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Environmental disclosure and environmentally-oriented management: an exploratory analysis of consistency.

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Introduction

During the last four decades there has been a growing public awareness of impacts on society by business activities and sustainable development has become the focus of increasing attention and concern. A wide range of stakeholders is increasingly demanding improved corporate social responsibility from companies all over the world. Companies are being pressed to become accountable not only for their economic performance but also for the social and ecological ones. An increasing demand for transparency is enhancing the role of voluntary disclosure in stakeholders relationships management. In such a context, the business world is trying to incorporate social and ecological issues developing new managerial orientations to deal with them. The need for information about the interaction between the firm and the environment is causing the companies to orient accounting paradigms towards integrated frameworks. At the same time, corporate strategy and operations are increasingly being influenced by companies' commitment toward sustainability.

Although the mentioned trends assume different connotations and maturity degrees across different regions, industries and organizations, their significance seems undisputed. Corporate sustainability related themes have gained primary relevance on academics agenda and a growing body of literature is being produced about a number of different subjects. Despite the widely acknowledged relevance recognized to this area of study, it is common opinion that many aspects still suffer from a lack of theoretical explanations and deserve further research. One specific subject which seems to have attracted little attention in literature so far is the one concerning the relationship between environmental reporting activity and environmental management. Although much of the earlier research appears to make an implicit assumption that a link between the two dimensions exists, systemic evidences about this aspect are still lacking, for the Italian context in particular. Answering the call for further research the current work focuses on the interplay between environmental reporting and some aspects of environmental management. A deeper understanding of this subject seems essential since current trends suggest environmental issues are likely to play an increasingly pervasive role in all the areas of management in the near future. Environmental performance currently contributes to a greater extent than before to corporate success and its importance is likely to grow. The implications arising from these discontinuities may be taken into account by managers since they are likely to increasingly alter the status quo outside and inside the firm. Additional appealing reasons to address this subject lie in the interdisciplinary approach necessary to deal with this area of study, the innovative nature of the themes discussed and the relevance sustainability related issues are likely to have in the near future for any managerial profession.

For this purpose, the main objective of this exploratory research is to determine if consistency exists between some aspects of environmental management and environmental disclosure at organizational level for a sample of Italian companies. Addressing this research question the current study contributes to previous literature in three ways. First, an overview of environmental reporting activity through different channels is provided. Second, an overview of different environmental management aspects is provided. Finally, the relationship between environmental management and environmental disclosure is examined. The dissertation is structured in three chapters.

Chapter I provides an overview of the most relevant academic contributions about the concepts addressed in the empirical part of the work. The historical evolution of sustainability development concept is outlined and the three dimensions of sustainability are identified. The linkage between sustainability and accounting is addressed through a review of concepts related to sustainability accounting. Sustainability accounting different interpretations and academic orientations are presented. The main findings about sustainability accounting diffusion and influence factors are reviewed. Then a wide section is dedicated to corporate sustainability reporting characteristics and channels. Out of the possible explanations behind sustainability disclosure legitimacy theory is especially taken into account. Finally three main aspects of environmental management are described: environmental strategy, environmental oriented operations and environmental management accounting.

Chapter II provides a description of the research rationale and methodological aspects. The research framework is outlined and the research hypothesis that a positive correlation exists between attention to environmental management and extent of environmental disclosure is formulated. An accurate description of the sampling process is provided and the final sample of 65 companies is identified. Then the two methods employed to collect the data are described: a questionnaire survey was used to measure the attention devoted to environmental management while content analysis was used to measure environmental disclosure extent. The constructs used in the survey to represent the environmental management aspects and the disclosure index employed to carry out the content analysis are detailed in particular.

Chapter III presents the outcomes of the research and provides an interpretation of the results observed. The data collected through the content analysis are elaborated to provide insights about environmental reporting channels adoption, disclosing extent and disclosing contents. Correspondingly the data collected through the survey are elaborated to provide insights about the relevance ascribed to the different environmental management dimensions. Then the two set of data are translated into variables to be matched through a correlation model. The results of correlation analysis are presented and substantial support to the research hypothesis is provided. Finally interpretations are suggested for the results obtained with reference to environmental reporting activity, environmental management relevance and their interplay. The dissertation is

concluded addressing the potential limitations of the work and suggesting avenues for future research.

Chapter I: Sustainability reporting and management

1. The concept of sustainable development

1.1 Sustainability historical development

Although the modern concept of "*sustainable development*" gained importance in national, international and corporate policies starting from the 1980s it seems to have deeper historical roots. The origin of the concept dates back to the European Enlightenment and derives from the German professional terminology of forestry (Grober, 2007). During the 18th century the woodlands began to be planned according to the "*sustained yield*" doctrine[1] in order to be passed on undiminished to following generations. The doctrine was inspired by John Evelyn's and Jean Baptist Colbert's theories[2] and was the major guideline of international forests management at the time. An even more ancient and vague awareness of the concept can be supposed if we consider that throughout most of its history the mankind has been facing hazards concerning natural resources degradation and adulteration (Mebratu, 1998).

