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Exploring Stakeholder Salience for the Adoption of Principles and Tools of Cleaner Production in Brazilian Companies

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ABSTRACT

Objective – The key objective of this paper is to show the primary environmental influences exerted by the government, economic agents and society on companies for the implementation of the principles and tools of cleaner production (CP), and the attributes (power, legitimacy and urgency) used by stakeholders to coerce companies into adopting these principles.

Design/methodology/approach – The research method employed was the application of an exploratory survey in 102 Brazilian companies and the multi-varied evaluation of data by means of multiple correspondent analysis.

Findings – The study shows that some principles of CP are little used by companies in Brazil. Concerning the influences on the adoption of CP, the government, economic agents and society are singled out as the important influencers. The government influence is manifest through the adoption of environmental regulating measures (power) in conjunction with sincere actions in environmental education (influence). The economic agents possess the power, legitimacy and urgency to influence the adoption of CP. Society's influences are less relevant, in that Brazilian society has much less awareness of sustainable production and consumption as compared to other countries.

Practical implications – This study shows that it is vital that Brazilian society learns more about sustainable production, because a society with no environmental conscience is a society with little means to demand the implementation of CP.

Originality/value – The results of the study represent an important theoretical contribution in that, at present, there is little literature on the relationship between stakeholders and Cleaner Production. This is the first study in Brazil to address the subject.

Keywords – Stakeholders Salience; Exogenous Influences; Cleaner Production; Brazil.

1 INTRODUCTION

Cleaner Production (CP) is the integrated application of technical, economic and environmental strategies in processes and products with the objective of increasing efficiency in the use of raw materials, water and energy through the non-generation, minimization or recycling of wastes and emissions with environmental, occupational and economic health benefits (Centro Nacional de Tecnologias Limpas [CNTL], 2003; United Nations Environment Programme [UNEP], 1990). CP must be applied to the production processes of organizations for the reduction of emissions and the economic use of resources in an eco-efficient manner (Glavic & Lukman, 2007).

Scientific evidence indicates that stakeholder influence motivates companies to adopt CP and focus on sustainable practices in their operating decisions, as a means to contribute to sustainable development (McDonald & Young, 2012; Aschehoug, Boks, & Støren, 2012). The flow of information, materials and energy between different organizations can be optimized in an effort to obtain favorable results (Harangozo & Zilahy, 2015). To this end, organizations must develop management mechanisms to identify these influences in order to develop plans of action to promote CP and to improve the dissemination of information through a unified sustainability report (Asif, Searcy, Zutshi, & Fisscher, 2013).

The three fundamental types of stakeholders that influence the adoption of CP in companies are: (i) government, through public policies (Ashford & Caldart, 2001; Bremmers, Omta, Kemp, & Haverkamp, 2007; Ciccozzi, Checkenya, & Rodriguez, 2003; Chiu, 2011; Geng, Xinbei, Qinghua, & Hengxin, 2010; Gravrilescu, 2004; Taylor, 2006; Zeng, Xu, Dong, & Tam, 2010); (ii) economic agents, comprised of company managers (Guerina, 2006; Hoff & Thiell, 2014), clients (Bremmers *et al.,* 2007) and shareholders (Ciccozzi *et al.,* 2003; O'Rourke, 2003; Zeng *et al.,* 2010), and; (iii) society, concerned with the future of the environment (Guerina, 2006; Taylor, 2006).

Stakeholders have influenced companies in all parts of the world to adopt the principles and tools of CP in an effort to foster environmental sustainability. For example, negotiations between the United States government and American companies have led to the creation of legislation to regulate the levels of environmental conformity, and thereby avoiding heavy penalties. This legislation contains the legal definitions of clean technology, waste emission controls, occupational health safety, as attributes required of all companies (Ashford & Caldart, 2001). The governments of Guatemala and Zimbabwe introduced stimuli for the adoption of CP to avoid fiscal retribution. Stakeholders and business administrators are concerned with the costs of the necessary investments, but the adoption of CP also facilitates access to international markets (Ciccozzi *et al.,* 2003). In France, concern with the cost of investment in CP caused businessmen to refer to it as "ethical investment" to promote socio-environmental responsibility (O'Rourke, 2003). The government of Romania was responsible for the creation of national policies to guarantee the correct application of CP through legislation and to institutionalize it in domestic industries. They also recruited the involvement of various stakeholders, such as centers for the implementation of CP, educational and media institutions, in an effort to attract foreign investment in clean technologies (Gravrilescu, 2004).

As other examples, the influence of government, non-governmental organizations, consultants and business organizations fostered the development of an environmental conformity program in Canada to avoid penalizing companies (Taylor, 2006). Mining companies in Australia must operate in strict cooperation with local communities, governments and suppliers. These stakeholders forced local management to implement clean technologies and internal recycling (Guerina, 2006). Small and midsized companies in the Netherlands were pressured into adopting an environmental management system by their clients and government, which

included actions to ease pollution stemming from production. The primary goal was to include these influences in the supply chain and network (Bremmers *et al.,* 2007). Regional Chinese governments played an important role in motivating local companies to adopt CP by providing financial subsidies through stimulus policies, including the opportunity to capacitate employees in environmental education (Geng *et al.,* 2010). As a result, Chinese companies recognized that CP makes environmental protection feasible and generates a competitive edge in business. However, it is important for the economic agents to control the costs of implementation, because a lower cost CP generates higher contribution to the overall financial performance of the company (Zeng *et al.,* 2010).

In addition, Asian and Pacific governments played a leading role in the development of public contracts for environmental regulation of commodities through strategic policies toward the efficient use of resources. This regulation influenced changes in consumption standards, development of tools for the administration of resources, and freed up credit to finance clean technologies and know-how (Chiu, 2011). Mexican administrators and stakeholders fostered the environmental collaboration of suppliers, which was extremely important for the implementation of CP (Hoff & Thiell, 2014).

Although the available literature clearly demonstrates the importance of stakeholder influence on the adoption of CP, there are no studies showing how this influence is exerted in Brazil. This paper deals with the importance of stakeholder influence on the adoption of CP, focusing on presenting the environmental influences applied by the federal government, economic agents, and society in general, on private companies to implement the principles and tools of CP, as well as discussing the attributes (power, legitimacy and urgency) that are in fact used by these stakeholders to ensure that companies adopt specific CP principles and tools. In order to accomplish these objectives, this paper performed a survey of 102 Brazilian companies. To identify specific attributes (power, legitimacy and urgency), the stakeholder salience model (Mitchell, Agle, & Wood, 1997) was applied, with the objective of classifying stakeholder characteristics. This model is one of the most widely used on the theory of stakeholders (Friedman & Miles, 2006), and appears in various studies related to environmental practices, such as: The Incorporation of Corporate Environmental Performance (Agle, Mitchell, & Sonnenfeld, 1999; Álvarez-Gil, Berrone, Husillos, & Lado, 2007; Dong, Burritt, & Qian, 2014; Gago & Antolín, 2004;); The Implementation of Eco-Management Audit System (EMS) (Le, Vu, Hens, & Heur, 2014); Responses to Environmental Accidents (Magness, 2008); Facilitation of Strategic Planning for Sustainable Tourism (Currie, Seaton, & Wesley, 2009.); Corporate Sustainability (Lyra, Gomes, & Jacovine, 2009); The Engagement of Stakeholders in Improving the Environmental Performance of Governance (Gifford, 2010); and The Implementation of Ethical Environmental Management (Samaras, 2010). Additionally, this study was motivated by the federal government implementation of the first phase of the Plan of Production and Sustainable Consumption (PPSC), which promotes the awareness of the principles and tools of CP applicable to the production system of business organizations.

The structure of the paper is as follows: Section 2 develops the Theoretical Foundation; Section 3 establishes the Research Methodology; Section 4 presents the Results of the Study; Section 5 presents a Discussion on the Results; and Section 6 draws a variety of Conclusions.

2 THEORETICAL FOUNDATION

2.1 Cleaner production: principles and tools

The implementation of the principles and tools of Cleaner Production consists of the incorporation of ideas of environmental improvement into the production process, in

order to address environmental norms and requisites with a greater effectiveness; they also promote the treatment of residues and emissions; and reduction of wastes and costs (Boyle, 1999). This, in turn, leads to a set of guidelines on the criteria of the sustainable project that, if followed, can lead to useful advances toward the reduction of costs and increased environmental gains (Anastas & Zimmermam, 2006). In an effort to present the principles and tools of CP incorporated in the present study, a series of data banks were accessed, including Science Direct, Emerald, Proquest, Ebsco, Capes e Google Scholar, using the keyword combinations "principle" and "cleaner production", "tool" and "cleaner production".

