Global Advanced Research Journal of Management and Business Studies (ISSN: 2315-5086) Vol. 3(6) pp. 249-266, June, 2014
Available online http://garj.org/garjmbs/index.htm

Full Length Research Paper

Analysis of the determinants of disclosure of environmental impacts of Brazilian companies

Dr Fabricia Silva da Rosa1, Dr Rogério João Lunkes[2], Dr Nelson Hein[3], Mara Vogt[4], Larissa Degenhart[5]

[1]FURB – Brasil
[2]UFSC – Brasil
[3]FURB – Brasil
[4]FURB - Brasil
[5]FURB – Brasil
Corresponding author Email: fabriciasrosa@hotmail.com

Accepted 21 May 2014

This article aims to identify the factors that influence Brazilian companies' environmental disclosures. To achieve this goal, the annual and sustainability reports of 98 companies that comprise the IBRX100 index of BM&FBOVESPA (São Paulo Stock Exchange) were analyzed for the period between 2010 and 2012. First, each company's level of disclosure of information about waste, emissions, effluents and other impacts was identified based on their annual and sustainability reports. A model to measure the level of disclosure was then built based on a literature review and the guidelines of the Global Reporting Initiative (GRI). Second, the factors that explain the contents of the companies' reports were identified using canonical correlation. Data analysis revealed that the companies fit the following profile: (i) The sustainability report is seldom used the exclusive channel of environmental disclosure; (ii) There is a correlation between information disclosed in annual reports and information disclosed in sustainability reports, which demonstrates that consistent information is provided, but there is a difference in a scope of the information provided in that sustainability reports provide more detailed information; (iii) The level of environmental information disclosed could be improved if companies would disclose more information about waste disposal, impact reduction targets, managing the impact of transportation and effluent treatment; and (iv) Aspects related to environmental performance (Potentially Polluting Enterprises (PPE) and GRI), legitimacy (AUDIT) and economic performance (ACCION, ASSEST and Return on Assets (ROA)) may influence or be positively related to the level of environmental disclosure, but the same is not true of ESI (Environmental Sustainability Index), CG (Corporate Governance) and ROE (Return on Equity) indicators.

Keywords: Environmental disclosure, Impact management, Brazil.

INTRODUCTION

Due to the environmental issues that have arisen in recent decades, society is increasingly concerned about corporate environmental management. Thus, the government has been enacting and adapting laws necessary to protect the environment and control the environmental impact of economic activity. In addition,

social movements have questioned companies' performance related to the environmental impact of their activities.

These forces have influenced companies' accountability decisions. Increasingly, in response to social demands to manage negative environmental impacts on climate, biodiversity and human health caused by economic activity, environmental transparency is important at the international level.

According to Cho et al. (2012), the last decade has seen a rapid growth in the use of independent reports to disclose information about companies' social and environmental performance. Although these reports are considered important for evaluating the legitimacy of companies' disclosures, concerns have arisen about not only the quality of the information reported by companies but also the impact of companies' activities on both society and the environment.

According to Cormier and Magnan (2013), when formulating an environmental disclosure strategy, company managers are pressures both to respond to the financial markets' informational needs and to maintain company legitimacy within the community. Cormier and Magnan believe that environmental disclosure both improves the quality of environmental information and influences how stakeholders perceive a company's legitimacy.

Thus, environmental disclosure based on the economy, sustainable development and other information helps investors to make forecasts and stakeholders to analyze a company's environmental performance. Both the scientific community and society at large debate—through documents, guidelines and laws—how to enhance the process of communicating the impact of companies' activities both on the environment and on society.

As a continuation of the study by Rosa et al. (2013), this article aims to identify the factors that influence the level of environmental disclosure provided by Brazilian companies. To analyze the determining factors of environmental disclosure, 100 companies that comprise the IBRX-100 index of the São Paulo Stock Exchange (Bolsa de Valores de São Paulo—BOVESPA) were selected, and their 2010-2012 annual and sustainability reports were analyzed.

Theoretical referential

Environmental disclosure can be conceptualized as a mean (or set of means) used by different companies to reveal their environmental practices to their stakeholders, which simultaneously serve as a decision-making tool for interested stakeholders.

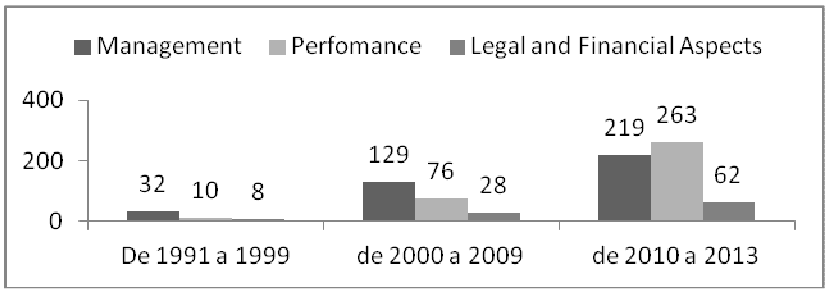
The means used by organizations to disclose their environmental management can be diverse, and include such communications tools as annual reports, sustainability reports, websites and other documents (Stray, 2008; Harte, Owen, 1991; Gray et al., 2001; Tilt, 2006). Companies' dissemination of these reports assists in the analysis of the environmental information that they provide.

Academic research is conducted to confirm the usefulness, legitimacy and performance of environmental information in different countries, revealing singularities in the levels of disclosure of environmental performance, such as: Africa (Villiers et al., 2014); Germany and Switzerland (Lock e Seele, 2013); Australia (Lodhia et al., 2013; Pellegrino e Lodhia, 2012, 2013; Moroney et al., 2012; Sutantoputra et al. 2012); Brazil (Krespi et al, 2012; Rosa et al, 2012, Rosa et al., 2013; Voss et al., 2012); Canada (Wegener et al., 2013; Caribbean (Bowrin, 2013); China (Zeng et al. 2012; Wang e Bernell, 2013; Kuo e Chen, 2013; Kuo et al., 2012; Weber, 2013; Meng et al., 2013; Lu e Abeysekera, 2014); Copenhagen (Andrikopoulos and Kriklani, 2013); Croatia and Sweden (Tagesson et al., 2012); Spain (Moseñe et al., 2013); U.S. (Christofi et al., 2012; Ashcroft, 2012; Bae, H., 2012; Mallin et al., 2013; Rupley et al., 2012; Peters e Romi, 2013; Silva-Gao, 2012; Chen et al., 2013; Cho et al., 2012; Clarkson et al., 2013; Cormier e Magnan, 2013); France (Mahjoub e Khamoussi, 2013; Albertini, 2013; Husser, 2012); Greece (Galani et al., 2012); Indonesia (Djajadikerta e Trireksani, 2012); Malaysia (Ahmad e Haraf, 2013; Mokhtar e Sulaiman, 2012; Latridis, 2013; Ahmad e Mohamad, 2013; Said et al., 2013); Portugal (Barros e Silva Monteiro, 2012); Qatar (Alnaimi, Hossain e Moni, 2012); Romania (Dusek e Fukuda, 2012); U.K. (Hassan e Ibrahim, 2012).

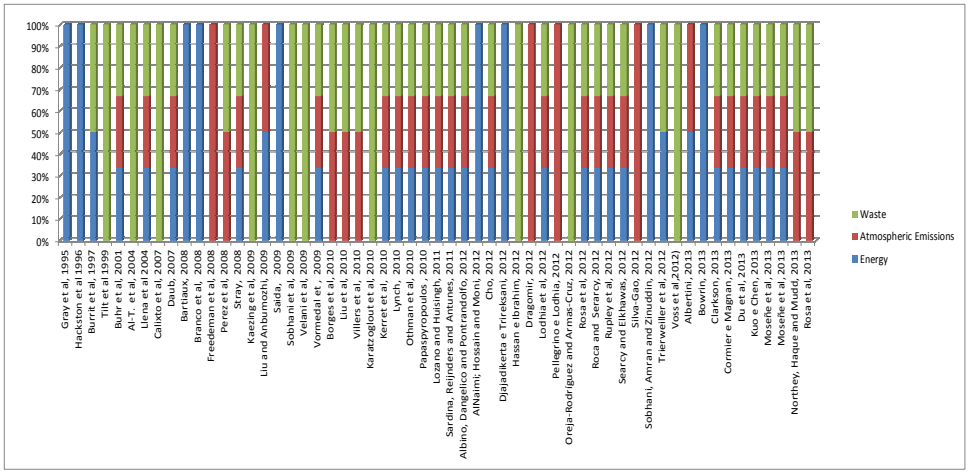
These studies also demonstrate that different types of organizations use environmental disclosure to enhance compliance with rules related to their use/consumption of natural resources and to show how they manage the environmental impact of their operations. Thus, the findings demonstrate that organizations are motivated to disclose environmental information to provide transparency to investors and legitimacy to other stakeholders.

However, it is important to consider each organization's uniqueness because each organization's environmental impact is directly related to its activities, as envisaged by laws in several countries, such as Brazil, where the Law 6938 of August 31, 1981, establishes a national environmental policy, rating companies according to the environmental impact that of their activities and investigating those activities are potentially polluting. In addition, it is important to consider that the standards and guidelines related to environmental disclosure may vary among countries.