Returning to the present day, the term "*sustainable*" has achieved great notoriety since 1987 when "*Our Common Future"*, the Report prepared by the Brundtland Commission, was published. The Brundtland Commission was established in 1983 by the UN General Assembly and it was responsible for proposing long term strategies in order to respond to the growing concerns about the accelerating environmental depletion. Since the UN Conference on the Human Environment held in Stockholm in 1972 it had become gradually apparent to the international institutions that environment and economic development could not remain in a state of conflict. The Report attaches great importance to the concept of sustainable development and states one of its most known and cited definitions: "*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs*[3]". According to the definition a sustainable practice should leave the future generations with the same opportunities that we inherited from our parents. The main ideas behind the Brundtland Report concept of sustainability are:

- "*the concept of "needs," in particular the essential needs of the world's poor, to which overriding priority should be given*
- *the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs*[4]".

[1] See *Sylvicultura oeconomica* by Hans Carl von Carlowitz (1713).
[2] See *Sylva* by John Evelyn (1664) and *Ordonnance* by Jean Baptiste Colbert's (1669).
[3] World Commission on Environment and Development (1987) *Our Common Future*, Chapter 2: Towards Sustainable Development, WCED Report, p. 1.
[4] *Ibidem*

According to Gray (1992) sustainability essentially relates to the environment's ability to renew itself or in other words to the "*carrying capacity*" of the environment. The companies should contribute in keeping this environmental carrying capacity by managing three types of capital which may be non-substitutable once consumed: the natural, the economic, and the social one (Dyllick and Hockerts, 2002). As it will be better explained in the following subsection, it is generally accepted that the concept of sustainable development can be broken down into three constituent parts: environmental sustainability, economic sustainability and social sustainability. The mentioned taxonomy is confirmed by the "*2005 World Summit Outcome Document"* adopted by the UN General Assembly in 2005 according to which: "*development is a central goal by itself and that sustainable development in its economic, social and environmental aspects constitutes a key element of the overarching framework of United Nations activities*[5]".

Since the present study focuses on the environmental dimension of sustainability at corporate level it seems useful to provide a specific definition for this particular field of sustainable development. Hockerts (1999, p. 31) defines corporate sustainability as "*any state of a business in which it meets the needs of its stakeholders without compromising its ability also to meet their needs in the future. An organization has to ensure that its operations are sustainable in regard to its economic, social and environmental performance*". The corporate sustainability concept is consistent with the broader sustainability concept but it mainly concerns the business operations and the firm's interactions with its stakeholders (Van Marrewjk, 2003).

The literature is still divided about corporate sustainability meaning and underlying assumptions but two main and opposed views are identifiable: the business approach and the critical one. The authors backing the business approach[6] believe that firms should adopt sustainable strategies and practices in order to get tangible and monetary benefits like image improvement, cost savings, risk reduction, competitive advantage and synergies creation (Carroll and Shabana, 2010). On the other side the critical approach affirms the incompatibility between sustainability and capitalism considering eco-efficiency and eco-justice the main conditions for sustainable development (Bebbington, 2001). The eco-efficiency is truly reached when no environmental impact is produced not only on the present generation but even between the present generation and the future ones. Similarly the eco-justice is truly reached when the distribution of resources is equal not only for the present generation but also between the present and the future ones. The more radical thinkers of the critical approach come to affirm that no sustainability at all can be reached unless the social contract between business and society is completely redefined (Gladwin et al., 1995).

[5] UN General Assembly (2005) *2005 World Summit Outcome Document*, p. 2.
[6] For an extensive review of the subject see *The Business Case for Corporate Social Responsibility: A Review of Concepts, Research and Practice* by Carroll and Shabana (2012).

1.2 The three dimensions of sustainability

Although different perspectives about sustainable development are currently in use, the most accepted is the "*integrated perspective*" which include the economic, social and environmental aspects. The integrated perspective may evolve into the inter-generational perspective considering the long term effects on the future generations and again into the holistic perspective considering inter-dimensional and inter-generational equilibriums (Lozano, 2008) but the three original constituent dimensions remain.

The integrated perspective marks a turning point with respect to the traditional economic theories according to which the economic sustainability is the only one determining the overall sustainability of the firm. The current opinion, shared not only by the radical authors but also by most of the business communities, is that an exclusive focus on the economic dimension can benefit the firm in the short term but all three dimensions have to be considered in order to keep the firm alive in the long term (Elkington, 1998).

The integrated nature of sustainability has been described by several graphical representations which imply slightly different underlying assumptions. The most known representations[7] are the "*Venn diagram*" and the "*concentric circles*" (Lozano, 2008). In the Venn diagram the three dimensions, represented by circles, are independent systems which can approach forming areas of overlap. The central area where the three circles overlap represents the full sustainability while the areas where only two circles overlap represent partial sustainability situations. The areas where there is no overlap at all represent the un-sustainable situations. This representation implies that sustainability is reached only when the three dimensions coexist.

In the concentric circles representation the three dimensions are symbolized by three concentric circles: the outer circle representing the natural environment, the middle one representing the society and the inner one representing the economic dimension. According to this representation the society is part of natural environment and the economy is part of society.