The content of the articles, norms and the Eco-efficiency Learning Module published in the WBCSD by Madden, Young, Brady and Hall (2005), was analyzed to identify the principles and tools of CP. Eco-efficiency is reached upon the delivery of goods and services at competitive prices that satisfy human needs and improve the quality of life, while progressively reducing the ecological impacts and the effect of resources over the product's life cycle. Based on this analysis, 30 principles and tools of CP were identified and are listed in Table 1.

Organizations are incorporating new principles and tools for the reduction or elimination of pollution into the production system. The acceptance of these principles and tools culminates in the Design for the Environment – DfE – with the focus on the conception of products, productive systems, and distribution networks (Birch, Hon, & Short, 2012; Yuksel, 2008). In the development of products, one seeks to reduce the consumption of materials and energy, focusing on remanufacturing, reuse or recycling to ease the environmental risks on human health. In the productive system, the focus is on the reduction of emissions, residues and wastes. In the distribution network phase, it is necessary to select sustainable players for the creation of manufacturing ecology.

To assist in the development of DfE, companies can co-create value with clients and suppliers. This co-creation consists of the participation of the client and suppliers in business decisions during the creation of value (Prahalad & Ramaswamy, 2004). In this context, they participate in the development of products and sustainable processes to be familiar with the environmental behavior of the clients and to identify raw materials and components that are less polluting.

Companies that develop sustainable products and services need to invest in research and innovation, focused on intensifying eco-design. Eco-design incorporated into the product's design project consists of the reduction of electrical energy waste; aims to simplify maintenance; avoiding waste of materials and protective packing; reductions in the usage of water and energy in the production process; and promotion of the substitution of contaminating components in existing products, allowing for a reduction on the environmental impact, as well as simultaneously reducing production and assembly costs (Gaziulusoy, Boyle, & McDowall, 2012). At the same time, clean technological innovations are being researched for the mitigation or elimination of emissions and residues, as well as the development of the specialized software for the control of residue generated during the fabrication process.

It is important to emphasize that principles and normative tools are important to empower the adoption of CP. The implementation of an environmental management system with ISO 14001 certification, when used in its legitimate form, permits the standardization of processes that conform environmentally through the execution of periodic system audits. With this confromance, a company can attain an environmental certification – ISO 14020 – for its products. Furthermore, the implementation of the AA 1000 norm can promote a greater participation from clients and suppliers in the eco-design phase, which has a direct relationship with sustainable production and consumption.

Business organizations not only have to monitor internal environmental risks, but also

be vigilant to external ecological vulnerabilities. Therefore, pollution generated in the supply chain must be reduced using a series of processes: the selection and audit of sustainable suppliers; the planning and control of production to avoid waste of raw materials and energy; the reduction of emissions of carbon gas while transporting products to clients; and the implementation of reverse logistics to correctly dispose of solid residue at the end of the useful life of the product.

The adoption of related principles and tools can also be used in the evaluation of environmental and economic performance. It is important to analyze the production process in detail to introduce environmental and economic performance evaluation indicators. Environmental performance can be evaluated through the material concentration in the abiotic and biotic compartments, water and air, enabling measurements of the environmental impact generated by each process, with the objective of developing goals for material reduction. However, the implementation of the principles and tools of CP can generate additional costs, requiring the development of performance controls to monitor training costs and increases in operational costs derived from the utilization of sustainable materials with greater aggregated value.

TABLE 1 – Principles and Tools of CP

Principles and Tools of CP	**Reference**
P1) Planning and control of production considering environmental factors, focused on the reduction of pollution and emissions through recycling, reuse and remanufacturing.	Yuksel, 2008; Chen and Mobahan, 2010
P2) Client participation in ecological product development (*eco-design*)	Boons and Lüdeke-Freund, 2013, Mauser et al., 2013
P3) Eco-efficient product project for the reduction of materials and energy consumption	Birch et al., 2012; Gaziulusoy et al., 2012.
P4) Product project incorporating the processes of remanufacturing, reuse and recycling	Edwards, 2002; Birch et al., 2012; Ortegon, Nies and Sutherland, 2013.
P5) Development of the eco-efficient product process for the reduction of greenhouse gas emissions	UNEP, 1990; Madden et al., 2005
P6) Auditing and control of pollution in the manufacturing process	Simon, Bernardo, Karapetrovic and Casadesús, 2011; Hong and Li, 2013
P7) Investment in innovation for clean manufacturing technology to minimize the consumption of raw materials and energy	Hallstedt, Thompson and Lindahl, 2013
P8) Supplier participation in the development of ecologically correct raw materials and components	Ngugi, Johnsen and Erdélyi, 2010.
P9) Existence of environmental criteria for the acquisition of raw materials with focus on the selection of sustainable suppliers	Yuksel, 2008; Igarashi, De Boer and Fet, 2013.
P10) Environmental audit of raw materials suppliers to control the use of water, energy and the final destination of residues.	Hong and Li, 2013.
P11) Utilization of ecologically friendly packaging for manufactured products, focusing on the reduction of environmental impact at the source.	Zhang and Zhao, 2012.
P12) Consideration of environmental questions concerning the management of the supply chain with focus on the processes for the selection of materials and suppliers, productive processes, delivery of products to consumers, and management of product end of life cycle.	Yuksel, 2008; Srivastava, 2007; Tsoulfas and Pappis, 2008.
P13) Reverse logistics for remanufacturing focusing on the reduction of the use of productive materials.	Rogers and Tibben-Lembke, 1998
P14) Reduction of external environmental risks to organizations through internal recycling and the adequate use of raw materials, electricity and water.	Rogers and Seager, 2009.
P15) Control and evaluation of the environmental impact of generated residues through the analysis of material concentration in the abiotic and biotic compartments, water and air.	Ritthoff, Rohn and Liedtke, 2002.

(Continua)

(Conclusão)

Principles and Tools of CP	Reference
P16) Evaluation of questions of life cycle sustainability (for example, extraction and processing of raw materials, manufacturing, transportation, distribution, use/reuse, maintenance, ease of dismantling and recycling) at the conception of the project of a product.	Hale, 1996; ISO 14042, 2000; Romero-Gamez, Suárez-Rey, Antón, Castilla, and Soriano, 2012.
P17) Environmental risk analysis for a product in terms of its effect on human health.	Wu, Olson and Birge, 2013.
P18) Pollution prevention of to control the emissions of industrial residue with the objective of reducing the toxicity of pollutants at the source.	Environmental Protect Act 1990, 1990; Harrington, 2012; Hoque and Clarke, 2013;
P19) Development of distribution networks, specializing in the recovery and correct destination of collected products, with the possibility for the separation into component parts and eventual reuse, remanufacture and/or internal recycling at the factory.	Yuksel, 2008
P20) Industrial ecology, focused on the development of an industrial production strategy and intercompany relationships, fostering minimal environmental impact.	Biswas, 2012; Liu and Zhang, 2013
P21) Investment in training in environmental education for factory employees, focused on the reduction and non-generation of emissions and residues.	Jimenez and Lorente, 2001; Teizer, Cheng and Fang, 2013; Kiperstok, Esquerre, Kalid, Sales and Oliveira 2013
P22) Implementation of operational cost indicators as a result of the acquisition of products with green certification.	Hale, 1996; Nilsson, Tunçer, and Thidell, 2004; Mauser et al., 2014
P23) Evaluation of environmental performance of the organization and leadership, the planning process, the involved personnel, the implementation, the operation, and the control of the economic, social and environmental results.	Franke and Grothe-Senf, 2006.
P24) Method through which an operation can be broken down for the allocation of environmental performance indicators and the prioritization of the primary constructs in the decision process.	Sellitto and Borchardt; Pereira, 2010.
P25) Evaluation of the CP plan of action to analyze conformity.	UNEP, 1990; CNTL, 2003.
P26) Implementation of MRP information technology into the production process to manage generated residues.	Wu, Ding and Chen, 2012; Vachon and Klassen, 2008.
P27) Existence of an environmental management system with an ISSO 14001 certification and an Eco-Management Audit System (EMAS) in the productive system.	Campos, 2012; Testa, Rizzi, Daddi, Gusmerotti, Frey and Iraldo, 2014
P28) Existence of a consistency between the product's environmental labeling and the manufacturer's ISSO 14001 certification	Environmental Protection Agency, 1993; ISO 14020, 1998; Sonderskov and Daugbjer, 2011.
P29) Existence of standards (AA1000) relating to the inclusion of the stakeholders in operational decisions with the participation of suppliers and clients.	AccountAbility, 2003; Hsu, Lee and Chao, 2013.
P30) Implementation of clean technologies in production for the prevention of pollution and the reduction of emissions.	Hale, 1996; Thrane, Nielsen and Christensen, 2009; Munsamy, Telukdarie and Zhang, 2014.