By analyzing these issues, Rosa et al. (2013) demonstrate that the interaction between a company and the environment is contextually unique and thus varies from company to company (Freedman and Patten, 2004; Freedman and Stabliano, 2008) in an educational



Graph 1: Evolution of the criteria examined in the literature on Environmental Disclosure
Source: From Rosa et al. (2013)



Graph 2: Studies on atmospheric emissions, energy and waste
Source: Authors

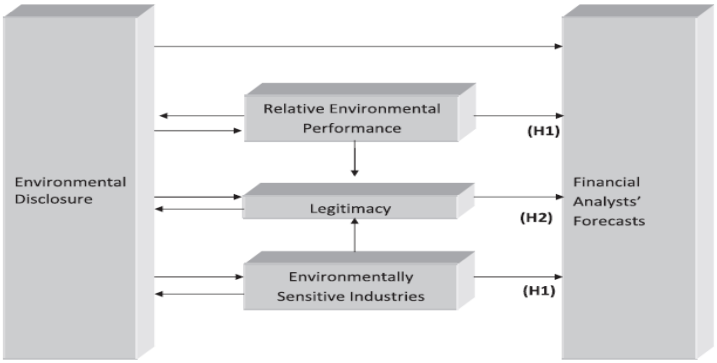


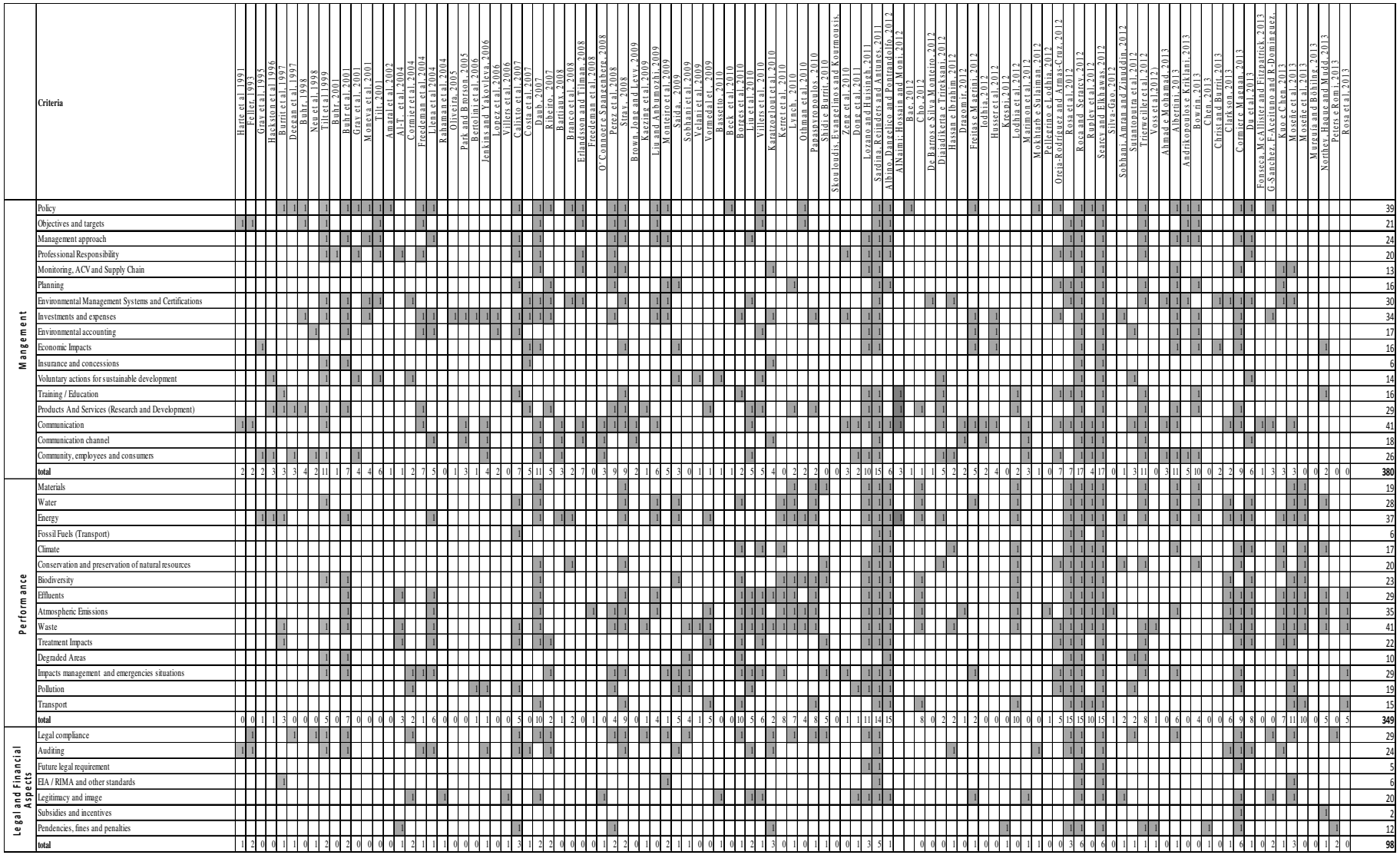
Figure 1. Conceptual framework linking environmental performance, legitimacy and financial analysts' forecasts
Fonte: Cormier e Magnan (2013).

process (Murray et al., 2006), so that companies and society remain in constant communication and learn about the causes, effects, and means of control and commitment from a sociopolitical perspective (Deegan and Rankin, 1997; Cormier; Gordon and Magnan, 2004; Hasseldine and Salama, 2005; Tilt, 2001).

According to Kosztrzepa (2004), the disclosure of environmental information can be accomplished in various ways that undoubtedly help both companies and users of accounting information to make safer and more reliable decisions about organizations.

As demonstrated by organizations and identified in the

Table 1. Criteria used to evaluate environmental disclosure.



Fonte: Adaptado de Rosa et al. (2013)

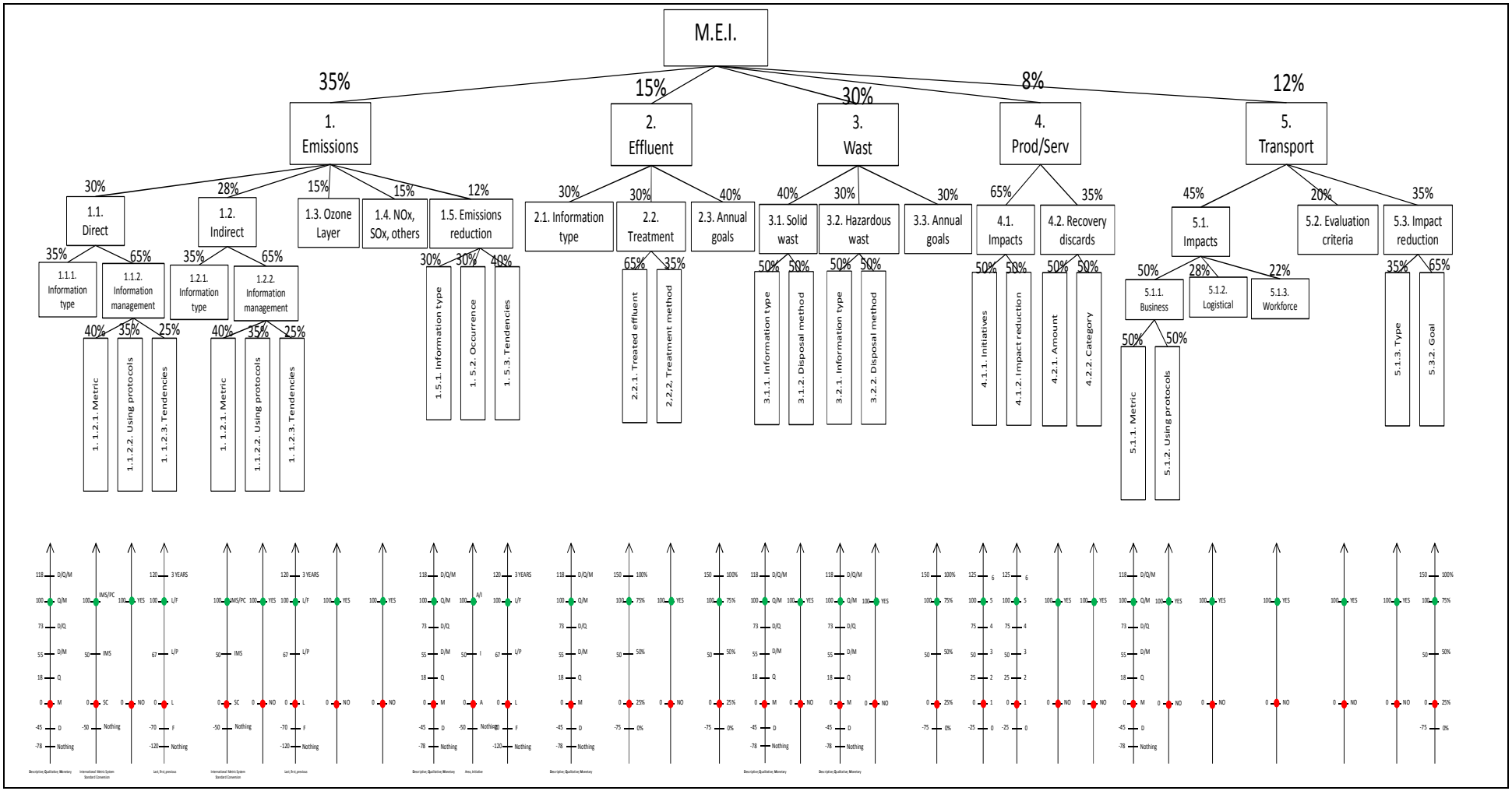


Figure 2: The structure of the evaluation model for the disclosure of risk management.
Source: Rosa et al. (2013)