The two models presented suffer from some flaws and oversimplifications even if they maintain their expressive power. Both models present the three dimensions as discrete systems which have no interconnections and present the sustainability as a static moment rather than as a dynamic process over time. Those limits where addressed by different authors who proposed more complex models (Lozano 2008), stressed the importance of the relationships between the

[7] Mebratu refers to Venn diagram as to "*dominant model*" and to non-concentric circles as to the "*cosmic interdependence model*", see *Sustainability and sustainable development: historical and conceptual review* by Mebratu (1998) pp. 513-514.

three dimensions (Dyllick and Hockerts, 2002) or introduced concepts from neoclassical economics (Stavins, Wagner A. and Wagner G., 2002).

Looking closer at the three dimensions of sustainability in a corporate perspective we could wonder if and when a firm complies with them. Dyllick and Hockerts (2002) suggest the conditions under which a business can be considered sustainable with respect to the three dimensions. A firm is economically sustainable when it produces a durable and above the market average return to its shareholders maintaining at the same time adequate liquidity. The ecological sustainability is reached by the firm when it consumes natural resources at a rate not exceeding their rate of reproduction or substitution. In addition the firm should not produce pollution at a rate exceeding the natural capacity of the environment to assimilate it and should not damage the services provided by the natural environment. From a social point of view a firm is sustainable when it provides added value to the society where its activity takes place improving human and public capital, in addition the firm should involve its stakeholders in its value system.

2. Sustainability accounting

2.1 The meaning of sustainability accounting

Despite the first academic research linking accounting to the concept of sustainability dates back to the early 1990s and since then the accounting academic debate has attracted growing attention and contributions (Lamberton, 2005), the subject still suffers from a lack of clearness. Sustainability accounting is a term about which a shared definition has not been provided yet by the literature. According to Gray and Milne (2002, p. 4) an effective sustainability accounting system should be centered on "*broader ecosystem-based approaches that require an understanding of cumulative environmental change and, most likely, new and alternative decision-making arrangements and institutions […] cumulative effects assessments of economic activity […] ecological footprint analyses […] precautionary decision-making principles […] democratic and participatory decision forums*".

Drawing from the traditional financial accounting model, Lamberton (2005) defined sustainability accounting as a framework made up of five interrelating components: objectives, applicative principles, techniques, reports and qualitative attributes of information reported. Sustainability accounting primary objective is "*to measure organizational performance toward the objective of sustainability*" (Lamberton, 2005, p. 18). This objective requires the company to define both sustainability concept, possibly according to a three dimensional model and the principles ruling the information collection and reporting activities. Defining principles means to determine the boundaries of the accounting system, the accounting period and measurement

approaches. The principles are applied both to sustainability accounting techniques and to reporting. The techniques are data capture tools, accounting records and measurement methods used to collect sustainability accounting data. Environmental performance indicators and life cycle analyses are specific examples of measurement techniques. The information captured by the techniques is presented to stakeholders both in qualitative and quantitative form through reporting activity. Reporting key features to be determined are the format and frequency of the reports. Sustainability accounting information has to comply with certain qualitative attributes during both collection and reporting phases. The attributes are "*drawn predominantly from financial accounting*", "*are designed to inform users as to how reports have been prepared by the reporting organization*" (Lamberton, 2005, p. 22) and the three most important ones are transparency, inclusiveness and auditability.

More recently, Schaltegger and Burritt (2010, p. 377) shed some light on the issue defining sustainability accounting as "*the term used to describe new information management and accounting methods to attempt to create and provide high quality, relevant information to support corporations in relation to their sustainable development*". According to the authors sustainability accounting should "*record, analyze and report*" the financial impacts produced by the environmental and social aspects referring to a "*defined economic system*" and stressing the linkages between the environmental, social and economic dimensions of sustainability.

The above mentioned definitions associate to sustainability accounting both a disclosing role in order to meet an external demand and an internal supporting role for decision making. The external informative function approaches sustainability accounting to conventional financial accounting but it is important noting that both the nature of the information provided and the kind of objectives pursued are sharply different. Similarly the decision making support function approaches sustainability accounting to management accounting (Cinquini, 2008; Giannetti, 2009) but the differences about information nature and objectives remain. Given these two different roles sustainability accounting can be broken down into two dimensions: sustainability reporting and sustainability accounting related techniques oriented to internal decision making. Sustainability reporting can be considered the activity encompassing "*new formalized means of communication which provide information about corporate sustainability*" (Schaltegger, Bennett and Burritt, 2006, p. 15) while sustainability accounting related techniques can be defined as "*data management tools used to capture and record sustainability accounting data*" (Lamberton, 2005, p. 18). Sustainability reporting is further described in Section 3 while sustainability accounting related techniques will be described in Section 4 with particular reference to environmental dimension.

Since the different concepts reviewed may result confusing, an explanatory scheme is provided below (see table 1).

	Objective	Focus	Nature of information
Sustainability accounting	Provide information both for external disclosure and for managerial purposes	External and internal	Sustainability related
Sustainability reporting	Provide information to meet an external demand	External	
Sustainability accounting related techniques	Capture and record data to support decision making	Internal	
Financial accounting	Provide reliable information for external disclosure	External	Financial
Management accounting	Provide relevant information for managerial purposes	Internal	

Table 1

Sustainability accounting can be interpreted in different ways by managers and consequently applied with different levels of depth and for different reasons (Schaltegger and Burritt, 2010). The poorest interpretation of sustainability accounting considers sustainability as a catchword to utilize in order to display a nice image of the company even if no real sustainability oriented activities are undertaken. The company pretends to show concern about sustainability issues and communicates a sustainability-friendly image in order to meet stakeholders' requirements but no real contribution to sustainability is provided. This attitude is usually called "*green-washing*".