2.2 Stakeholder theory

The concept of stakeholders was developed at the Stanford Research Institute as early as the 1960s. It refers to any group or individual who can affect or be affected by the achievement of the goals of an organization (Freeman, 1988), groups for which the corporation is responsible (Alkhafaji, 1989), groups that have relationships with the organization (Thompson, Wartick, & Smith, 1991) and agents that support voluntarily or involuntarily risks (Clarkson, 1994).

There are two definitions for stakeholders: one in the broad sense, which consists of all identifiable groups or individuals who can affect the achievement of the organization's objectives or that may be affected by such objectives; and another in the strict sense, consisting of any identifiable group or individual on whom the organization depends to survive. From the point of view of business strategy, stakeholders must be understood in their broadest sense, to establish a channel of communication and comprehend the

needs of each stakeholder for marketing decisions and operations (Freeman & Reed, 1983).

The primary goal of this paper is to discuss the influence of stakeholders in reference to the principles and tools of CP. Therefore, the following sections will present these influences, separated into type (government, economic and society) and manner in which this influence is manifested (power, legitimacy and/or urgency).

2.2.1 *The influence of stakeholders on the adoption of CP*

Stakeholders can influence the adoption of environmental practices by companies in three different ways: government, economic agents and society. For this study, a review of the existing literature was performed, using a series of data bases, including Science Direct, Emerald, Proquest, Ebsco, Capes and Google Acadêmico, and the keyword combinations "principle" and "cleaner production"; "tool" and "cleaner production". Table 2 lists the eleven studies on which the influences of the stakeholders are based.

This study is unprecedented in its effort to identify and classify each separate influence exerted by the three types of stakeholders, as well as associate the influences to the principles and tools of CP. Among the papers that deal with the influence of stakeholders, it is possible to extract 22 public policy (government) influences, 16 influences exerted by economic agents, and 5 influences from society, as demonstrated in Table 2.

Research indicated three public policy approaches used by the government to influence and/or coerce companies to adopt the principles and tools of CP, regulatory, stimulus and educational. The most prevalent approach consists of the elaboration of regulatory public policies, with this type of influence appearing with greater frequency in the studies from the United States (Ashford & Caldart, 2001) and Canada (Taylor, 2006). In these studies, the objective was to control the levels of environmental conformity by requiring the adoption of clean technologies; by inspecting emissions, residues and industrial effluents; by controlling the occupational security and health of company employees and neighboring communities; and by intensifying taxes and penalties.

Education-based public policies, a much discussed subject in the works of Gravrilescu (2004), Geng *et al.,* (2010) and Chiu, (2011), emphasize the opportunity to reconcile economic, environmental and social questions at the university level, as well as promote professional education on the subject of the environment to company executives.

The public policy stimulus for the adoption of the principles and tools of CP (Ciccozzi *et al.,* 2003), is little explored in the literature. It usually deals with the concession of low interest loans for investment in clean technologies with the intention of reducing or eliminating emissions and effluents.

In three studies from Romania (Gravrilescu, 2004), China (Geng *et al.,* 2010), and Asia and the Pacific (Chiu, 2011), governments influenced companies through the use of financial, regulatory and educational stimuli. In this case, it is evident that the use of the three elements jointly helped achieve the goals of supplying subsidies to invest in clean technologies, apprizing companies on environmental education, and intensifying regulation, in that the alternative was to levy penalties on companies that do not adhere to the process of the adoption of the principles and tools of CP.

The influence of economic agents in the implementation of the principles and tools of CP generally is associated with the opportunity to advance a company's competitive edge by means of access to international markets (Ciccozzi *et al.,* 2003), attaining economic advantages (Zeng *et al.,* 2010), and avoiding the risk of increased taxation from being considered polluters of the environment (Ciccozzi *et al.,* 2003). The implementation of CP allows for the enhancement of the product brand and the company reputation on the international scenario, including being listed on foreign stock exchanges. A company with a favorable brand

and environmental reputation can better serve clients with sustainable demand. This economic advantage can be attained by companies that adopt CP, owning to the possibility for the reduction of waste during the manufacturing process and the ease with which to finance investments aimed at the modernization of the productive process through the use of clean technology. Other businessmen consider that the absence of environmental practices during production can increase tariffs and taxes on the emission of pollution and the extraction of scarce resources.

Society, with standards of sustainable consumption, also pressures companies to adopt CP (Chiu, 2011). Parts of society have displayed changes in personal values and can be outspoken when defending the purchase of sustainable products or denouncing polluting companies through corporate communication channels. Maybe the most telling aspect is the disposition of certain consumers to pay higher prices for sustainable products, as a result of their aggregated environmental value.

TABLE 2 – Stakeholder Influences

22 Government Influences on the Implementation of CP	Bibliography
PP1) Communication of the importance and the necessity of sustainable production.	Gravrilescu, 2004; Bremmers et al., 2007.
PP2) Adoption of a environmentally based tax reform with subsidies and tax exemptions for companies that reduce pollution and emissions.	Taylor, 2006; Geng et al., 2010.
PP3) Existence of legislation for the implementation of clean technologies and the combat of pollution.	Gravrilescu, 2004.
PP4) Rapid and efficient judiciary intervention to prevent new environmental damage.	Gravrilescu, 2004.
PP5) Penalties and compensation for the extraction of natural resources.	Taylor, 2006.
PP6) Require transparency and free access to information on the socioenvironmental aspects of companies.	Gravrilescu, 2004.
PP7) Dissemination of information with respect to the effect of the environmental crisis and the future of humanity.	Gravrilescu, 2004.
PP8) Control of information that substantiates a company's concern with sustainability, including environmental zoning, management of hydrographic basins and destination of waste.	Ashford and Caldart, 2001; Gravrilescu, 2004.
PP9) Establishment of legislation for environmental control in conjunction with a court of arbitration.	Gravrilescu, 2004; Bremmers et al., 2007.
PP10) Dissemination of the risks and restrictions for substances harmful to health.	Ashford and Caldart, 2001; Gravrilescu, 2004.
PP11) Environmental inspections in companies.	Taylor, 2006.
PP12) Establishment of progressive penalties for activities resulting in severe carbon emissions.	Chiu, 2011.
PP13) Penalties for the dumping of polluting effluents.	Taylor, 2006.
PP14) Inspection of equipment in production processes to ascertain the possibility for substitution for clean technology.	Ashford and Caldart, 2001; Gravrilescu, 2004.
PP15) Control over water resources, processes for environmental licensing, forestry code, national policies on the environment, solid and gaseous residues of the greenhouse effect.	Ashford and Caldart, 2001; Gravrilescu, 2004.
PP16) Promotion of discussion forums on sustainability.	Bremmers et al., 2007.
PP17) Raising of awareness for environmental auto-regulation.	Ciccozzi et al., 2003; Hoff and Thiell, 2014.
PP18) Transparency in the control of the environment by public administrators.	Bremmers et al., 2007.
PP19) Debates with information on public policy for society.	Gravrilescu, 2004; Zeng et al., 2010; Chiu, 2011.
PP20) Evaluation of neighborhood meetings called to discuss sustainability related subjects.	Guerina, 2006; Chiu, 2011.
PP21) Initiatives for the separation and collection of garbage.	Ciccozzi et al., 2003.
PP22) Evaluation with respect to the purchase of ecological products by society.	O'Rourke, 2003; Gravrilescu, 2004.