Table 2. Variables that influence or determine the environmental disclosure

Source	Main Variables																			
	General			Legitimacy				Economic and Finance									Environmental			
	Size	Sector or activity	Region	Corporate governance	Auditing	Power of government	Internacionalization	Source control or share control	ROE; ROA; others on return	Accion	Economic and/or financial performance	Assests	Financial leverage	Financial leverage; sales varion	Economic and/or financial risk	Debts	Certificação	Potentially polluting companies	Environmental performance	Management of environmental risk
Neu e Warsame (1998)	1									1										1
Tilt et al. (1999)																			1	
Alberton (2003)									1											
Al-Tuwaijri e Christens (2004)											1									1
Freedman e Patten (2004)											1									1
Grzebieluckas, Campos e Selig (2007)									1	1		1								
Liu e Anbumozli (2009)	1		1	1							1							1		
Bouten, L., et al. (2012)				1					1								1	1		
De Barros and Silva Monteiro (2012)																	1			
Galani, D., et al. (2012).	1	1							1	1		1							1	
Hassan, A. and E. Ibrahim (2012)					1			1											1	1
Moroney, R., et al. (2012)	1				1				1			1				1				
Rupley, K. H., et al. (2012)				1																
Silva-Gao, L. (2012).														1				1		
Zeng, S., et al. (2012)	1																		1	
Ahmad, N. N. N. and A. S. A. Haraf (2013).	1																		1	
Andrikopoulos, A. and N. Kriklani (2013).	1								1					1						
Bowrin, A. R. (2013).	1	1		1			1		1							1				
Clarkson, P. M., et al. (2013).	1							1								1		1	1	
Rosa et al (2013)					1				1	1				1				1	1	
Kuo, L. and V. Y. J. Chen (2013).																		1		
Mahjoub, L. B. and H. Khamoussi (2013)	1				1											1		1		
Mallin, C., et al. (2013).				1																
Meng, X. H., et al. (2013)				1																
Peters, G. F. and A. M. Romi (2013).				1																
Said, R., et al. (2013).				1																
Weber, O. (2013).				1					1	1					1				1	
Wegener, M., et al. (2013).	1			1			1		1	1			1			1		1		
Lu, Y. and I. Abeysekera (2014).	1	1			1	1			1					1						
Total	**12**	**3**	**1**	**10**	**5**	**1**	**2**	**2**	**11**	**6**	**3**	**3**	**1**	**4**	**1**	**5**	**2**	**8**	**8**	**4**

Source: Authors

iterature, many types of information are relevant, including but not limited to policies, objectives, management systems, accounting and financial information, audit information, legal compliance, fines, consumption of natural resources and environmental impact, in Table 1 (Appendix).

In our 2013 study, we observed a significant change in the literature over the past three decades, indicating an increase of studies on the disclosure of environmental performance and environmental management strategies, Graph1.

The scientific community's interest in issues related to environmental performance (e.g., water, energy, biodiversity, emissions, effluents, waste, impacts, transport) and management (e.g., certification, environmental management system and environmental policies) corroborates the concerns raised by both mass movements and social and political debates about sustainable development.

Global meetings that discuss topics related to climate, biodiversity and human health have been convened all over the world by the United Nations (UN). These meetings include the Earth Summit (1992), the Kyoto Treaty (1997), the Copenhagen Climate Convention (2009) and Rio+20 (2012). At the Copenhagen Climate Convention, it was reported that the countries with the highest levels of CO_2 emissions worldwide are China, the United States, Russia, India, Japan, Germany, Canada, Great Britain, South Korea and Iran.

In recent decades, the aspects of environmental performance that have received the most academic attention are atmospheric emissions, energy and waste, as shown in Graph 2.

In addition to environmental disclosure, the scientific community is concerned about aspects related to the legitimacy of companies that provide environmental information. Thus, there is apparently a relationship between environmental disclosure and organizational performance. Accordingly, environmental disclosure analysis has become an important tool to identify the relationship between information provided by companies and those companies' economic and financial performance.

The search for this type of analysis has attracted

Table 3. Determinant factors for disclosure

Identificati on code	Index	How eo measure	Theorical reference
X1	Corporate Sustainability Index (ISE)	Identification of companies belonging of the ISE in BM&FBOVESPA	BM&FBOVESPA, 2011; Rosa et al., 2011; Rosa et al., 2013.
X2	Potentially Polluing (POTEN)	Companies framework according to Law 10.165/2000 – Brasil	Liu e Anbumozli, 2009; Bouten, et al., 2012; Silva-Gao, 2012; Clarkson et al., 2013; Rosa et al., 2013; Kuo and Chen, 2013; Mahjoub and Khamoussi, 2013; Wegener et al, 2013.
X3	Global Reporting Initiative GRI	Identify if the company uses the model of the GRI report. (2010 to 2012).	Galani et al. 2012; Moroney et al, 2012; Ahmad and Haraf, 2013; Clarkson et al, 2013; Villiers et al, 2014; Lu and Abeysekera, 2014; Christofi et al, 2012; Rosa et al., 2012; Rosa et al., 2013; Kuo et al., 2012; Lock and Seele, 2013; Lodhia and Jacobs, 2013; Moseñe et al., 2013; Sutantoputra et al., 2012; Dragomir, 2012; Du et al., 2013.
X4	Assets	Assets value of each company collected in the Economatic software (2010 to 2012)..	Grzebieluckas, Campos and Selig, 2007; Galani et al., 2012; Moroney et al, 2012.
X5	Accion	Accion value of each company collected in the Economatic software (2010 to 2012).	Neu, Warsame and Pedwell, 1998; Grzebieluckas, Campos and Selig, 2007; Galani et al., 2012; Rosa et al., 2013; Weber, 2013; Wegener et al., 2013.
X6	Audit	Identification of the Audit in the reports (2010 to 2012).	Hassan and Ibrahim, 2012; Moroney et al., 2012; Rosa et al., 2013; Mahjoub and Khamoussi, 2013.
X7	Returno on Assets (ROA)	ROA value of each company collected in the Economatic software (2010 to 2012).	Bouten, et al., 2012; Galani, et al., 2012; Andrikopoulos and Kriklani, 2013; Bowrin, 2013; Rosa et al., 2013; Weber, 2013; Wegener et al., 2013; Lu and Abeysekera, 2014.
X8	Returno n Equity (ROE)	ROE value of each company collected in the Economatic software (2010 to 2012).	Bouten et al., 2012; Galani et al., 2012; Andrikopoulos and Kriklani, 2013; Bowrin, 2013; Rosa et al., 2013; Weber, 2013; Wegener et al., 2013; Lu and Abeysekera, 2014.
X9	Corporate governance (CG)	Identification of companies belonging of the CG in BM&FBOVESPA	Liu e Anbumozli, 2009; Bouten, et al., 2012; Silva-Gao, 2012; Clarkson et al., 2013; Rosa et al., 2013; Kuo and Chen, 2013; Mahjoub and Khamoussi, 2013; Mallin, C., et al. (2013); Wegener et al., 2013.

Source: Authors.

interest from both the scientific community and company stakeholders because such an analysis would allow identification of the evolution of environmental disclosure and inferences related to the factors that determine or affect the level of environmental disclosure made by companies worldwide, thus assisting the decision-making processes of interested stakeholders.

According to Cormier and Magnan (2013), the factors that determine or affect the level of environmental disclosure may be related legitimacy, environmental performance, a company's level of environmental impact and financial performance, as shown in Figure 1.

Among the aspects identified by Cormier and Magnan (2013), it is observed that scientific studies conducted over the last decade have emphasized size, CG, profitability, potentially polluting companies and environmental performance.

The scientific community associates these aspects with environmental disclosure as determining factors or as factors that influence the level of environmental information provided by different organizations around the world (Table 2).

Table 4. Variables

Variables in set 1: ISE; POTEN; GRI; ATIVO; AÇÃO; AUDIT; ROA; ROE; GC X	Variables in set 2: RAG; RSG Y
Number of complete cases: 291	

Sources: Authors

Table 5: Research sample

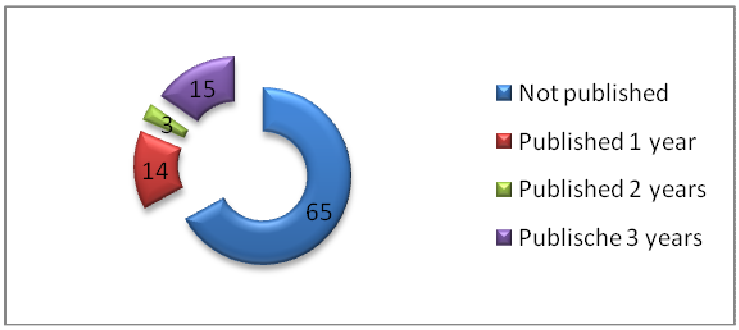
AES TIETE	CIELO	GERDAU	MARFRIG	SABESP (NM)
ALL AMER LAT	COPASA (NM)	GERDAU MET	MILLS (NM)	SANTANDER BR
AMBEV	COPEL (N1)	GOL	MINERVA (NM)	SID NACIONAL
ANHANGUERA (NM)	COSAN	HRT PETROLEO (NM)	MMX MINER	SOUZA CRUZ
ARTERIS (NM)	CPFL ENERGIA (NM)	HYPERMARCAS	MRV	SUL AMERICA (N2)
B2W DIGITAL (NM)	CYRELA REALT	IGUATEMI (NM)	MULTIPLAN (N2)	SUZANO PAPEL
BANRISUL (N1)	DASA	IOCHP-MAXION	MULTIPLUS (NM)	TAESA (NM)
BMFBOVESPA	DURATEX (NM)	ITAUSA	NATURA	TELEF. BRASIL S.A
BR MALLS PAR	ECORODOVIAS (NM)	ITAUUNIBANCO	ODONTOPREV (NM)	TIM PART S/A
BR PROPERT (NM)	ELETROBRAS (N1)	JBS	OGX PETROLEO	TOTVS (NM)
BRADESCO	ELETROPAULO	KLABIN S/A (N1)	OI	TRACTEBEL (NM)
BRADESPAR	EMBRAER (NM)	KROTON (NM)	P.ACUCAR-CBD (N1)	ULTRAPAR (N1)
BRASIL (NM)	ENERGIAS BR (NM)	LIGHT S/A (NM)	PDG REALT	USIMINAS
BRASKEM	ENEVA (NM)	LLX LOG (NM)	PETROBRAS	VALE
BRF FOODS	EQUATORIAL (NM)	LOCALIZA	PETROPAR S.A.	VALETRON S.A.
BROOKFIELu	ESTACIO PART (NM)	LOJAS AMERIC	PORTO SEGURO (NM)	VALID (NM)
CCR AS	EVEN (NM)	LOJAS RENNER	QUALICORP (NM)	WEG (NM)
CEMIG	EZTEC (NM)	M.DIASBRANCO (NM)	RAIADROGASIL	
CETIP	FIBRIA	MAGAZ LUIZA (NM)	RANDON PART (N1)	
CIA HERING	GAFISA	MARCOPOLO (N2)	ROSSI RESID	