Second, sustainability accounting can be considered a generic term covering a wide range of issues and methods related more or less to the concept of sustainable development. This interpretation denotes a poor understanding of the subject and a blurred view of sustainability three dimensions. Usually managers approaching to sustainability in this way adopt some sustainable-oriented behavior pressed by competition or because of a voluntary decision. In this case sustainability accounting practices remain partial and linked to some isolated reasons.

In some cases managers could look at sustainability accounting as to a measurement tool able to quantify with just a single monetary figure the overall sustainability performance of the firm. A key figure could be useful in order to perform assessments and rankings but its calculation does not seem feasible. Given the sustainability concept complexity and considering the interdependencies among its dimensions the mentioned approach should necessarily result simplistic. Since the one-figure approach does not seem useful in an internal decision making perspective it could be adopted because of legislative obligations or stakeholders' requirements.

According to the finest interpretation, sustainability accounting should be a well-organized set of tools driven by firm's objectives and addressing the environmental, social and economic dimensions of sustainability with particular attention to interdependencies. The distinctive point of this approach is that sustainability accounting methods should address only the issues which are relevant for the firm and should clearly show connections with overall company's strategy and success. In this case the information provided by the accounting system is truly useful in a decision making perspective and it is instrumental to meaningful reporting. Usually the managers who adopt such sophisticated approach are truly committed to sustainability issues and are motivated by ethical implications. In addition to noble reasons the mentioned approach could be undertaken in order to fully exploit the economic potential behind sustainable behaviors.

The following table associates the different interpretations of sustainability accounting to the use and the reason for adoption they are usually related to (see table 2).

Sustainability accounting interpretations, uses and reasons for adoption

Interpretation of sustainability accounting	Use of sustainability accounting	Reason for adoption
Catchword	Window dressing or green washing	Stakeholders' pressure
Generic term	Implementation of isolated practices	Industry pressure or personal initiative
One-figure measurement approach	Measurement of corporate sustainability performance through one figure	Legislative and stakeholders' pressure
Set of pragmatic information management tools and information	Useful decision making and meaningful reporting support	Ethical reasons or business case for sustainability

Table 2
Source: adaptation from *Sustainability accounting for companies: Catchphrase or decision support for business leaders?* by Schaltegger S. and Burritt R. (2010).

Before concluding this overview of sustainability accounting, it is worth noting that, up to the present time, the environmental dimension of corporate sustainability was the one to attract more researchers' attention and thus sustainability predominantly evolved towards environment management related issues. From an accounting perspective, the subset of sustainability accounting techniques related to environmental issues is called Environmental Management Accounting (EMA) (Burritt, Hahn and Schaltegger, 2002). Adequate room for the description of EMA is dedicated in Section 4.

2.2 Critical and managerial paths to sustainability accounting

Academic literature distinguished two main paths (Burritt and Schaltegger, 2010) concerning sustainability accounting development: the "*critical path*" and the "*management oriented path*". According to critical authors the concept of sustainability was not understood properly by firms and consequently its applications have to be partial or incorrect (Aras and Crowther, 2009). It is also questioned that sustainability may have any application at corporate level since the concept of sustainability has a global nature (Gray and Milne, 2002). The main convincement underlying critical perspective is that since accounting and reporting serve the established forms of capitalism and capitalism by nature pursues exclusively profit, regardless of environmental and social impacts, little room remains for a real sustainability accounting development (Gray, 2006) and the concept itself barely makes sense (Gray and Milne, 2002). The approach is rooted in the criticism concerning traditional economic theories which consider the social desirability of economic growth taken for granted and which deal with environmental aspect as with mere externalities (Gray, 1992). The critical researchers believe that managers embrace sustainability accounting only in a shallow way as a trendy term which could prove useful in order to communicate to stakeholders a positive corporate image. Any improvement or increase in adoption rate of sustainability accounting methods must be interpreted as a profit driven activity: if a manager accounts and reports about sustainability issues it means he recognizes the opportunity of a financial return by doing so.

Although the critical path enlightens correctly some flaws about conventional theories it lacks constructiveness. To question trivial approaches to sustainability can be useful in order to raise awareness on the issue but it is necessary to find some development directions rather than abandon the research field (Burritt and Schaltegger, 2010). In this regard, the managerial path authors accept the call declined by critics in order to help managers and practitioners to face sustainability challenges. Although conscious of the problems raised by the critics, the managerial approach thinkers try to discover how do companies get benefits from engaging in sustainability maintaining an active stance towards the issues raising from this research field. In addition the analysis is shifted towards information gathering in a decision making oriented approach in order to provide a more solid foundation to sustainability accounting and unanswerable questions are set aside.