(Continua)

(Conclusão)

16 Influences of Economic Agents on the Implementation of CP	Bibliography
E1) Perception of environmental cost as an investment.	Ciccozzi et al., 2003; O'Rourke, 2003.
E2) Creation of value for the company as a result of the association of brand and reputation with sustainability.	Ciccozzi et al., 2003; O'Rourke, 2003; Zeng et al., 2010.
E3) Perception that the eco-efficiency can result in economic and environmental advantages, due to the reduction of the use of materials and energy.	Zeng et al.,2010.
E4) Necessity for investment in clean technology.	O'Rourke, 2003; Guerina, 2006; Chiu, 2011.
E5) Ease of obtaining financial resources for the investment in sustainability.	Gravrilescu, 2004.
E6) Establishment of high interest on loans used to finance activities to extract scarce resources.	Ciccozzi et al., 2003.
E7) Ease with which to utilize Mechanisms for Clean Development (MCD) to reduce emissions through the transfer of technology and low cost financing.	Chiu, 2011.
E8) Inclusive global economy directed toward sustainable development for the reduction of environmental impacts caused by production activities.	Hoff and Thiell, 2014.
E9) Perception that capital and natural resources are complementary items in the conquest of new markets.	Zeng et al.,2010.
E10) Acceptance of environmental intervention in organizational decisions.	O'Rourke, 2003.
E11) Economic policies that enable competitive pricing by alleviating the higher costs of ecologically correct products.	Zeng et al.,2010.
E12) Evaluation of the economic benefits of environmental policies.	Gravrilescu, 2004.
E13) Perception that sustainability will lead to the reduction of waste as a result of processes changes.	Zeng et al., 2010.
E14) Participation of indicators of sustainability on the stock market — Dow Jones Indicators of Sustainability — which should help organizations become more attractive to investors.	Gravrilescu, 2004.
E15) Use of indicators to divulge prices of environment friendly products on the market.	Zeng et al., 2010; .
E16) Convey clearly to society the cost of pollution control and the preservation of the environment.	O'Rourke, 2003; Zeng et al., 2010; .
5 Influences of Society on the Implementation of CP	Bibliography
S1) Consumers accept paying more for the aggregate added value of the ecologically correct products.	Zeng et al., 2010.
S2) Changes in society values, increasingly accepting the necessity for sustainable products.	Ashford and Caldart, 2001; Chiu, 2011.
S3) Society understands the factors that should be taken into account for the preservation of the planet.	Chiu, 2011.
S4) Society is conscience of and willing to refute or denounce misleading practices by companies with reference to sustainability.	O'Rourke, 2003.
S5) Society believes vital to have an independent and reliable group to prevent misleading advertising and to stimulate condemnation of illegal practices to the environment.	O'Rourke, 2003.

2.2.2 *The role of stakeholder influence during the adoption of CP: the Mitchell Model*

According to Freeman (1984), companies should identify their stakeholders with the objective of recognizing possible influences, and especially the intrinsic behavior resulting from these external stimuli. To classify these influences, Friedman and Miles (2006) reported that among the existing proposals, the most widely used was the Mitchell *et al.* (1997) Model, "stakeholder salience", in which, to illustrate stakeholders' effects on company activities, three attributes generate four different types of stakeholders with seven possibilities for classification (Table 3).

The three attributes of relationship are: [i] Regulatory or Coercive Power, defined as position to carry out one's will despite resistance; [ii] Legitimacy, characterized by a normative nucleus – an attribute accepted unequivocally

by stakeholders, denoting legitimacy in its utilization; and [iii] Urgency, which considers the time factor of immediate action. Importantly, the independent use of power and legitimacy may affect management, so it is important to add urgency to move from the static model to the dynamic model for immediate action (Mitchell *et al.,* 1997). Before Mitchell *et al.* (1997), Starik (1994) had already defined an attribute denominated "proximity", that is not considered among the attributes presented in Table 3; however, it was fully contemplated by Driscoll and Starik (2004). The proximity of stakeholders is related to a spatial distance, such as members from the same network or chain of value, clients, local communities and the surrounding environments (Driscoll & Starik, 2004). The identification of the proximity of stakeholders, based on distance, can be as important as the attribute "urgency", which is related to time (Lee & Robbins, 2000). Based on these definitions, the natural environment can be seen a stakeholder critical to the business organization. Therefore, the sustainability criteria should be incorporated into the concept of stakeholders, adding the attribute "proximity" (Driscoll & Starik, 2004) to the attributes defined by Mitchell *et al.* (1997).

TABLE 3 – Typology of Stakeholders

Type of *Stakeholder*	Classification
Latent Stakeholders (have only one of the three attributes; are likely to receive little attention from the Company)	(i) Dormant Stakeholder (Lat Dorm) - has the power to impose its will on the organization, but is not accepted (legitimate and neither has urgency. This it is usually out of use, having little or no interaction with the company (ii) Discretionary Stakeholder (Lat Discr) - is accepted but has no power to influence the company nor to require urgency. There is absolutely no pressure on the other parties, although normative and acceptable, those involved may choose to do so mainly due to the lack of control (iii) Demanding Stakeholder (Lat Dem) - when the mostly important attribute is urgency. It has no power or legitimacy.
Expectant Stakeholders (have at least two attributes; have a more active posture of stakeholder)	(iv) Dominant Stakeholder (Exp Dom) - Is accepted without dispute due to the legitimacy and power. (v) Dangerous Stakeholder (Exp Dang) - When there is power and urgency, but there is no acceptance. This is totally coercive. (vi) Dependent Stakeholder (exp Dep) - is one that has allegations urgently and with acceptance, but has no power in itself, depending on other stakeholder for their claims to be accepted. (vii) Definitive Stakeholder (Defin) - Have power, legitimacy and urgency, requiring immediate attention and prioritization involved. Non-stakeholder (No Stak) - has no influence or is influenced

Note. Source: Based on the Mitchell, R. K., Agle, B. R., & Wood, D. J. (1997). Toward a theory of stakeholder identification and salience: defining the principle of who and what really counts. *Academy of Management Review, 22*(4), 853-886.

Furthermore, the "proximity" attribute allows for the definition of the physical and local context in which organizations operate. The identification of the proximity attribute is intrinsic to spatial distance, as in extreme weather events that can occur where organizations or stakeholders are operating (Driscoll & Starik, 2004). In this context, despite being considered a trend aspect (Driscoll & Starik, 2004), the natural environment is considered as a primary stakeholder, due to its involvement with all other attributes (Haigh & Griffiths, 2009).

3 RESEARCH METHODOLOGY

3.1 Procedure for data collection

The research method used in this study was that of the exploratory survey (Forza, 2002). The questionnaire was divided into four sections: (1] descriptive information on the company; (2] the principles and tools of CP (see Table 1); (3] exogenous influences of the stakeholders (see Table 2); (4] stakeholder influence attributes (power, legitimacy and urgency) for the classification of

stakeholders (section 2.2.2 and Table 3). With the exception of the first section of the questionnaire, responses in the other sections were attributed a nominal value to evaluate the importance/adoption of the principles and tools of CP, the exogenous influences of the stakeholders and influence attributes in participating organizations (Surely Adopted (S) or Not Adopted (N)).

The participants in the study were business organizations formally committed to sustainability and also associated with the Ethos Institute, an entity created and maintained by a group of 667 companies involved in promoting sustainable development (Instituto Ethos, 2014). As the study has exploratory purposes, a probabilistic and intentional method was adopted to determine the sample size. The criteria for sample selection were: 1) companies possessing known brands; 2) companies with institutional sites mentioning aspects of sustainability; and, 3) companies operating in different industries, but mainly targeting the manufacturing industry. After applying these filters, 130 companies were selected, a quantity consistent with a sample size of 19% of the total population associated with the Ethos Institute — a percentile considered satisfactory for the exploratory purposes of the research.

Of these 130 organizations, four important companies were selected as a pre-test, to evaluate the adequacy of the questionnaire in terms of number of questions, language and syntax, and time needed to complete the task. The companies selected to participate in the pre-test were two from the chemical industry, one from the steel industry and one automobile manufacturer. The pre-test was conducted through interviews with company directors in charge of environmental management. The interviews lasted an average of an hour and forty minutes, and the results of the pre-test were considered satisfactory. The findings from the pre-test allowed us to combine questions of similar content, remove questions of little value and correct text that caused confusion. The application of the questionnaire in this phase permitted us to judge the reaction of the interviewee to each question (Seidman, 1991). The pre-test process lasted from February 2012 until March 2012, beginning with the scheduling of the interviews and ending with the final application.

