verify that ETE ensures the removal of more than 80% of biochemical oxygen demand, ensuring compliance with legal requirements and emissions below the limits established for the discharge of its effluents, which are monitored in all units Of Klabin. This procedure is managed through reports and analysis. The rivers that receive the effluents have monitored water quality. Klabin also declared that seeks to reduce consumption and promote the rational use of water in all its industrial and forestry operations.

With regards to environmental procedures, the company has presented excerpts of

environmental goals and policies. With regards to environmental goals, the discourse directs management towards sustainable development. In addition, the activities carried out by the organization follow guidelines for climate change, whereas the goal for 2014 is to reduce greenhouse gas emissions.

With regards to environmental policies, Klabin undertakes to adhere to the best practices adopted in the market, using environmentally and socially responsible processes throughout the production chain. Its code of conduct gathers together principles of business sustainability in economic, environmental and social spheres. In this sense, the sustainability policy guide the conduct of business and investments, taking into consideration the sustainable growth and value generation for all stakeholders.



**Figure 4.** Application of IDA to Klabin

Key: 3.1 - Environmental goals; 4.1 - Environmental program; 5.1 - Environmental policies; 6.1 - Reuse of water; 7.1 - Environmental audit; 8.1 - Environmental accounting practices; 10.1 - Costs and expenses.

Source: The authors (2017).

In the environmental management systems category, Klabin presented evidence of environmental auditing and adoption of environmental management programs. From the audit perspective, a contracted risk management company is monitored and audited at Klabin's units. In December 2013, the company monitored 1992 requirements in all of its units. Performing periodic internal and external audits ensures correctness of data and system evidences. As a result, in the last three years the company has not suffered any lawsuit, whether of civil or criminal nature concerning the environment.

As to the environmental programs, Klabin has a program for research and conservation of fauna and flora, monitoring biodiversity and identification of species considered rare or extinct. Superar Program has been contributing to the company's continuous improvement through the involvement and appreciation of people, developed at Monte Alegre (PR) unit. O Superar is present in 14 units, with expressive results in the excellence of processes and products.

With regards to the environmental financial information, the analysis evidences costs / expenses and accounting practices of environmental items. In terms of costs and expenses, Klabin was fined R\$ 2,784.52 for having produced the acidity corrector (lime sludge) with magnesium oxide content beyond the tolerance limit set.

With regards to the accounting practices of environmental items, Klabin has an agreement signed with the Government of the state of Paraná that provides for the division of ICMS from operations of the new plant among 12 municipalities. With Ortigueira bearing 50% and the remaining 50% being divided among the 12 municipalities.

#### 4.5 Joint Analysis

Table 6 was prepared based on the individual analysis of the Sustainability Reports of companies Celulose Irani, Cia. Melhoramentos de São Paulo, Fibria Celulose and Klabin, presenting the environmental categories proposed by IDA, the composition of the segregated IDA and the objects companies analyzed hereunder.

Among the analyzed companies, only in Cia. Melhoramentos de São Paulo excerpts referring to the environmental financial information category were not observed. In other organizations at least one item of each IDA category was mentioned.

Table 6  
Comparison of IDA application

Environmental Categories	Composition of the Segregated IDA	Celulose Irani	Cia. Melhoramentos de SP	Fibria Celulose	Klabin
Impact of Products and Processes	1.1 - Air pollution	X		X	
	1.2 - Water Pollution	X			
	1.3 - Noise Pollution				
	1.4 - Visual pollution				
	2.1 - Debris	X		X	
	2.2 - Waste	X			
	3.1 - Environmental goals	X	X	X	X
Environmental Policies	4.1 - Environmental program	X	X	X	X
	5.1 - Environmental policies	X	X	X	X
Environmental Management Systems	6.1 - Reuse of water	X	X	X	X
	7.1 - Environmental audit	X	X	X	X
Environmental Management Systems	8.1 - Environmental accounting practices			X	X
	9.1 - Environmental reserve				
	10.1 - Costs and expenses	X		X	X

**Note.** Source: The authors (2017).

Comparing the composition of the segregated IDA (fourteen indicators) with the environmental disclosure, we find that: i) Celulose Irani is the company that most evidenced IDA categories, that is, ten categories or 71% disclosure; ii) Cia Melhoramentos de São Paulo presented five categories or 36% disclosure; iii) Fibria Celulose presented 9 categories of segregated IDA or 64% disclosure and; iv) Klabin presented seven categories or 50% disclosure.

Thus, considering the joint analysis of the companies integrating this study, we verify that IDA composition have integrated the Sustainability Report of companies within the paper and pulp sector. However, the degree of environmental disclosure is unstable. Some companies disclose information more often than others. It was also found that environmental policy categories and environmental management systems are those presenting the highest level of disclosure. These are recurrent in all reports analyzed.

## 5 CONCLUSIONS

The article aimed to present the results of the application of IDA in companies comprising to the pulp and paper sector in Brazil. In this sense, the work sought to be an empirical contribution to the validation of the indicator proposed by Bachmann et al. (2013), based on content analysis of the Sustainability Reports of four companies: Celulose Irani; Cia Melhoramentos de São Paulo; Fibria Celulose and Klabin. Moreover, aspects focused on the sustainability of organizations were discussed.

To the light of the analysis it was found that all companies examined evidence environmental information. The environmental policies and environmental management systems are the most publicized categories. On the other hand, the volume of excerpts and the robustness of the Sustainability Report vary among organizations; Differences were found in the volume of information and further in the categories explained by companies.

It is concluded that the findings of this study contribute to: i) evidencing how companies from the pulp and paper segment report their environmental information to stakeholders; ii) demonstrating the application of ADI to a specific segment; iii) validating IDA, an indicator that until now was restricted to the theoretical field, as it was not applied empirically; iv) strengthen theoretical and empirical environmental studies.

However, when analyzing the results it is necessary to take into consideration that the findings are limited to the Sustainability Reports analyzed as well as to the pulp and paper segment. Therefore, these should not be understood generally. Moreover, it is noted as a further limitation, that the study refers to the year of 2013. Thus, it is possible that analyzed companies presented other aspects of environmental disclosure in previous years.

We suggest that future researches are carried out in other segments or that the window under analysis comprises a greater number of years, in order to consolidate the validation of the theoretical construction proposed by Bachmann et al. (2013). Finally, it is recommended to replicate this study so that comparisons can be made.

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