According to Schaltegger and Burritt (2010) the managerial path can be articulated into three different approaches: the inside-out, the outside-in and the twin track. The inside-out approach provides relevant information about sustainability in order to implement the firm's strategy. Sustainability accounting is a set of tools constructed on the existing conventional accounting system as a first step towards its full acceptance by managers. The approach has the aim to translate sustainability related aspects of the business strategy into measurement techniques

articulating them consistently with internal managerial informational needs. The information provided by sustainability accounting should be related to firm's objectives in such a way as to allow, on one side social and environmental problems to be addressed while on the other to improve firm's competitive position.

The outside-in approach is driven by reporting activities according to the expectations expressed by shareholders and stakeholders. According to this approach the firm is part of a broader community which can influence its performance and survival. The performance measures and indicators will be defined starting from external expectations and the accounting system will be shaped consistently. While the final aim of inside-out approach is to provide support for internal decision making, the objective of outside-in approach is to produce external oriented information. Through reporting the company seeks key stakeholders' involvement in order to pursue different objectives. Sustainability reporting can be useful to legitimate corporate activities with respect to environmental and social impacts providing the company with freedom to operate in a given context. In addition to legitimization effect, a number of different benefits can be obtained like increased corporate reputation and brand value, enhanced competitive advantage, superior performance demonstration, increased internal transparency, accountability, motivation and control (Schaltegger et al., 2006). Considered the different orientation of this perspective, it can be noticed that it may be more susceptible to adverse selection issue. Since stakeholders are unable to judge information contents and management can benefit from not disclosing certain information it is likely that discretion will be exercised by choosing the degree of the information quality, above which information is disclosed and below which information is withheld (Verrecchia, 1983), alteration of social perceptions may be pursued (Frost and Seamer, 2002) and actual accountability delivered may be scarce (Gray, 2006). An additional problem is that stakeholders may have their self-interested interpretations of sustainability issues and may push managers to focus only on certain dimensions of sustainability.

The twin-track approach combines the two previously presented approaches and it may be considered the most advanced one. According to this approach sustainability accounting should both provide information about environmental, social and economic impacts to stakeholders and support managerial decision-making processes in an integrated way. Internal and external perspectives are brought together and the relationships between internal sustainability management and external sustainability disclosure assume primary importance. The current study aims to explore further this area of research providing a contribution to the understanding of the relationships between internal and external perspectives, according to a twin track approach.

2.3 Adoption of sustainability accounting

Academic literature recently investigated sustainability accounting diffusion and relevance at organizational level. These exploratory studies usually adopted a survey based research framework and focused on sustainability accounting tools related to environmental sustainability. While most of them measured EMA importance representing it as a set of tools (Wilmshurst and Frost, 2001; Ferreira, Moulang and Hendro, 2010; Christ and Burritt, 2013) some of them focused on specific sustainability accounting tools (Henri and Journeault, 2008). In the present subsection an overview of the most relevant studies is provided.

A research performed by Wilmshurst and Frost (2001) investigated the actual role accountants and accounting are playing in environmental management systems at corporate level. Data were collected through a survey addressed both to CFOs and CEOs of the top 500 companies listed on the Australian Stock Exchange. CFOs were asked what kind of environmental information is usually provided within the existing management accounting systems and what environmental accounting practices have been developed. CFOs' attitude toward environmental issues was also assessed through a number of questions and accounting staff involvement in specific environmental activities was measured as well. CEOs were asked about their opinion on a number of issues related to environmental accounting. The main finding of the research is that both CFOs and CEOs are inclined to have a "*neutral attitude toward the accountant's role in the environmental management process and toward environmental accounting issues, suggesting limited involvement of accounting and the accountant in the EMS.*" (Wilmshurst and Frost, 2001, p. 141). Other interesting findings are that through management accounting systems companies focus on reducing and controlling high risk environmental activities and that the adoption of specific environmental accounting practices is mainly driven by regulatory requirements and cost savings. According to the mentioned study even if there is a general awareness about the importance of environment related issues, most of the companies cannot recognize accountants and accounting potential role within environmental management. Although for the time being accountants in general seem to play a limited role, the authors suggest that in the future they may be essential in order to identify proper means to measure and present environmental information.

An exploratory study conducted by Henri and Journeault (2008) examined the importance of environmental performance indicators (EPIs) in the Canadian manufacturing context. EPIs are sustainability accounting tools used to measure performance toward sustainability and a wide array of them exists (Lamberton, 2005). EPIs support internal decision making providing "*key information about environmental impact, regulatory compliance, stakeholder relations, and organizational systems.*" (Henri and Journeault, 2008, p. 166). The mentioned study moved along two directions inquiring on one side the relevance of a set of specific measures while on

the other side the reasons why indicators are most extensively used. The data, collected through a survey, showed that overall, companies consider the different EPIs moderately important. The most relevant indicators appeared to be the ones measuring compliance with requirements or expectations, the ones related to energy consumption and the ones related to community relations while the less relevant the ones related to environment conditions, the ones measuring auxiliary materials consumption and the ones about the implementation of environmental policies and programs. With reference to the extent of utilization the results showed that overall companies make moderate use of EPIs. The reasons why EPIs are most frequently used appeared to be monitoring internal compliance with environmental policies and regulations, followed by continuous improvement and providing information for internal decision making while providing data for external reporting was the least frequent reason.