After revising the questionnaires during April 2012, an invitation to participate in the study was emailed to the companies in the sample, using a subject line entitled "Forward to the sector of corporate communications, please". In the body text of the email, the objectives of the study were briefly explained, the option of participation or non-participation in the survey, and the link to complete the questionnaire. For the construction and development of the questionnaire, as well as its database, the platform Google Docs was used. This process lasted from April 2012 through July 2012. It is important to note that it was necessary to call the designated participants personally to emphasize the importance of this study. Of the 130 organizations selected in the initial sample, 102 companies returned the fully completed questionnaires. The return rate of 78% can be considered satisfactory for the exploratory purposes of this study (see Table 4).

TABLE 4 – Beginning Sample and Rate of Return

Sector	Sent	Received	Return Rate (%)
Chemicals	41	34	83%
Steel	24	19	79%
Services	19	18	95%
Paper and Cellulose	10	9	90%
Electro-Electronics	11	8	73%
Food Processing	13	7	54%
Automobile Manufacturing	12	7	58%
Total	130	102	78%

3.2 Procedure for data analysis

Following the return of the questionnaires, based on the answers on stakeholder influences and attributes (power, legitimacy and urgency) as a Yes/No response, a conceptual theoretical model was developed comprised of the following constructs: "Principles and Tools of CP"; "Typology of Stakeholders"; and "Exogenous Influences of the Stakeholders". It is important

to remember that the typology of stakeholders is established in the work of Mitchell *et al.* (1997) (Table 3) by means of the classification assigned by companies to the attributes (power, legitimacy and urgency). Table 5 illustrates the constructs and their classifications, as well as the abbreviations which will be used in correspondence analysis.

Correspondence Analysis (Anacor) (Whitlark & Smith, 2001) is a technique that demonstrates a set of associations between categorical variables on a nominal perceptual map. This allows for a visual analysis of any pattern of associations between typology and stakeholder influences in the adoption of the principles and tools of cleaner production. In this study, the symmetric projection was used (Greenacre, 2007), which allows for simultaneous exploration of the relationships between rows and columns of contingency tables, i.e. – the associations between all categories of both variables. That is to say those categories with nearby locations on the map have a stronger relationship than those separated by greater distances.

TABLE 5 – Conceptual theoretical model

Construct (level 1)	Construct (level 1.1)	Construct (level 1.1.1)	Quantity	Acronym at Anacor	Example
Principles and tools of CP	-	-	30	Pi:j	P1:S; P1:N
Exogenous Influences of the Stakeholders	Government (Public Politicies)	-	22	PPi:j	PP7:S; PP12:N
	Economic agents	-	16	Ei:j	E2:N; E5:S
	Society	-	5	Si:j	S2:S; S1:N
Typology of the Stakeholders	Latent	Dorment	-	Lat_Dorm	-
		Discretionary	-	Lat_Discr	-
		Demanding	-	Lat_Dem	-
	Expectant	Dominant	-	Exp_Dom	-
		Dangerous	-	Exp_Dang	-
		Dependent	-	Exp_Dep	-
	Definitive	-	-	Defin	-
	Nonstakeholder	-	-	No_Stak	-

Due to the large amount of variables for the principles and tools of CP (30), stakeholder exogenous economic influences (16) and exogenous influences of policies (22), a procedure for the reduction of variables was adopted, as a higher number of variables complicates the interpretation of the resulting maps illustrated in the multiple correspondence analysis associations. For the set of constructs mentioned, only the first quartile of indicators was considered, representing the variables which respondents judged as most often used (S) by companies. This procedure was not adopted for the evaluation of the exogenous influences of society because of the low number of indicators. In this case, all indicators of this construct were used in correspondence analysis. Table 5 enumerates the variables selected for the correspondence analysis, enabling responses to the following questions in the questionnaire:

Question 1 – What are the most relevant influences of the stakeholders (government, financial agents and society) for the implementation of the principles and tools of CP?

Question 2 – Which principles and tools of CP are more and less utilized by companies as a consequence of the influences of stakeholders (government, financial agents and society)?

A multiple-correspondence analysis was performed individually for each of the stakeholders' exogenous influences. This procedure was used in answering the following questions:

Question 3 – Which influences and government stakeholder typology are associated with the implementation of the principles and tools of CP in Brazilian companies?

Question 4 – Which influences and economic agent stakeholder typology are associated with the implementation of the principles and tools of CP in Brazilian companies?

Question 5 – Which influences and society stakeholder typology are associated with the implementation of the principles and tools of CP in Brazilian companies?

The responses to these questions demonstrate that government, through its public policy, economic agents and society, can affect the accomplishment of organizational objectives relating to the adoption of principles and tools of CP, which concurs with the writings of Freeman and Reed (1983). In this context, stakeholders must be identified so as not to affect the competitiveness of companies (Freeman, 1984) and studied to comprehend how they influence the activities of the organization (Mitchell *et al.,* 1997).

4 RESULTS OF THE STUDY

Table 6 demonstrates the most cited stakeholder influences, as well as the principles most adopted by companies participating in the survey. The most relevant stakeholder influences (government, economic agents and society) for the implementation of the principles and tools of CP are described as follows.

TABLE 6 – Indicators most and least cited by respondents (25% most cited/25% least cited)

Construct (Level 1)	Construct (Level 1.1)	Quantity Most Cited	Acronyms of Most Cited Indicators used in Correspondence Analysis	%	Quantity Least Cited	Acronyms of Least Cited Indicators	%
Stakeholders exogenous influences	Government (Public Politicies)	6	PP8	90	6	PP14	43
			PP1	76		PP12	42
			PP18	76		PP16	38
			PP21	75		PP22	33
			PP2	74		PP20	32
			PP15	74		PP5	31
	Economic Agents	5	E3	86	5	E5	37
			E13	85		E9	37
			E8	83		E14	34
			E4	80		E11	30
			E1	75		E6	16
	Society	5	S5	65	2	S1	31
			S2	62		S4	29
			S3	56			
			S1	31			
			S4	29			

(Continua)

(Conclusão)

Construct (Level 1)	Construct (Level 1.1)	Quantity Most Cited	Acronyms of Most Cited Indicators used in Correspondence Analysis	%	Quantity Least Cited	Acronyms of Least Cited Indicators	%
Principles and tools of CP		8	P1	80	7	P24	31
		P8	73	73	P17	30	30
		P3	68	68	P18	30	30
		P15	68	68	P27	28	28
		P21	68	68	P23	27	27
		P7	67	67	P29	25	25
		P22	67	67	P28	13	13
		P30	66	66			

4.1 Influences of Government

The Brazilian government, based on the first phase of the PPCS (Ministério do Meio Ambiente, 2011), tried to caution industries on the environmental problem (PP1), primarily with respect to the concern for deforestation, water management, and waste separation to avoid the disposal of industrial residues as if they were domestic garbage (PP21). Furthermore, other often cited governmental influences in the survey were the existence of financial subsidies and the reduction of taxes (PP2), and the control of water resources, quantity of solid residues and gases contributing to greenhouse effect (PP15), targeted to environmental transparency (PP18). However, the government did not establish inspection processes to measure emissions generated by obsolete equipment or offer financial resources for the acquisition of clean technology (PP14). It also did not establish any structure for fines on organizations that repudiated the reduction of carbon emissions (PP12) or continued to extract natural resources (PP5). Moreover, other less cited government influences included the lack of effort to promote educational initiatives, in conjunction with society, on sustainable production and consumption (PP16, PP20, PP22).

4.2 Influences of Economic Agents

In regard to the influences of economic agents, the survey identified the opportunity for economic gains through the reduction of the use of raw materials and energy (E3), as well as the decrease in waste (E13), which are the factors that most influence organizations to adopt the principles and tools of CP. Moreover, the current tendencies of the corporate world, which is most committed to the concepts of sustainability, are the other economic factors that lead to CP. This is evivence of the need to foster a more inclusive global economy focusing on sustainable development (E8), the necessity for investment in clean technologies (E4), and the concept that environmental cost is an investment (E1). However, the results of the study demonstrate the lack of a pro-active stance on the part of organization influencing economic agents that do not set aside sufficient financial resources to implement the principles of CP (E5), not to mention the lack of taxation on production processes that extract scarce natural resources (E6). For example, hygiene products, manufactured by the chemical industry, are almost 80% water.