Source: Authors

Following a study of 108 Belgian companies, Bouten et al. (2012) report that it is not possible to state that size and return on equity (ROE) are related to environmental disclosure, and those authors consider that the disclosure decision should be made by companies.

Barros and Silva Monteiro (2012) have analyzed information approximately 29 Portuguese companies. The results of that study show that 76.9% of companies do not disclose any environmental information and that the companies that do disclose such information (seven companies) have environmental certifications that may influence the level of disclosure.

Galani et al. (2012) examine the standards for the quality of voluntary environmental disclosures made by the 100 most profitable companies in Greece, finding that only 35 of those companies disclose environmental information in their annual reports. In addition to verifying the quality of company-provided information, the authors find that company size, type of business and use of reports in accordance with Global Reporting Initiative



Graph 3: Number of companies who have published sustainability report in the analyzed period (2010-2012)
Source: Authors

Table 6: Average of disclosure on management impacts in the sustainability report

Environmental Disclosure Assessement	2010					2011					2012				
	Emissões	Efluentes líquidos	Resíduos	Produtos e serviços	Transporte	Emissões	Efluentes líquidos	Resíduos	Produtos e serviços	Transporte	Emissões	Efluentes líquidos	Resíduos	Produtos e serviços	Transporte
MAXIMO	88,85	119,90	113,43	116,25	95,06	91,40	103,40	90,55	116,25	37,15	91,40	119,90	90,55	108,13	27,25
MINIMO	-46,22	-65,40	-49,80	-46,22	-46,22	-46,22	-65,40	-49,80	-46,22	-46,22	-46,22	-65,40	-49,80	-46,22	-46,22
MEDIA	**-22,09**	**-37,79**	**-27,68**	**-25,02**	**-35,90**	**-19,41**	**-36,60**	**-25,27**	**-19,70**	**-35,21**	**-10,11**	**-40,54**	**-17,11**	**-4,73**	**-30,92**
MEDIANA	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22	-46,22
DESVIO PADRÃO	40,08216	33,35934	38,06918	39,687598	20,2675743	42,54027	33,39938	35,10007	42,950345	17,895425	47,74643	28,74756	41,43848	52,448188	20,478241

Source: Authors

Table 7: Companies that stand by the level of environmental disclosure in annual reports

Environmental Disclosure Assessement	2010					2011					2012				
	emissions	effluents	waste	product/se	transport	emissions	effluents	waste	product/se	transport	emissions	effluents	waste	product/se	transport
BRF - BRASIL FOODS S.A.	-15,660	119,900	43,475	67,500	10,475	4,445	56,500	49,250	67,500	10,475	69,982	119,900	-5,875	108,125	-22,125
AMBEV	1,608	104,900	121,300	83,750	57,150	88,852	84,500	121,300	116,250	74,213	-46,220	-46,220	-46,220	-46,220	-46,220
DURATEX S.A.	56,024	-6,100	75,550	75,625	-22,125	71,024	-6,100	75,550	41,875	-25,838	71,024	-6,100	37,400	41,875	-25,838
ECORODOVIAS	75,272	-41,500	75,550	41,875	-25,838	51,029	-55,500	31,625	41,875	0,025	52,837	-55,500	75,550	83,750	11,275
ENERGIAS BR	44,446	-55,500	90,550	66,250	-25,838	59,036	-41,500	90,550	50,000	-25,838	84,872	-65,400	38,050	41,875	-25,838
COPEL S.A.	64,304	52,400	-3,250	58,125	-8,850	83,072	-55,500	25,275	58,125	-8,850	60,841	-41,500	2,000	25,625	-8,850
EMBRAER	-45,052	-65,400	-49,800	-32,500	-25,838	17,291	-6,100	105,550	74,375	31,838	71,677	-20,100	90,550	58,125	2,400
BM&FBOVESPA	-9,368	-65,400	38,050	67,500	-25,838	-9,368	43,500	38,050	67,500	48,338	62,437	-65,400	38,050	0,000	-25,838
CPFL ENERGIA	39,911	-55,500	31,625	25,625	-12,225	37,604	-41,500	52,400	25,625	-12,225	43,652	-55,500	52,400	41,875	-22,125
P. ACUCAR	26,517	-65,400	-5,875	75,625	-22,125	91,397	-65,400	-5,875	59,375	-22,125	91,397	-65,400	-5,875	59,375	-22,125
SUL AMERICA	47,726	-65,400	-5,875	66,250	-0,975	54,041	-65,400	-5,875	33,750	-0,975	47,726	-65,400	-5,875	25,625	12,300
NATURA	9,717	-55,500	-44,025	67,500	-22,125	9,717	-55,500	-21,525	75,625	-22,125	80,257	-41,500	-5,875	66,250	1,375
COPASA S.A.	16,103	-51,400	10,975	50,000	-25,838	47,257	-55,500	31,625	50,000	-25,838	23,221	-55,500	-44,025	58,125	-8,850

Source: Authors

(GRI) standards are factors that determine Greek companies' level of environmental disclosure.

Hassan and Ibrahim (2012) analyze 100 companies in the United Kingdom and find that winning a particular environmental award is influenced by the presence of an Environmental Management System, the engagement of stakeholders and the disclosure of specific environmental information (i.e., information related to waste management, risk of climate change and climate-change-related activities).

Moroney et al. (2012) analyze the environmental disclosure of 500 Australian companies and find that 40% disclose environmental information. In addition, the authors note that auditing has no direct relationship with level of disclosure but that company size does affect disclosure. The authors note that companies that take a proactive approach to environmental risks may have a competitive advantage and increased gains.

Rupley et al. (2012) examine the reports of 127 companies in the United States and find not only that

Table 8. Mean disclosure of impact management in the annual report

nvironmental Disclosure Assesseme	2010					2011					2012				
	Emissões	Efluentes	Resíduos	Produtos e	Transport	Emissões	Efluentes	Resíduos	Produtos e	Transporte	Emissões	Efluentes	Resíduos	Produtos e	Transporte
máximo	75,272	119,900	121,300	116,250	57,150	91,397	84,500	121,300	116,250	74,213	91,397	119,900	90,550	108,125	57,150
mínimo	-46,220	-65,400	-49,800	-46,220	-46,220	-46,220	-65,400	-49,800	-46,220	-46,220	-46,220	-65,400	-49,800	-46,220	-46,220
média	-32,986	-51,146	-32,338	-18,863	-29,552	-29,093	-52,594	-30,970	-21,241	-28,121	-21,377	-45,369	-29,239	-16,923	-32,128
mediana	-45,052	-65,400	-46,220	-32,500	-25,838	-45,052	-65,400	-46,220	-32,500	-25,838	-46,220	-46,220	-46,220	-46,220	-46,220
desvio padrão	28,16507	30,1634	34,34183	38,14353	14,83602	35,60486	23,8695	36,75526	35,21538	18,72113	42,82343	24,7823	31,93616	45,47754	20,73517

Source: This study

Table 9. Indicators used in the correlation analysis

Global indices of environmental disclosure *(dependent variables)*	**Performance indicators** *(independent variables)*		
	Environmental	**Legitimacy**	**Economic**
Level of Environmental Disclosure in Annual Report of the companies surveyed (Y1) Level of Disclosure in Environmental Sustainability Report of the companies surveyed (Y2)	ISE (X_1), POTEN (X_2), GRI (X_3)	Audit (X_6), GC (X_9)	Assets (X_4), Accion (X_5), ROA (X_7), ROE (X_8)

Source: Authors

Table 10. Canonical Correlations

		Canonical	**Wilks**			
Number	**Eigenvalue**	**Correlation**	**Lambda**	**Chi-Squared**	**D.F.**	**P-Value**
1	0,669577	0,818277	0,2125	438,314	30	0,0000
2	0,32072	0,566322	0,643117	124,924	18	0,0000
3	0,0532368	0,230731	0,946763	15,4819	8	0,0504

Source: Authors

potentially polluting companies make a greater attempt to disclose their environmental performance but also that aspects of CG influence the level of environmental disclosure.

Silva-Gao (2012) analyzes 54 American energy companies and finds that there is a relationship between potentially polluting companies and level of environmental disclosure.

Zeng et al. (2012) analyze 871 Chinese companies and find that public, potentially polluting companies that use environmental management indices have higher levels of environmental disclosure.