One study performed by Ferreira, Moulang and Hendro (2010) measured the extent of use of EMA through a survey administered to the largest and most environmentally sensitive Australian companies. Companies were asked to rate twelve specific management accounting tools, related to environmental sustainability, according to the extent of use. The multi-item construct representing EMA included tools like environmental cost accounting, product life cycle cost assessment and environmental performance indicators. The data collected showed that on average EMA is scarcely implemented and that great variance among companies exists since some organizations do not adopt EMA at all while others adopt EMA to a great extent.

One survey based study by Christ and Burritt (2013) investigated the present and future role of EMA at the organizational level as perceived by a sample of Australian practicing accountants. The role of EMA was measured through a multi-item construct similar to the one employed by Ferreira et al. (2010) requiring the accountants to rate the extent to which each specific accounting tool was currently used or was expected to be used in the future in their organization. The main result was that on average the present role of EMA is perceived as scarce while the future role is perceived as more significant suggesting "*EMA may become more prominent in organizations in the next three years*" (Christ and Burritt, 2013, p. 169).

Burritt and Tingey-Holyoak (2012) investigated the extent of adoption of sustainability accounting instruments for a small sample of Australian accounting firms without focusing exclusively on the environmental dimension. Sustainability accounting instruments or tools were divided into two sets: one set of instruments developed by researchers not expected to be used substantially and one set of instruments expected to be commonly applied. The data collected showed that out of 20 instruments included in the survey only 5 seemed to be actually used to some extent by companies. Out of the set of instruments developed by researchers only ABC analysis appeared to be used while out of the set of applied instruments only Cost accounting appeared to have a good diffusion. Even if the majority of the sample employed at least one applied sustainability accounting instrument, the overall extent of adoption appeared to

be poor and focusing on few tools. Another interesting result produced by the mentioned research was that the dominant driver for sustainability accounting instruments adoption appeared to be the client's request while competitors, regulators, employees or society did not seem to play any encouraging role.

The literature reviewed in the present subsection provides quite an homogeneous picture about the diffusion of sustainability accounting among companies suggesting that for the time being accounting still plays a marginal role with respect to sustainability management. Companies seem to concentrate on few sustainability accounting tools mainly driven by compliance and efficiency considerations, even if the results reviewed have to be considered prudently given sampling and regional focusing limitations. Although the present level of sustainability accounting diffusion does not appear satisfactory, some researchers seem to share optimism about future development of EMA.

2.4 Contextual factors for adoption of sustainability accounting

A consistent body of literature recently explored sustainability accounting diffusion among companies. One still limited but fast growing research branch is the one focusing on the contextual factors underlying the adoption of sustainability accounting practices (Passetti et al., 2013). The current subsection will review the most interesting studies performed on the subject since a basic understanding of contingent variables influence on sustainability accounting adoption may prove useful to interpret the results of the present study.

Management accounting has been mostly studied through contingency theory based approaches (Chenhall, 2007) under the assumption that organizational activity is a direct result of the context where the organization is positioned. Recent studies started to apply contingency theory based research frameworks to sustainability accounting and to EMA in particular, suggesting that this approach may prove useful to better understand sustainability accounting related issues. This body of research aims to identify the key contingent variables influencing the adoption of EMA some of the most relevant ones being the industry, the organizational size and the environmental strategy.

One of the principal factors studied with reference to the relationship between industry and adoption of EMA practices has been the environmental sensitivity of the industry. It is reasonable to assume that a company operating in one more polluting and natural resources intensive industry (more environmentally sensitive industry) will more likely adopt management accounting techniques in order to monitor its environmental impacts and performances. Studies supporting the existence of a positive association are the one performed by Ferreira et al. (2010) finding that the industry is a good predictor of EMA use and the one performed by Christ and Burritt (2013) showing that a positive correlation exists between the

industry and accountants' perceptions of the role of EMA at the organizational level. A study performed by Frost and Wilmshurst (2000) conversely indicated that even if environmental reporting is more likely to occur in environmentally sensitive industries, the adoption of EMA practices is not significantly correlated to the environmental sensitivity of the industry. The mixed results suggest that further research is required to establish the nature of the relationship between industry nature and EMA diffusion.

Another frequently tested relationship has been the one between the organizational size and the EMA adoption. Usually larger organizations have at disposal higher financial resources and more specialized internal functions that may be necessary to implement a more advanced EMA system. In addition larger organizations are more probably subject to regulators and opinion leaders' attention urging the company to adopt EMA more frequently. For the reasons mentioned it is reasonable to assume that larger companies will more likely adopt management accounting techniques. According to Christ and Burritt (2013) a positive correlation exists between organizational size and accountants' perceptions of EMA at the organizational level. Another study supporting the positive correlation between size and the relevance of EMA is the one performed by Henri and Journeault (2008) even if with limitation to environmental performance indicators. Conversely the study performed by Ferreira et al. (2010) finds no significant effect of the size on EMA adoption. The existence of a positive correlation is questioned as well by Passetti et al. (2013) showing no correlation between organizational size and sustainability strategy adoption.