Furthermore, survey results illustrate that company economic agents are not totally confident that sustainability can improve the competitive advantage of the organization and make businesses more attractive by participating on the stock exchange (E14). For this reason, companies are reticent on the subject (E9) and do not tend to manufacture ecologically friendly products at competitive prices (E11).

4.3 Influences of Society

The first relevant observation is that the influences of society are much less important than those of the government and economic agents. The largest percentage of citations in the society category was 65% as opposed to 90% and 86% registered by government and economic agents. Among the influences attributed to society, the most cited were the need for a corporate channel of communication on a sustainable environment (S5), a change in the values of society that is becoming increasingly conscious of environmental problems (S2), and knowledge on methods to implement sustainable production (S3). The absence of public policies raising society awareness on issues of sustainable production and consumption can be a reason for the lack of perception of the importance of public denunciations of polluting organizations, in an effort to promote sustainable business (S4).

Furthermore, the strict profit oriented focus of businessmen, stockholders and administrators often result in inflated prices for the ecologically correct product, owing to the product's elevated aggregated value of the components and materials with the green certification; in most cases, consumers are not willing to pay the additional value (S1).

As a consequence of the influences exerted by the stakeholders (government, economic agents and society), the participants in the survey embraced certain principles and tools of CP with more intensity (question 2 of the survey). Two of the most implemented principles by companies participating in the survey are the existence of planning and control of production considering environmental aspects (P1) and the adoption of ecologically correct materials and components, developed in cooperation with suppliers (P8). In addition, other principles were also mentioned with frequency. Among the most prominent were the focus on eco-efficiency during the development of the project (P3), control and evaluation of the environmental impact of residues through a material intensity factor (P15), investments in training in environmental education (P21), investments in innovation with the objective to minimize the use of raw materials and energy (P7), adoption of cost indicators in relation to the acquisition of products with green certification (P22) and the implementation of clean technologies in the production process (30).

On the other hand, some of the principles and tools of CP were little used, indicating a low priority for the standardization of environmental policies in companies: ISO 14001, with environmental labeling, and ISO 14020 (P27, P29) and AA1000 for the inclusion of stakeholders (P29), even though there is acceptance of the participation of suppliers and clients in the process of product development or modification. It is important to point out that for ISO 14001 and/or AA1000 certification, it is indispensable to conduct detailed analyses of the production and organizational processes to allocate performance indicators. The low adherence to environmental standardization resulted in the sparse use of the attributes utilized in the evaluation of environmental performance, in that there was no process analysis to create performance indicators (P24) for the prevention of toxins that affect human health (P17, P18), which made it difficult for management and operators to control environmental factors.

Subsequent to the descriptive profile of the primary influences of the stakeholders (government, economic agents and society) and the principles and tools of CP, a multiple correspondence analysis was conducted on each stakeholder, based on the most cited influences and principles and tools of CP, with the objective of relating their influences and typologies to the adoption of principles and tools of CP in Brazilian companies (Questions 3, 4 and 5). Figure 1 maps the relationships between government influences and typology and the principles and tools of CP.

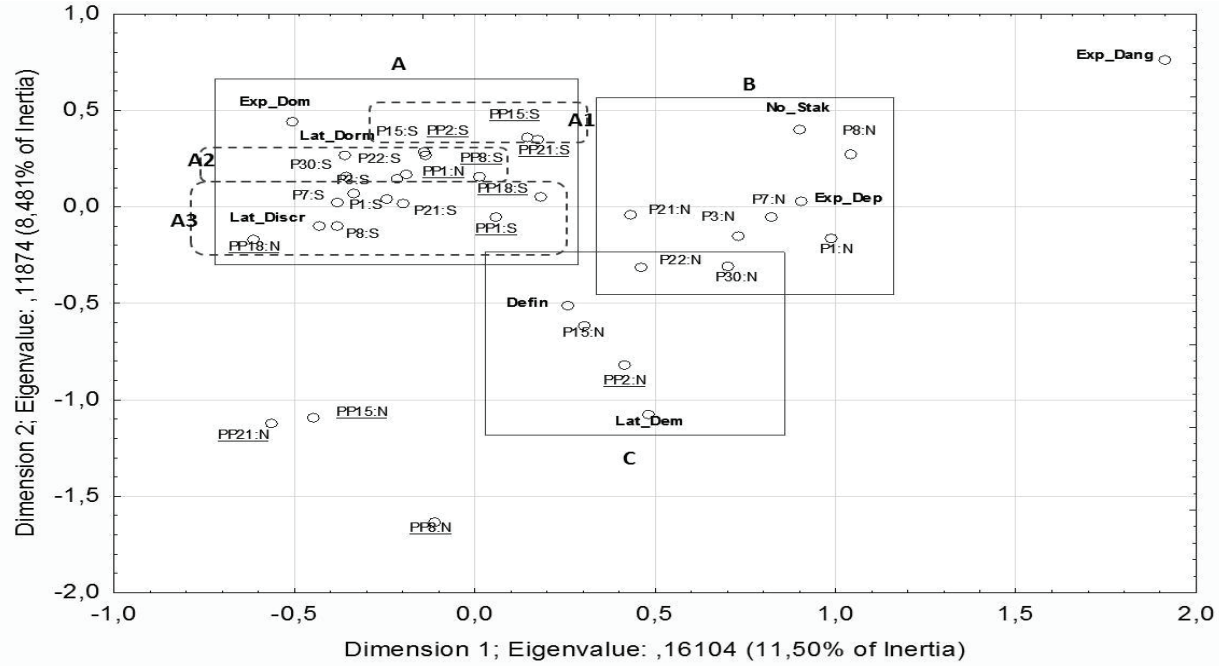

FIGURE 1 – Graph demonstrating the relationships between the influences of public policies, the principles and tools of CP, and the typology of stakeholders.

Group A1 in Figure 1 shows that the public policies related to the reduction of taxes (PP2:S) and increased control (PP15:S) for the decrease of pollution and emissions, as well as initiatives focused on the separation of waste for selective waste collection (PP21:S), lead to the use of a principle that anticipates the control/evaluation of the destination of the residues (PP15:S). The figure also shows that the participants of the survey understand that these influences are legitimate, although imposed (expected to be dominant, according to Mitchell *et al.,* 1997).

Group A2 in Figure 1 reveals that simple communication/dissemination by the government on the importance of sustainable production (PP1:N) was not sufficient to lead to the adoption of the principles of CP. This required increased government control through the substantiation of the company's commitment to sustainability (PP8:N), that boosted the implementation of the principles P3 (product project eco-efficient), P22 (adoption of operational cost indicators related to the acquisition of products with green certification) and P30 (implementation of clean technologies in production). This influence is seen by organizations as being imposed by government, not being considered as legitimate, nor urgent (latent dormant, according to Mitchell *et al.,* 1997).

Group A3 in Figure 1 illustrates an interesting fact about the communication/dissemination of the importance of sustainable production (PP1: S). Even though it was not a factor that led to the adoption the P3, P22 and P30 principles, it is correlated to the adoption of the principles P1 (planning and control of production considering environmental factors), P7 (investment in clean technology innovation), P8 (participation of suppliers in the development of raw materials and ecological components), and P21 (investment in environmental educational programs for employees). This influence is seen as legitimate by companies (latent discretionary, according to Mitchell *et al.*, 1997). Public policy PP18 (transparency in environmental control in public administration) is also inserted into Group A3. This shows that it also has influence over the adoption of CP (PP18: S); however, companies, that do not think that it does not exert influence on the adoption of CP, believe so because the

influence, although legitimate, does not have the power nor urgency to change an organization. Group B in Figure 1 shows the reason why some business organizations do not utilize a series of important principles of CP (in this case P1, P3, P7, P8, P21, P22, and P30). One can observe that in this group there is no public policy. Therefore, there is a minority of companies that believe that public policy does not influence the adoption of CP (no stakeholder, according to Mitchell *et al.,* 1997).

Finally, Group C in Figure 1 demonstrates that companies that do not use the principles (P15, P22 and P30) are those that do not believe in environmentally based tributary reform that would provide subsidies and tax reduction for ecologically-minded organizations. This factor is seen by the participants of the survey as being urgent (latent demanding according to Mitchell *et al.,* 1997) on the path towards sustainability.