Ahmad and Haraf (2013) find in a sample of 30 Malaysian companies that over time, companies improve the quality of their environmental information and that aspects related to size and environmental performance influence the level of disclosure. However, they also report that even with this improvement in the amount of information disclosed, the extent of disclosure remains both low and insufficient.

Andrikopoulos and Kriklani (2013) analyze the environmental reports of 136 companies from Copenhagen and find that regulations and company size (the larger the company, the greater the disclosure) increase the degree of environmental disclosure, whereas the liquidity constraints of companies with high financial leverage tend to decrease the degree of environmental disclosure. The authors highlight the importance of considering cultural contexts in developing countries.

Bowrin (2013) analyzes the environmental disclosure profile of 36 publicly held companies in the Caribbean and finds a low degree of disclosure. In Bowrin's sample, environmental disclosure is positively related to the size and type of company, foreign influence and organizational culture. However, the following aspects are not significantly related to the degree of environmental disclosure: corporate profitability, national culture, the importance of public capital funding, gender diversity and board independence of the board to make

Table 11. Coefficients for Canonical Variables of the First Set

ISE	-0,046539	-0,293832	-0,109508
POTEN	0,134415	-0,112023	-0,269048
GRI	0,878416	-0,148538	-0,255896
ATIVO	0,200843	-0,0890141	0,408424
AÇÃO	0,0556667	0,214261	-0,179144
AUDIT	0,24066	-0,321424	0,53034
ROA	0,100984	-0,358357	0,238085
ROE	-0,0629805	-0,0635749	-0,233743
GC	-0,0604362	-0,0192619	0,583658
X	-0,177082	-0,767544	-0,305636

Source: Authors

Table 12. Coefficients for Canonical Variables of the Second Set

RAG	0,0324526	-0,15344	1,11672
RSG	0,885409	-0,372156	-0,600445
Y	0,340162	0,942831	0,0995415

Source: Authors

decisions about the scope of disclosure.

Clarkson et al. (2013) examine 93 companies in the United States and find that a proactive environmental strategy and its disclosure to investors may increase share price, thus suggesting that environmental strategies and proper disclosure can be advantageous for companies.

Rosa et al. (2013) examine the annual and sustainability reports of 50 Brazilian companies and detect both a low degree of environmental disclosure and low correlation between economic performance and environmental disclosure.

Iatridis (2013) analyzes 529 publicly traded companies in Malaysia companies and finds that environmental disclosure is positively associated with environmental performance, high profitability, high capital expenditures, type of activities, CG, and independent audits.

Mahjoub and Khamoussi (2013) analyze the relationship between environmental disclosure and financial performance for 250 companies in France, and find that companies with the highest levels of social and environmental commitment are not only more likely to derive benefits and but also to communicate more persistent and desirable gains to investors.

Mallin et al. (2013), Meng, et al. (2013) and Peter and Romi (2013) analyze reports of companies in the United States and China and find a positive association between environmental disclosure and CG.

Wegener et al. (2013) analyze 319 Canadian companies and find that upper-management decisions to disclose climate change data are associated with domestic investors, not foreign ones. In addition, the authors find that companies with low pollution levels tend to provide greater disclosure than do potentially polluting companies.

Weber (2013) and Lu and Abeysekera (2014) analyze reports from Chinese companies and find positive associations between environmental disclosure and company size, profitability and industry classification.

Thus, we conclude that scientific studies over the last decade show that disclosure levels are still considered low. Nevertheless, there is a consensus in the literature that environmental disclosure may serve as a decision-making tool for interested stakeholders and therefore, there is growing interest from different organizations to expand and improve environmental disclosure.

It also is found that management decisions related to disclosure environmental aspects may be influenced by factors that improve the company-stakeholder relationship, such as financial leverage, awards and legitimacy. Thus, studies over the last decade show that environmental disclosure may be primarily associated with size and type of company, environmental performance and corporate governance.

Development of the analytical structure of the research

For the development of the analysis of results, analytical structures of environmental disclosure, of the determinant factors and statistical treatment are built.

Table 13. Canonical correlation between Environmental Disclosure and Determinants Factores

Identification code	Index	Correlation with reports	Authors to corroborate the findings of the research	Authors who oppose the research findings
X1	Corporate Sustainability Index (ISE)	NEGATIVE	Rosa et al., 2011; Rosa et al., 2013.	
X2	Potentially Polluing (POTEN)	POSITIVE	Liu e Anbumozli, 2009; Bouten, et al., 2012; Silva-Gao, 2012; Clarkson et al., 2013; Rosa et al., 2013; Kuo and Chen, 2013; Mahjoub and Khamoussi, 2013; Wegener et al, 2013.	
X3	Global Reporting Initiative GRI	POSITIVE	Galani et al. 2012; Moroney et al, 2012; Ahmad and Haraf, 2013; Clarkson et al, 2013; Villiers et al, 2014; Lu and Abeysekera, 2014; Christofi et al, 2012; Rosa et al., 2012; Rosa et al., 2013; Kuo et al., 2012; Lock and Seele, 2013; Lodhia and Jacobs, 2013; Moseñe et al., 2013; Sutantoputra et al., 2012; Dragomir, 2012; Du et al., 2013.	
X4	Assets	POSITIVE	Galani et al., 2012; Moroney et al, 2012.	Grzebieluckas, Campos and Selig, 2007
X5	Accion	POSITIVE	Neu, Warsame and Pedwell, 1998; Galani et al., 2012; Rosa et al., 2013; Weber, 2013; Wegener et al., 2013.	Grzebieluckas, Campos and Selig, 2007.
X6	Audit	POSITIVE	Hassan and Ibrahim, 2012; Moroney et al., 2012; Mahjoub and Khamoussi, 2013.	
X7	Returno on Assets (ROA)	POSITIVE	Galani, et al., 2012; Andrikopoulos and Kriklani, 2013; Bowrin, 2013; Rosa et al., 2013; Weber, 2013; Wegener et al., 2013; Lu and Abeysekera, 2014.	Bouten, et al., 2012;
X8	Returno n Equity (ROE)	NEGATIVE	Bouten et al., 2012; Bowrin, 2013; Rosa et al., 2013.	Galani et al., 2012; Andrikopoulos and Kriklani, 2013; Weber, 2013; Wegener et al., 2013; Lu and Abeysekera, 2014.
X9	Corporate governance (CG)	NEGATIVE	Bouten, et al., 2012;	Iatridis, 2013; Rupley et al, 2012; Mallin, 2013; Meng et al, 2013; Peters and Romi, 2013.

Sources: Authors

Analytical structure of impact of level of management disclosure (IMD)

In this study, we performed an analysis of companies' environmental disclosure using the IMD a model, which aims to assess a company's level of environmental disclosure. The model is based on the GRI guidelines, following Rosa et al. (2013). This study analyzes the environmental information of 100 Brazilian companies based on the analytical structure shown in Figure 2 (appendix).

Each of the model's five categories is composed of criteria and subcriteria that represent the elements that the GRI guidelines deem relevant to evaluate companies' impact management. Therefore, these criteria and subcriteria were measured using ordinal scales (which express order) and cardinal scales (which express value) and were integrated using compensation rates that express the degree of importance among the criteria and subcriteria. Finally, the model was integrated based on the global evaluation of alternatives, which was calculated by the additive aggregation equation: $V(a) =$

w1*v1(a) +w2*v2(a) + w3*v3(a) + ... wn*wn(a). V(a) = global value of action a; v1(a), v2(a), ... vn(a) = partial value of action a in criteria 1, 2, 3, ..., n; w1(a), w2(a)... wn(a) = replacement rates of criteria 1,2,3,...,n; n = number of model criteria.

To analyze the results of the disclosure levels identified, three performance levels were considered: (i) Compromise (below 0); (ii) Market (between 0 and 100); and (iii) Excellence (over 100).

Breakdown Structure Determinants of Environmental Disclosure

From the theoretical construct of this research were determined indices analysis, see Table 3.

Analytical framework of the statistical treatment

The analysis of canonical correlations was proposed by Hotelling (Mingoti, 2005) and has as main objective "study of the linear relationships between two sets of variables" (Mingoti, 2005, p.143). Basically, the technique summarizes the information of each set of response variables in linear combinations, and the choice of the coefficients of these combinations is performed taking as a criterion the maximization of the correlation between the sets of response variables. These linear combinations constructed are called canonical variables, while the correlation between them is called canonical correlation. This correlation measures the degree of association between two sets of variables, in this case, the indexes in the stock mentioned. Mathematically we can say that regression is a generalization of multiple linear regressions, or that this is a special case of the first.

Are matrices $X_{i\times j}$ and $Y_{i\times j}$, i Table of Brazilian companies and their respective indices j statements, listed on the Bovespa and NYSE. And the matrices $W_{k\times j}$ e $Z_{k\times j}$ the scale of British firms k and their account index j, listed on the NYSE and the LSE. The aim is to establish the relationships:

$$a_1x_1 + a_2x_2 + a_3x_3 ... + a_jx_j = b_1y_1 + b_2y_2 + b_3y_3 + ... + b_jy_j$$

and

$$c_1w_1 + c_2w_2 + c_3w_3 + ... + c_jw_j = d_1z_1 + d_2z_2 + d_3z_3 + ... + d_jz_j$$

Formally, we define the first pair of canonical variables as the pair $U_1 = a_1x_1 + a_2x_2 + ...a_mx_n$ and $V_1 = b_1y_1 + b_2y_2 + ... + b_ny_n$, (in the case of this study m = n = j) where a=[a1, a2, ...,am] and b=[b1, b2, ...,bn], are vectors of constants, respectively selected so that the correlation between variables U1 and V1 is a maximum and such that these two variables have variance equal to 1, ie: var(U1)=Var(V1)=1. The same is also true for U2 e V2, U3 and V3, ...Vk e Uk, k=1,2,...,min(m,n).