The relationship between the relevance of environmental strategy and the adoption of EMA was also tested with general empirical agreement. According to Christ and Burritt (2013) the presence of a proactive corporate environmental strategy is a good predictor of EMA importance at the organizational level. The research performed by Passetti et al. (2013) showed that a positive correlation exists between sustainability strategy relevance and sustainability accounting tools adoption. According to Parker (1997) the corporate environmental strategy proactivity is positively associated to environmental accounting developments. Even if with limitation to the extensive use of environmental performance indicators, the positive correlation is confirmed by Henri and Journeault as well (2008).

The mixed results obtained by contingency theory based empirical studies may be due to regional differences between the samples selected or to the different research methods employed. The definition of the circumstances under which EMA is more likely to be adopted seems an essential step in order to understand the reasons behind corporate sustainability phenomenon. In this perspective the contribution of contingency theory should be valued and further research should be performed.

3. Corporate sustainability reporting

3.1 Mandatory and voluntary reporting

One of the most common ways to provide an immediate representation of the firm is to describe it as an open social system depending on its surrounding environment to survive and to develop (Bertini, 1990). Interacting with external environment means to relate with external actors relevant to the firm's activities also known as stakeholders. The whole disclosure provided by the company to its public of stakeholders is vary in nature including information presented with different degrees of formalization, subjected to stricter or lesser regulations and related to different subjects. At the same time disclosure activities are influenced by a number of company specific factors such as for example the country the company belongs to (Newson and Deegan, 2002) and the industry the company competes in (Deegan and Gordon, 1996). In the present subsection only a brief overview of the most relevant aspects related to corporate disclosure will be provided. One of the most relevant categorizations regarding corporate disclosure is the one separating mandatory disclosure from voluntary disclosure.

Mandatory disclosure is the information the company is obliged to provide because required by law or regulations. Disclosing impositions exist in order to ensure the protection of third parties' interests and stakeholders' guarantee. Financial disclosure is mainly mandatory since financial regulations across the world impose a considerable and increasing amount of mandatory information to be disclosed. Even if some national particularities exist almost everywhere companies have to publish annually the financial statement basically including the statement of financial position, the statement of income and the statement of cash flows followed by the management discussion and analysis. The extent of financial mandatory disclosure varies according to companies' financial relevance so for example financial institutions and listed companies are subjected to additional disclosing requirements.

Voluntary disclosure is the information that is not required by law and regulations or the additional information going beyond the minimum requirements in a mandatory area (Williams, 2008). The reasons behind the voluntary disclosure of different subjects can be complex and they are object of an extensive literature. One general consideration is that thanks to voluntary disclosure the management is able to develop targeted communication directed only to selected stakeholders and providing only certain information. Mandatory disclosure delimits both the recipients and the contents of corporate communication activities resulting in significant expression constraints while voluntary disclosure allows to describe properly those data and facts which, according to the management, are more relevant (Quagli, 2005). One second consideration is that mandatory disclosure usually requires official communication channels like reports and documents whose form and language can be complicated and rigid. Voluntary

disclosure is more flexible and can be provided both through public channels similar to the mandatory disclosure ones and through private channels like restricted meetings or presentations.

Sustainability disclosure is almost completely voluntary even if environmental regulations are gradually becoming stricter worldwide (Henri and Journeault, 2008; Burritt and Tingey-Holyoak, 2012). Indeed sustainability disclosure is not bounded by content or regulatory requirements and companies are free to follow voluntary guidelines provided by international organizations like for example the Global Reporting Initiative (GRI) or not. If on one hand the development of non-mandatory sustainability disclosure can be viewed as a step forward with respect to no disclosure at all, on the other hand it raised "*considerable and growing doubt and skepticism about the accountability actually delivered*" and it raised the call for its inclusion in a "*mandatory context*" (Gray, 2006, p. 65). Sustainability reporting covers the whole activity of reporting and communication of sustainability relevant issues and operations. The information provided usually respects the triple bottom line framework thus including environmental, social and economic sustainability aspects. The rationale underlying triple bottom line paradigm is that the overall fulfillment of company's obligations towards communities, employees, customers and other stakeholders "*should be measured, calculated, audited and reported*" (Norman and Mac Donald, 2003, p. 243). Sustainability reporting encompasses new formalized means of communication (Schaltegger et al., 2006) and should systematically give comparable data with agreed disclosures and metrics on sustainability issues. Sustainability reporting can employ different communication channels even if there seems to be "*a general convergence in standalone reporting in which organizations are increasingly seeking to address social, environmental, economic and sustainability issues within the same report*" (Gray, 2006, p. 72). Sustainability reporting channels are described at the end of the present section.

According to Kolk (2004) the beginnings of sustainability reporting practice can be dated back to 1989 when the first stand-alone environmental report was published. Since then the number of companies disclosing sustainability related information increased substantially. According to one KPMG research in 2008 nearly 80% of the largest 250 companies worldwide issued sustainability reports up from around 50% in 2005. Sustainability reporting continuous growth is confirmed by GRI statistics: during 2010 the number of sustainability reports registered on the GRI Reports List increased by 22% (GRI, 2011). The number of dedicated sustainability reports produced globally by companies according to one rough estimate increased from 300 in 1996 up to 3100 in 2010 (KPMG, 2011). A global survey of 378 senior executives performed by KPMG in 2010 revealed that about one out of three companies polled produced a sustainability report at that time and that more than half of the sample was planning to do it within two years. The survey also revealed that about two out of three companies with

annual revenues of 5 billion US dollar or more currently produce sustainability reports (KPMG, 2011).