Figure 2 maps the associations between economic influences, typology of stakeholders and principles and tools of CP of the responses to question 4.

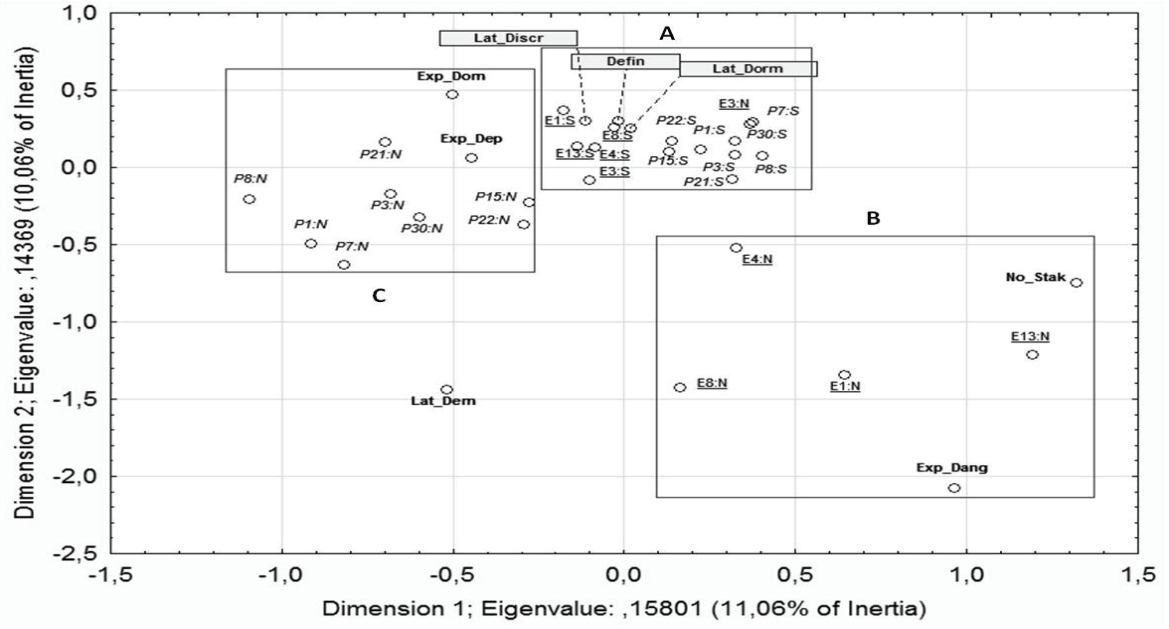

FIGURE 2 – Graph demonstrating the relationships between economic influences, the principles and tools of CP, and the typology of stakeholders

An analysis of Group A indicates that a large part of the participants in the survey consider that a majority of the principles of CP (in this case P1, P3, P7, P8, P15, P21, P22, and P30) were implemented as a result of the influences from the economic agents. Specifically, two of these influences (E8 – more inclusive global economy focused on sustainable development, and E3 – understanding that eco-efficiency can lead to economic benefits) are considered by a large segment of the companies as having power over them, while at the same time considering the principles as legitimate and urgent (definitive stakeholder according to Mitchell *et al.,* 1997).

Although other agents also influenced the adoption of CP and are considered legitimate, they did not have the power of influence, nor were urgent (latent discretionary according to Mitchell *et al.,* 1997). This is the case of considering environmental cost as an investment (E1), the necessity for investments in clean technology (E4) and the understanding that sustainability

leads to the reduction of waste (E13). Finally, an interesting observation should be made: the influence of E3 (the understanding that eco-efficiency can result in economic benefits) appears as "N" in this group, indicating that the few companies that believe that this factor does not have influence on the adoption of CP do so because they feel that E3 is not legitimate, nor urgent, despite the fact that they recognize that this factor has the potential to impose its will on the organization (latent dormant according to Mitchell *et al.,* 1997).

An analysis of Group B in Figure 2 shows that a few companies believe that economic factors do not exercise influence on the adoption of CP in their company (no stakeholder according to Mitchell *et al.,* 1997) nor believe that this influence is totally coercive with an appeal to power and urgency (expectant dangerous according to Mitchell *et al.,* 1997). This observation is held by a minority of companies, in so much as the factors that comprise Group B (E1, E4, E8, and E13) are exactly those factors considered by the majority of respondents as influential for the adoption of CP in organizations (Table 1).

Group C in Figure 2 shows a concentration of companies that do not use a series of principles and tools of CP without having an associated economic factor.

Figure 3 maps the associations between influences of society, typology of stakeholders, principles and tools of CP of the responses to question 3.

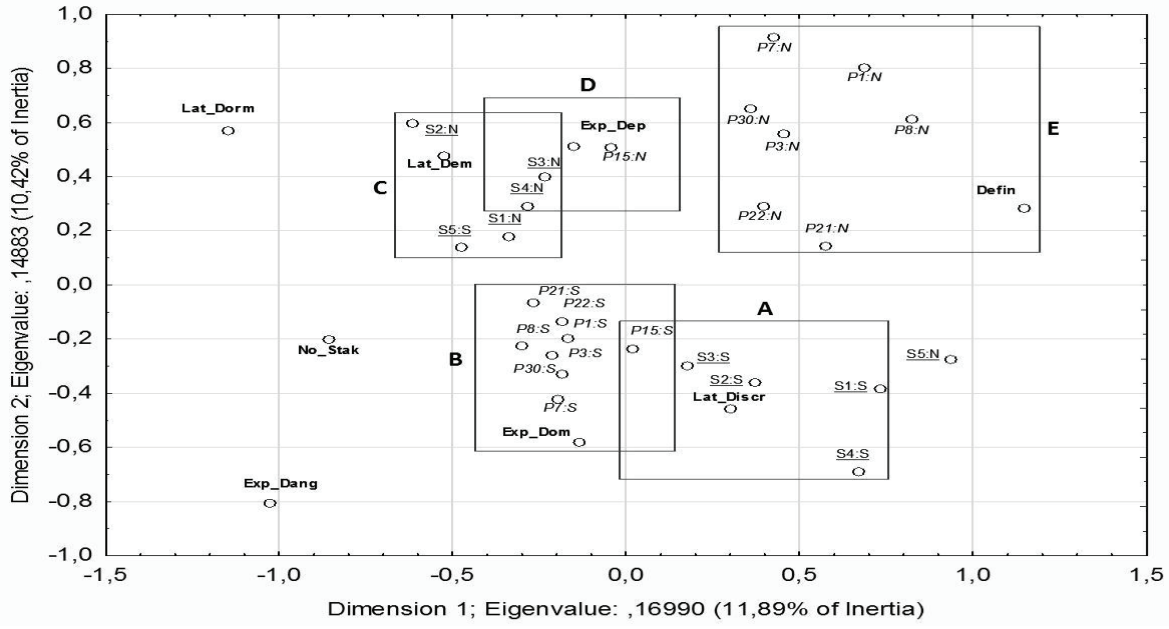

FIGURE 3 – Graph demonstrating the relationships between society influences, the principles and tools of CP, and the typology of stakeholders

Groups A and B in Figure 3 show that eight principles of CP (P1 – planning and control of production with environmental education; P3 – eco-efficiency in product project; P7 – investment in innovative clean technology; P8 – participation of suppliers in the development of raw materials and ecologically correct components; P15 – control and evaluation of the environmental impact of generated waste; P21 – investment in training; P22 – implementation of indicators; and P30 – implementation of clean technology) have been adopted by business organizations in function of factors relative to society (S1, S2, S3, and S4), which are considered legitimate. In spite of their adoption, these factors are not seen as urgent, nor highly influential on the company

(latent discretionary according to Mitchell *et al.,* 1997).

Groups C, D and E in Figure 3 show that a number of companies believe that influence S5 (importance of an independent service to prevent misleading advertising and to stimulate condemnation of illegal practices to the environment) impacts the adoption of CP in that, according to these respondents, this influence is urgent, although not considered legitimate and not considered as having the power to change organizations (latent demanding according to Mitchell *et al.,* 1997).