For the vectors ak and bk, is shown in the literature (SEBER, 1984, Anderson, 2002 and TIMM, 2002) which should solve the following linear system:

$$\begin{cases} \left(\Sigma_{XY}\Sigma_{YY}^{-1}\Sigma_{YX} - \lambda_k\Sigma_{XX}\right)a_k = 0 \\ \left(\Sigma_{YX}\Sigma_{xx}^{-1}\Sigma_{xy} - \lambda_k\Sigma_{YY}\right)b_k = 0 \end{cases}$$

Where ∑XX is the matrix of variance X, ∑YY the matrix of variance Y, ∑XY and ∑YX are the covariance matrices and λk is the k-th largest eigenvalue of the matrix $\Sigma_{XX}^{-1}\Sigma_{XY}\Sigma_{YY}^{-1}\Sigma_{YX}$.

This study only will do the analysis of U1 e V1 to each case, as they may be interpreted as indices of overall performance. The remaining latencies will not be discussed. On the statistical inference, there is a test to see if the matrices X, Y, W and Z are, or not correlated. However, this test only applies when the vectors are multivariate normal. When multivariate normality is valid, it is also possible to construct statistical tests to assess the significance of the canonical variables. These tests are already present by default, because the software used in the article is the Statgraphics package in its version 5.1. The case of correlation and determination were performed by using the following formulas: $r = \sqrt{\frac{SQ(\text{modelo})}{SQTotal(\text{corrigido})}}$, where SQ (model denotes the sum of squares for the regression model fit to the data and SQTotal is the sum of the squares in its entirety), according Table 4.

Population and sample

The population sample was selected according to the following criteria: (i) companies listed on the stock exchange; and (ii) different sectors.

The first criterion provides for access to sustainability-related reports and data due to the requirement that corporations publish information for their stakeholders. The second criterion implicates scope and diversification because companies from different sectors suffer different societal pressures to provide different types of environmental information and, consequently, the second criterion assists in attaining the research objective of encompassing factors that explain environmental information provided by companies.

Based on these characteristics, we selected companies listed in the IBRX-100 index. That investment index is composed of the 100 most-liquid Brazilian companies in the BM&FBOVESPA. The data were gathered in March 2014 and due to the removal of three companies from the

index, the analysis was performed using 97 companies (Table 5).

Period of analysis

Given that publication of the Sustainability Report has had greater regularity in the sample studied in the last three years, the study opted to analyze the years 2010 and 2012 to increase the number of observations and firms analyzed. It is important to highlight that the year 2013 was not included because the sustainability report is usually published in the second semester of the following year and, therefore, most of the companies studied still did not have a report in the time period for conducting this study.

ANALYSIS OF THE RESULTS

Analyzing our results was a three-step process. The first step analyzed the level of disclosure in sustainability reports; the second step analyzed the level of disclosure in annual reports; and the third step analyzed the determinant factors of disclosure of information on waste, emissions, effluents, product/service and transport.

Sustainability reports

According to Figure 3, the 97 companies analyzed seldom publish sustainability reports, and only the following 15 companies published reports throughout the period analyzed: BMF&Bovespa, Bradespar, Braskem, Brookfield, Ccr Sa, Cetip, Cia Hering, Fibria, Gafisa, Localiza, Petropar S.A., Suzano Papel, Telefônica Brasil S.A., Usiminas and Valetron S.A.

The sustainability reports' low disclosure levels might be related to the fact that the disclosures are not mandatory. Therefore, it is possible that companies that publish sustainability reports envision a wider disclosure, creating a space for to communicate with society and stakeholders alike to disclose more detailed information about their environmental responsibility, and such information is more detailed than that required by accounting standards and regulatory agencies.

In addition to the voluntary nature of sustainability reports, it is also observed that some companies use their annual reports to disclose environmental, financial, social and managerial information in an integrated manner, discarding the sustainability report as an exclusive communication channel.

Although business practices do not yet favor this type of communication, previous scientific studies and our perceptions create the belief that a sustainability report can be an exclusive communication channel for providing environmental information.

Therefore, it is understood that an exclusive means of communication enables a company to deepen the level of the information provided, and as a result it can provide benefits for the **company** (i.e., dissolving market borders, broadening communications with stakeholder groups interested in company environmental information, enhancing transparency and increasing credibility), for **society** (i.e., expanding knowledge about the impact of business activity on the environment, allowing monitoring of a company's trajectory with respect to its concern about and action on issues regarding sustainable development and human health) and for the **environment** (i.e., organizational actions that allow a reduction in natural resources consumption and the impact of organizational processes that also assist in environmental protection, restoration and conservation).

Thus, environmental disclosure is perceived as an opportunity for companies to show society their pro-environmental actions and, thus, to gain competitive advantages and to support sustainable development.

With respect to scope, the absence or low level of information on (i) impact reduction targets, (ii) comparison standards for emissions, effluents and waste and (iii) quantitative and monetary information on environmental impacts, are considered weaknesses,.

Among the companies with the highest levels of environmental disclosure during the analyzed period, we find that the best indicators refer to information on effluents, waste and products/services, with the following companies standing out: AES Tiete, Fibria, Petrobras, Suzano Papel, BRF-Brasil Foods S.A., Natura, Klabin, Cemig S.A., Duratex S.A., P. Açucar, Tractebel, Copasa S.A., Ecorodovias, Eletrobras, Eletropaulo, Ambev, Energias BR, Vale, Copel S.A. and Braskem S.A.

It is also noted that the level of disclosure of emissions, effluents and products/services evolved between 2010 and 2012; however, the level of information about waste has decreased and information about transport has remained at the lowest assessment level (Table 6).

According to Table 6, information about emissions, effluents and products/services has improved with respect to disclosure level. This improvement is observed in information about greenhouse gases, indirect emissions, disposal of effluents and reverse logistics (for products/services).

It is interesting to note the important role played by society in the process of information improvement and thus, in the last decade, increased information about emissions and waste has been observed. Corroborating not only social movements such as those that occurred in Stockholm (2009) and Rio+20 (2012) but also Brazilian regulations (Federal Act Number 12.305/2010—Solid Waste), it is possible for companies to increase their disclosure levels to meet demand. Thus, it is noted, that sustainability reports can also be used as a mechanism for improving information demanded by society and the government.

Annual reports

Our analysis reveals that companies do not prioritize information about environmental impact in their annual reports, reserving that space for other information about managerial, economic and financial performance, and only 13 of the 98 companies analyzed make environmental disclosures at levels considered good or excellent, as set forth in Table 7.

Table 7 shows that BRF Brasil Foods S.A. has excelled during the last three years—particularly with respect to the disclosure of wastewater-related information—differentiating itself from other companies. BRF Brasil Foods S.A. may be concerned about effluent discharge because its greatest impact is associated with the use and consumption of water. Another company that stands out with respect to effluents is beverage company AMBEV, which engages in activity that has major wastewater-related environmental impacts.

The analysis also reveals that many companies' annual reports reveal concern about reporting impacts related to company products/services, which can indicate a concern about explaining a company's legitimacy to its stakeholders.

It is concluded that on average, the companies examined have a performance level of environmental disclosure below zero for the five criteria analyzed, thus revealing a compromising level of information, as set forth in Table 8.

Our analysis reveals that in general, companies lack comparison protocols, information on substances destructive to the ozone layer, presentation of comparative charts about the evolution of the generation and reduction of environmental impacts, explanations about methods of effluent treatment and disposal of solid waste, transportation used for logistical purposes and by employees and quantitative and monetary information about environmental impacts.

To improve information about emissions, we perceived a need to present the following information: (i) data showing the evolution of impacts; (ii) information about substances that deplete the ozone layer; and (iii) disclosure of the type of information provided (i.e., descriptive, quantitative or monetary). For effluents, it is important to expand information about (i) treatment methods and (ii) annual reduction targets. With respect to waste, there are opportunities to improve information about (i) hazardous waste transportation and (ii) annual reduction targets. For products and services, important disclosure elements include (i) identification of impacts and (ii) disposal recovery. Finally, for transport, it is necessary to disclose information about (i) the scope of the impact of staff and logistic-related transportation and (ii) annual impact reduction targets.

Determining factors

The determining factors are observed to identify the relationship between global indices of environmental disclosure with performance indicators, see Table 1.

Based on the dependent and independent variables shown in Table 3, as canonical correlations Tables 10, 11 and 12 were performed.

This procedure finds the linear combinations of two sets of variables which have the highest correlation between them. In this case, 3 sets of linear combinations have been formed. The first set of linear combinations is:

-0,046539*ISE + 0,134415*POTEN + 0,878416*GRI + 0,200843*ATIVO + 0,0556667*AÇÃO + 0,24066*AUDIT + 0,100984*ROA - 0,0629805*ROE - 0,0604362*GC - 0,177082*X

and

0,0324526*RAG + 0,885409*RSG + 0,340162*Y

Where the variables have first been standardized by subtracting their means and dividing by their standard deviations. The table shows the estimated correlation between each set of canonical variables. Since 2 of the P-values are less than 0,05, those sets have statistically significant correlations at the 95,0% confidence level.

Our canonical analysis reveals that sustainability reports and annual reports are positively correlated—that is, their disclosure levels are proportional. It is important to note that approximately 10% of the companies analyzed issue a unified report (both reports included in a single document), thus presenting the same information. Moreover, the remaining companies issue separate reports that contain complementary information—that is, the annual report is used to provide general information and the sustainability report is used to provide more detailed information about environmental impact.