5 DISCUSSION

The results of the previous section demonstrate the influences of varying importance for the adoption of CP in the sectors surveyed. The Brazilian government, supported by the PPCS (Ministério do Meio Ambiente, 2011), has tried to induce companies to adopt the principles of CP and has tried to create regulations governing the generation and destination of solid residue. On the other hand, they have not increased inspections to evaluate the effectiveness of their actions.

Economic agents have targeted the reduction of waste during the production process with the limited focus of generating additional financial gains. But, on the other hand, they understand that their actions lack a pro-active stance toward the environment, as they do not believe that a pro-environmental reputation can enhance a competitive advantage and make the company financially more attractive.

Societal influences are less relevant in terms of the adoption of CP. This observation indicates that Brazilian society has little knowledge of sustainable production and consumption, different from the situation in Asia and the Pacific, where governments have encouraged the civil society to promote CP (Chiu, 2011). In this context, Brazilian society has participated little in discussions on the relocation of companies closer to the communities. According to O'Rourke (2003), in France, society interacts in conjunction with other stakeholders to approve operating licenses for companies.

In reference to implemented principles, notably there are some important principles that are little used by surveyed companies. This probably occurs as a result of the lack of environmental policies in these organizations, but can be stimulated with the adoption of ISO 14001 and AA1000 certification, which uses environmental performance indicators in factory processes. To ensure that environmental policies are more widely adopted, greater participation by the government is of fundamental importance to developing public policies with established performance goals that can be enforced by the power of legislation. Organizations, in turn, will have to publish their environmental policies in their mission, vision and values statements, as an essential means to inform the general public. In Holland, for example, Bremmers *et al.* (2007) write that the government exerts pressure on all companies for the implementation of a system of environmental management in the entire supply chain.

In reference to the relationship between influences, types of stakeholders and the principles of CP, a series of influences exerted by the government is imposed, but accepted as legitimate by business (PP2, PP15, PP21). An interesting fact resulting from the present survey is in reference to the communication/dissemination of the importance of the sustainable product. It is important and considered legitimate for the adoption of a number of principles of CP P1, P7, P8 and P21); however, it is not sufficient because of the lack of additional command and control actions.

Government control of information that measures a company's concern for sustainability is also fundamental for the adoption of CP. However, the present study demonstrates that environmental regulating measures adopted by the Brazilian government are successful only when applied in conjunction with sincere

environmental education activities. This survey discovery, related to the adoption of command measures in conjunction with government communication on sustainability, corroborates the findings of Geng *et al.,* (2010) that concluded, in China, the government participated with companies by subsidizing financial resources and promoting the dissemination of information on environmental education.

On the subject of public policies, there are a number of companies that have not adopted CP practices, not recognizing any significant public policy influence on the adoption of this paradigm. This can happen when a company believes that public policies do not have the power to change organizations or for the lack of legitimacy or urgency of a certain policy (the three attributes suggested by Mitchell *et al.,* 1997). This discovery corroborates the studies developed in some European Union countries. The Romanian government established CP legislation with the objective to institutionalize its application in business organizations, and from that beginning, involved CP research centers, environmental educational institutions, and the media in the dissemination of basic concepts to society (Gravrilescu, 2004). The Spanish government is also a definitive stakeholder, as they increased their environmental policies to balance power, legitimacy and urgency (Gago & Antólin, 2004).

The majority of principles of CP analyzed in this study (P1, P3, P7, P8, P15, P21, P22, and P30) were also adopted through the influences of economic agents. Two of these influences (E8 and E3) were considered by a large part of the companies as having power over them, and at the same time are considered legitimate and urgent. Other principles associated with economic agents, although influential in the adoption of CP, were considered only legitimate (E1, E4, and E13).

Survey results indicated that organizations treated environmental cost as an investment, including the implementation of clean technologies, mainly because eco-efficiency can generate satisfactory economic benefits through the minimization of the use of materials and energy and the prevention of waste, resulting in a return on investment. This finding corroborates the work of Zeng *et al.* (2010), which affirms the necessity for cost controls for the evaluation of financial performance.

Nonetheless, in respect to the influences of economic agents, the primary reason why some respondents did not mention economic influences for the adoption of CP can be attributed to the lack of legitimacy and urgency, even though they admit that economic factors have the power to change companies implementing CP. This result demonstrates that some organizations still do not see the relationship between economic gains and the adoption of CP. A study performed in Guatemala and Zimbabwe determined that economic agents were not willing to invest in the implementation of CP, but eventually relented to facilitate their access to international markets (Ciccozzi *et al.,* 2003). This international pressure inexorably reached these companies.

The influence of society can be observed in four principles (S1, S2, S3, and S4) that are considered legitimate, but not urgent nor with influence on the company. Another factor (S5) is considered urgent, but without power to change organizations. One can tell, however, that companies do not believe in the influence of society in the adoption of CP because they feel that society does not have enough power to change organizations during the CP implementation process.

Survey results indicate that Brazilian society does not have the power to influence companies in the adoption of CP, by noting the lack of a standard for sustainable consumption. This finding shows an important difference in environmental conscience between Brazilian society and societies in other developed countries. For example, the Taylor study (2006) reveals that Canadian society demonstrates a high level of commitment to sustainable consumption and, for this reason, exercises a strong influence on the adoption of CP. Likewise in Australia, where organizations are heavily influenced by the power of society, managers are highly cognizant of the

necessity for environmental measures (Guerina, 2006).

6 CONCLUSIONS

The objective of this study is to demonstrate the environmental influences exerted by government, economic agents and society on business organizations to adopt the principles and tools of CP and the attributes (power, legitimacy and urgency) used by these stakeholders to compel companies to implement specific principles and tools. In order to accomplish this goal, a survey was performed, enlisting 102 Brazilian companies. For the identification of the attributes (power, legitimacy and urgency), the Mitchell Model (Mitchell *et al.*, 1997) was applied, nominating stakeholder salience as the means with which to classify stakeholder influence. The preliminary results of the study represent an important theoretical contribution to the field in that, at present, there is very little literature on the subject of the relationship between stakeholders and Cleaner Production. To the best of our knowledge, this is the first study in Brazil to address the subject.

The present study enumerates a series of CP principles that are being implemented by companies that participated in the survey, highlighting the existence of planning and control in production while taking into account environmental aspects and the adoption of environmentally correct materials and components developed in conjunction with suppliers. On the other hand, some of the stated principles of CP are little used by organizations, like the adoption of environmental standards for environmental labeling and the inclusion of stakeholders in the decision making process, crippling the implementation of performance controls. This demonstrates that, in Brazil, CP still lacks a high level of implementation of the principles of environmental labeling and the inclusion of stakeholders in decisions to implement environmental practices.

The results of the present study illustrate that a large part of the companies see government, economic agents and society as major influences on the adoption of CP. In the case of the government, the adoption of environmental regulating measures (power) in conjunction with sincere actions in environmental education (influence) are the reasons that lead the vast majority of the respondents of the survey to adopt a number of the principles of CP. On the other hand, the lack of legitimacy, urgency or power are factors that lead a few of the companies to believe that the government does not exert influence over the adoption of CP.

Economic agents also play a fundamental role in the adoption of CP for the majority of survey participants. A large part of the companies believe that economic agents are the definitive stakeholders by possessing the power, legitimacy and urgency to influence the adoption of CP. This is undoubtedly due to the inclusion of sustainable development in business decisions that are focused on the opportunity for economic gains related to the adoption of CP. Alternatively, the main reason that a few proponents did not mention economic influences and the adoption of CP is the lack of legitimacy and urgency, although those companies recognize that economic factors have the power to bring change to organizations implementing CP.

Finally, study results show that society influences are less relevant to the adoption of CP in the opinion of the survey participants. This information indicates that Brazilian society has little knowledge on the subject of sustainable production and consumption, different from that which occurs in other countries around the globe. This said, it is vital that Brazilian society learn more about sustainable production, because a society with no environmental conscience is a society with little means to demand the implementation of CP. Furthermore, the study also demonstrated that companies do not believe in the influence of society in the adoption of CP, which leads them to feel that society does not possess sufficient power to effect changes in organizations implementing CP, a reality totally

distant from that found in developed countries. All these results and the subsequent discussion equating attributes to stakeholders, represents a practical contribution of this study.

A weakness of this study is its limited generalizability because of its exploratory nature. For future studies, the formulation of strategies is suggested, based on organizational influences and types of stakeholders that influence the conception of sustainable practices.

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