The canonical correlation also makes it possible to observe the determining factors that best explain environmental disclosures in annual and sustainability reports: PPE, GRI, ASSEST, ACCION, AUDIT and ROA have a positive correlation, and ESI, ROE and CG have a negative correlation with environmental disclosures in reports published between 2010 and 2013 (Table 13).

According to Table 13, the present study corroborates previous studies' findings regarding PPE, GRI, AUDIT and ESI indicators, showing that the following types of companies demonstrate higher levels of environmental disclosure: potentially polluting enterprises (PPE); and companies with reports that are both prepared in accordance with the guidelines of the GRI and audited (AUDIT). However, this study may also corroborate previous studies showing that inclusion in the Environmental Sustainability Index (ESI) is not a factor that has a positive relationship with disclosure levels.

In the present study, it is found that ROA, ACCION and

ASSET may be related to level of environmental disclosure because the canonical correlation between the level of disclosure and these indicators is positive. However, it is worth noting that although relevant to this study, until now there has been no consensus in the literature that indicators of profitability, share and asset values affect investments into and expenditures on the environment and their respective disclosures, as previously reported by Grzebieluckas, Campos and Selig (2007).

Finally, we highlight the determining factor related to CG, which in this study does not correlate with environmental disclosure. This result suggests that level of disclosure is not influenced by CG or vice versa; moreover, it does not corroborate previous research by Iatridis (2013), Rupley et al. (2012), Mallin (2013), Meng et al. (2013) and Peters and Romi (2013). It is worth noting that in the present study, the only aspect considered is whether a company is listed or not in the CG Index of the São Paulo Stock Exchange (BM&FBOVESPA), whereas previous studies consider the influence of different CG aspects, such as board size, board independence, CEO duality, the existence of an audit committee and ownership concentration. Therefore, we conclude that it is important to consider the fact that CG does not cause a particular company to improve its disclosure. Thus, to affirm or refute the influence of CG on level of environmental disclosure, it is essential to consider CG's various aspects.

CONCLUSION

The present study aims to identify the factors that determine the level of environmental disclosure by Brazilian companies from different economic sectors listed on the stock exchange, using a sample of the 98 companies that compose the IBRX-100 index and analyzing their sustainability and annual reports from 2010-2012.

We analyzed our results to identify the sampled companies' levels of disclosure of information about emissions, effluents, waste, products/services and transport in their annual and sustainability reports.

After determining the companies' disclosure levels, a canonical correlation analysis was performed on the level of environmental disclosure, using environmental, legitimacy and economic performance indicators to identify the factors that determine disclosure.

The analysis of disclosure level was performed in four stages: (i) type of information provided; (ii) type of report used to provide information; (iii) environmental disclosure index; the (iv) correlation of environmental disclosure findings with indicators related to internal and external factors.

First, we checked the disclosed items contained in the annual and sustainability reports of the 98 analyzed companies. As noted in the literature review, the theme of environmental disclosure is evolving such that in the 1990s, analyses of environmental information were primarily related to management, commitment and legal aspects whereas, beginning in the 2010s, environmental performance aspects (i.e., impacts and consumption of natural resources) have become more recurrent research themes.

Although the scientific community has demonstrated the importance of several aspects that must be disclosed by companies, disclosure levels are still low. Our findings show that approximately 70% of companies did not published a sustainability report over three consecutive years. Observing the indicators that reveal the impacts related to emissions, effluents, waste, products/services and transport, we find that approximately 80% of companies have low disclosure levels that we deemed compromising. We observe an absence of information about transportation and a low level of information on the amount of liquid effluents discharged, generated waste, waste treatment, percentage reduction in emissions, effluents and waste, and monetary data on environmental expenditures and investments related to impacts. The best disclosure levels are those related to products/services and waste and greenhouse gas emissions.

It is observed, then, that aspects such as emissions and waste, discussed at global meetings such as Stockholm (2011) and Rio+20 (2012), have gained prominence in company reports, reinforcing the view that society exerts influence on environmental disclosures via social pressures, thus prompting companies to improve their reports to meet the demands.

Therefore, as already stated by Sardinha, Reijnders and Antunes (2011), Skouloudis, Evanginos and Kourmousis (2010), Sobhani, Amran and Zainuddin (2012) and Lodhia (2012), our study reveals a low percentage of companies that use specific reports to disclose environmental information. This may be because the publication of a sustainability report is not mandatory, or it may be evidence of an absence of management control mechanisms for producing this information.

It is also noted that these 98 Brazilian companies show a correlation between the two reports, revealing that the companies that issue annual and sustainability reports are consistent in their disclosures, only differentiating between the level of detailed information in each report, where the sustainability report allows more detail and depth than the annual report.

Finally, it is concluded that for the studied sample of 98 Brazilian companies, aspects related to environmental performance (PPE and GRI), legitimacy (AUDIT) and economic performance (ACCION, ASSEST and ROA), may influence or be positively related to the level of environmental disclosure, but the same does not occur with the ESI, CG and ROE indicators.

For future research, it is important to do the following:

(i) expand the sample to compare Brazilian companies with international companies; (ii) analyze how CG aspects can affect or determine environmental disclosure levels; and (iii) question company executives about the reasons that lead to the disclosure (or lack thereof) of information on environmental aspects and impacts.

REFERENCES

Ahmad NNN, and Haraf ASA (2013). "Environmental disclosures of Malaysian property development companies: Towards legitimacy or accountability?" Social Responsibility Journal 9(2): 241-258.

Ahmad NNN, and Mohamad NA (2013). "Environmental Disclosures by the Malaysian Construction Sector: Exploring Extent and Quality." Corporate Social Responsibility and Environmental Management.

Albertini E (2013). "A Descriptive Analysis of Environmental Disclosure: A Longitudinal Study of French Companies." Journal of Business Ethics: 1-22.

Alnaimi HA, Hossain M. Momin MA (2012). "Corporate social responsibility reporting in Qatar: A descriptive analysis." Social Responsibility Journal 8(4): 511-526. (No texto não esta com et al)

Anderson TW (2002). An Introduction to multivariate analysis. New York: John Wiley, 2002.

Andrikopoulos A, and Kriklani N (2013). "Environmental Disclosure and Financial Characteristics of the Firm: The Case of Denmark." Corporate Social Responsibility and Environmental Management 20(1): 55-64.

Ashcroft PA (2012). "Extent of environmental disclosure of U.S. and Canadian firms by annual report location." Advances in Accounting 28(2): 279-292.

Bae H (2012). "Reducing Environmental Risks by Information Disclosure: Evidence in Residential Lead Paint Disclosure Rule." Journal of Policy Analysis & Management 31(2): 404-431.

Barros CLM, and da Silva Monteiro SM (2012). Determinant factors of mandatory environmental reporting: The case of portuguese primary metal and steel industry. 286: 123-147.

BM&FBOVESPA (2014). "Empresas 2011. Disponívelem: www.bovespa.com.br Acesso em: 13 mar. 2014..

Bouten L, Everaert P, Roberts RW (2012). "How a Two-Step Approach Discloses Different Determinants of Voluntary Social and Environmental Reporting." Journal of Business Finance and Accounting 39(5-6): 567-605.

Bowrin AR (2013). "Corporate social and environmental reporting in the Caribbean." Social Responsibility Journal 9(2): 259-280.

Chen JC, Cho CH, Patten DM (2013). "Initiating Disclosure of Environmental Liability Information: An Empirical Analysis of Firm Choice." Journal of Business Ethics: 1-12.

Cho CH, Michelon G, Patten DM (2012). "Impression management in sustainability reports: An empirical investigation of the use of graphs." Accounting and the Public Interest 12(1): 16-37.

Christofi A, Christofi P, Sisaye S (2012). "Corporate sustainability: Historical development and reporting practices." Management Research Review 35(2): 157-172.

Clarkson PM, Fang X, Li Y, Richardson G (2013). "The relevance of environmental disclosures: Are such disclosures incrementally informative?" Journal of Accounting and Public Policy 32(5): 410-431.

Cormier D, and Magnan M (2013). "The Economic Relevance of Environmental Disclosure and its Impact on Corporate Legitimacy: An Empirical Investigation." Business Strategy and the Environment.Published online in Wiley Online Library, (wileyonlinelibrary.com) DOI: 10.1002/bse.1829.

Cormier D, Gordon IM, Magman M (2004). "Corporate environmental disclosure: contrasting management's perceptions with reality", Journal of Business Ethics, 49(2): 143-165. (No texto não esta com et al)

Deegan C, Rankin M (1997), "The materiality of environmental information to users of annual reports", Accounting, Auditing and Accountability Journal, 10(4): 562-583.

Djajadikerta HG, Trireksani T (2012). "Corporate social and environmental disclosure by Indonesian listed companies on their corporate web sites." Journal of Applied Accounting Research 13(1): 21-36.

Dragomir VD (2012). "The disclosure of industrial greenhouse gas emissions: A critical assessment of corporate sustainability reports." Journal of Cleaner Production 29-30: 222-237.

Du X, Jian W, Zeng Q, Du Y (2013). "Corporate Environmental Responsibility in Polluting Industries: Does Religion Matter?" Journal of Business Ethics: 1-23.

Dusek J, Fukuda Y (2012). "New perspective in corporate environmental targets reporting." International Journal of Automation Technology 6(3): 338-344.

Freedman M, and Patten DM (2004). "Evidence on the pernicious effect of financial report environmental disclosure", Accounting Forum, 28(1): 27-41.

Freedman M, Stagliano AJ (2008). "Environmental disclosures: electric utilities and Phase 2 of the Clean Air Act", Critical Perspectives on Accounting, 19(4): 466-486.

Galani D, Gravas E, Stavropoulos A (2012). "Company Characteristics and Environmental Policy." Business Strategy and the Environment 21(4): 236-247.

Gray R, Javad M, Power DM, Sinclair C (2001). "Donald. Social and Environmental Disclosure and Corporate Characteristics: A Research Note and Extension", Journal of Business Finance and Accounting, 28(3-4): 327–356.

Grzebieluckas C, Campo LMS, Selig PM (2007). As Empresas com Certificação ISO 14001 são mais Rentáveis?: Uma Abordagem em Companhias Abertas no Brasil. In: IX ENGEMA - Encontro Nacional Sobre Gestão Empresarial E Meio Ambiente. Anais... Curitiba.

Harte G, and Owen D (1991). "Environmental Disclosure in the AnnualReports of British Companies: A Research Note". Accounting,Auditing and Accountability Journal, 4(3), 51-61.(Falta, páginas)doi10.1108/09513579110144442

Hassan A, Ibrahim E (2012). "Corporate Environmental Information Disclosure: Factors Influencing Companies' Success in Attaining Environmental Awards." Corporate Social Responsibility and Environmental Management 19(1): 32-46.

Hasseldine J, Salama AI, Toms JS (2005). "Quantity versus quality: the impact of environmental disclosures on the reputations of UK Plcs", The British Accounting Review, 37(2): 231-248.

Husser J, André JM, Barbat G, Lespinet-Najab V (2012). "CSR and sustainable development: Are the concepts compatible?" Management of Environmental Quality 23(6): 658-672.

Iatridis GE (2013). "Environmental disclosure quality: Evidence on environmental performance, corporate governance and value relevance." Emerging Markets Review 14(1): 55-75.

Kosztrzepa RO (2004) "Evidenciação dos Eventos Relacionados com o Meio Ambiente: Um Estudo Em Indústrias Químicas". Dissertação de Mestrado do Curso de Ciências Contábeis da Universidade do Vale do Rio Sinos. São Leopoldo.

Krespi NT, Utzig MJS, Dallabona LF., Scarpin JE (2012). "Disclosure of information environmental analysis under the social aspect of companies listed on ISE." Custos e Agronegocio 8(4): 147-170.

Kuo L, and Chen VYJ (2013). "Is environmental disclosure an effective strategy on establishment of environmental legitimacy for organization?" Management Decision 51(7): 1462-1487.

Kuo L, Yeh CC, Yu HC (2012). "Disclosure of Corporate Social Responsibility and Environmental Management: Evidence from China." Corporate Social Responsibility and Environmental Management 19(5): 273-287.

Liu X, and Anbumozhi V (2009). "Determinant factors of corporate environmental information disclosure: an empirical study of Chinese listed companies", Journal of Cleaner Production, 17(6): 593-600.

Lock I, Seele P (2013). "Analyzing Sector-Specific CSR Reporting: Social and Environmental Disclosure to Investors in the Chemicals and Banking and Insurance Industry." Corporate Social Responsibility and Environmental Management.

Lodhia S, Jacobs K (2013). "The practice turn in environmental reporting: A study into current practices in two Australian commonwealth departments." Accounting, Auditing and Accountability Journal 26(4): 595-615.

Lodhia S, Jacobs K, Park YJ (2012). "Driving public sector environmental reporting: The disclosure practices of Australian Commonwealth Departments." Public Management Review 14(5): 631-647. (No texto, falta et al)

Lu Y, and Abeysekera I (2014). “Stakeholders' power, corporate characteristics, and social and environmental disclosure: Evidence from China”. Journal of Cleaner Production 64: 426-436.

Mahjoub LB, Khamoussi H (2013). "Environmental and Social Policy and Earning Persistence." Business Strategy and the Environment 22(3): 159-172.

Mallin C, Michelon G, Raggi D (2013). "Monitoring Intensity and Stakeholders' Orientation: How Does Governance Affect Social and Environmental Disclosure?" Journal of Business Ethics 114(1): 29-43.

Meng XH, Zeng SX, Tam CM, Xu XD (2013). "Whether Top Executives' Turnover Influences Environmental Responsibility: From the Perspective of Environmental Information Disclosure." Journal of Business Ethics 114(2): 341-353.

Mingoti SA (2005) “Análise de dados através de métodos de estatística multivariada – uma abordagem aplicada”. Bel Horizonte: Editora UFMG.

Mokhtar N, Sulaiman M (2012). "Environmental reporting practices of Malaysian government linked companies (GLCs)." International Journal of Economics and Management 6(2): 241-277.

Moroney R, Windsor C, Aw YT (2012). "Evidence of assurance enhancing the quality of voluntary environmental disclosures: An empirical analysis." Accounting and Finance 52(3): 903-939.

Moseñe JA, Burritt RL, Sanagustín MV, Moneva JM, Holyoak JT (2013). "Environmental reporting in the Spanish wind energy sector: An institutional view." Journal of Cleaner Production 40: 199-211.

Murray A, Sinclair D, Power D, Gray R (2006). “Do financial markets care about social and environmental disclosure?: Further evidence and exploration from the UK”. Accounting, Auditing and Accountability Journal, 19(2): 228-255.

Neu D, Warsame H, Pedwell K (1998). “Managing public impressions: environmental disclosures in annual reports”. Accounting, Auditing and Accountability, 23(2): 255-282.

Pellegrino C, and Lodhia S (2012). "Climate change accounting and the Australian mining industry: Exploring the links between corporate disclosure and the generation of legitimacy." Journal of Cleaner Production 36: 68-82.

Peters GF, Romi AM (2013). "Does the Voluntary Adoption of Corporate Governance Mechanisms Improve Environmental Risk Disclosures? Evidence from Greenhouse Gas Emission Accounting." Journal of Business Ethics: 1-30.

Rosa FS da, Ensslin SR, Ensslin L, Lunkes RJ (2012). “Environmental disclosure management: a constructivist case”. Management Decision, 50(6): 1117-1136.

Rosa FS da, Guesser T, Hein N, Lunkes RJ (2013). “Environmental impact management of Brazilian companies: analyzing factors that influence disclosure of waste, emissions, effluents, and other impacts”. Journal of Cleaner Production: 1-13.

Rupley KH, Brown D, Marshall RS (2012). "Governance, media and the quality of environmental disclosure." Journal of Accounting and Public Policy 31(6): 610-640.

Said R, Omar N, Abdullah WN (2013). "Empirical investigations on boards, business characteristics, human capital and environmental reporting." Social Responsibility Journal 9(4): 534-553.

Sardinha ID, Reijnders L, Antunes P (2011). “Using corporate social responsibility benchmarking framework to identify and assess corporate social responsibility trends of real estate companies owning and developing shopping centres”. Journal of Cleaner Production, 19(13): 1486-1493.

Silva-Gao L (2012). "The Disclosure of Environmental Capital Expenditures: Evidence from the Electric Utility Sector in the USA." Corporate Social Responsibility and Environmental Management 19(4): 240-252.

Skouloudis A, Evangelinos K, Kourmousis F (2010). “Assessing non-financial reports according to the Global Reporting Initiative guidelines: evidence from Greece”. Journal of Cleaner Production, 18(5): 426-438.

Sobhani FA, Amran A, Zainuddin Y (2012). “Sustainability disclosure in annual reports and websites: a study of the banking industry in Bangladesh”. Journal of Cleaner Production, 23(1): 75-85.

Stray S (2008). “Environmental Reporting: The U.K. Water and Energy Industries: A Research Note”. Journal of Business Ethics, 80(4): 697-710.

Sutantoputra AW, Lindorff M, Johnson EP (2012). "The relationship between environmental performance and environmental disclosure." Australasian Journal of Environmental Management 19(1): 51-65.

Tagesson T, Gujic B, Petrovic K (2012). "Secrecy versus Transparency-A Comparative Study of Social and Environmental Disclosure Practice in Croatian and Swedish Corporations." Journal of East-West Business 18(4): 321-336.

Tilt CA (2001). “The content and disclosure of Australian corporate environmental policies”. Accounting, Auditing and Accountability Journal, 14(2): 190–212.

Tilt CA (2006), “Linking environmental activity and environmental disclosure in an organisational change framework”. Journal of Accounting and Organizational Change, 2(1): 4-24.

Tilt CA, and Symes CF (1999). “Environmental disclosure by Australian mining companies: environmental conscience or commercial reality?”. Accounting Forum, 23(2): 137-154.

Villiers C, Low M and Sankim G (2014). "The institutionalisation of mining company sustainability disclosures."Journal of Cleaner Production. In press.

Voss BL, Pfitscher ED, Vicente EFR, Ferreira LF (2012). "Disclosure of environmental impacts within the agribusiness chain: A study on transport of solid waste in a city in Santa Catarina." Custos e Agronegócio 8(3): 91-112.

Wang H, Bernell D (2013). "Environmental Disclosure in China: An Examination of the Green Securities Policy." Journal of Environment and Development 22(4): 339-369.

Weber O (2013). "Environmental, social and governance reporting in china." Business Strategy and the Environment.

Wegener M, Elayan FA, Felton S, Li J (2013). "Factors Influencing Corporate Environmental Disclosures." Accounting Perspectives 12(1): 53-73.

Zeng SX, Xu XD, Yin HT, Tam CM (2012). "Factors that Drive Chinese Listed Companies in Voluntary Disclosure of Environmental Information." Journal of Business Ethics 109(3): 309-321.