Despite sustainability reporting is widely recognized as a growing phenomenon no shared view about its reasons is established in literature. It is exactly the voluntary nature of the reporting activity which leads researchers to question why it occurs (Deegan, 2002). There could be a variety of reasons for managers to voluntary disclose sustainability information, a short list can be provided according to Deegan's comprehensive review (2002):

1. Management may report to comply with legal requirements but given the substantial lack of requirements in relation to social and environmental aspects this cannot be a major motivation;
2. Companies may be willing to obtain business advantages in appearing to behave conscientiously arising from economic rationality considerations;
3. Management may have embraced a belief in an accountability or responsibility to report according to a social aware perspective regardless of the related costs. Since companies mostly operate in capitalist systems this ethical motivation is usually questioned;
4. Reporting may be driven by fundraising thus in order to comply with borrowing requirements or to attract investment funds;
5. Companies may desire to comply with community's expectations according to more or less self-interested considerations like obtaining freedom to operate;
6. Management may report as a response to certain threats to the organization's legitimacy. Common threats are negative media attention, negative sustainability related reputation, poor impression generated by incidents and poor ratings given by rating agencies;
7. Companies may be willing to comply with industry specific requirements or particular codes of conduct related to sustainability issues in a freedom to operate perspective;
8. Through their reporting efforts companies may desire to prevent more onerous disclosure regulations, thus companies may act proactively to dissuade institutional initiatives.

Kolk (2004) lists further possible disclosing motivations characterized by a more interior oriented perspective. Companies may report in order to enhance their ability to track their progress against targets or to facilitate the implementation of sustainability strategies. Moreover management may disclose to facilitate greater awareness of sustainability issues throughout the organization or to convey particular corporate messages.

The above reviewed motivations should not be seen as mutually exclusive and many reasons could drive simultaneously companies' reporting efforts. However one of the main reasons investigated to explain why companies externally report environmental and social information is the need to achieve legitimacy "*by demonstrating a congruence between organizational*

activities and societal values" (Frost and Seamer, 2002, p. 106). The field of study grown around this assumption is known as legitimacy theory (Lindblom, 1994; Suchman, 1995; Deegan, 2002). The following subsection is dedicated to an overview of legitimacy theory main features.

3.2 Legitimacy theory

Legitimacy theory principal claim is that the main reason behind corporate sustainability disclosure is the willingness to legitimize an organization's operations. According to Suchman (1995, p. 574) legitimacy can be defined as "*a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs, and definitions*". Legitimacy theory according to Gray (1996, p. 45) can be considered a systems oriented theory or a perspective that "*permits us to focus on the role of information and disclosure in the relationships between organizations, the State, individuals and groups*".

Briefly the two distinctive features of legitimacy theory are the interpretation of the company as an entity interacting with a broader social system and the relevance attributed to disclosure policies. With reference to systematic relationships the entity is influenced by, and in turn has influence upon, the society it operates in. With reference to corporate disclosure activities the company's management is considered able to influence external perceptions about the organization's operations. Legitimacy theory roots in the broader political economy theory studying interactions and power conflicts occurring between different groups within society. According to political economy the reporting activities act as "*a tool for constructing, sustaining and legitimizing economic and political arrangements, institutions and ideological themes which contribute to the corporation's private interests*" (Guthrie and Parker, 1990, p. 166). One theory showing significant overlapping (Gray, Kouhy and Lavers, 1995) with the legitimacy theory is the stakeholder theory. One branch of stakeholder theory claims the importance to manage properly the ongoing relationships between the company and its most relevant stakeholders, thus the stakeholders the company's existence and success depend on. Accordingly the company will seek to satisfy the expectations of different stakeholder groups in order to obtain legitimization.

The legitimacy concept can be related to the concept of a social contract stipulated between the company and the society. According to the social contract the company has the right to exist and to consume resources as long as the benefits produced exceed the costs from a social point of view. Not complying with the social contract can be dangerous for the company and may cause the company to lose its legitimization. Managers perceiving the company is not in line with the social contract will likely adopt corrective actions to change public perceptions. It is

worth noting that given information asymmetry any actual initiative internally performed by the company in order to comply with the social constraints will be effective only if perceived by the external public. For the reason mentioned the management's first aim is to change public perceptions from negative to positive employing disclosure policies. In this perspective corporate disclosure can be regarded as an essential tool in order to enhance company's legitimacy and sustainability disclosure in particular plays its role with regard to sustainability related stakeholders' expectations (Brammer and Pavelin, 2004).

One implication arising from the legitimacy theory is that when faced with legitimacy threats the company may choose to change the perceptions of the relevant public but not to change its actual behavior (Lindblom, 1994). Information may only be released in response to suspicions and concerns and not because the company is committed with ethical considerations thus legitimacy theory may arouse doubts about sustainability disclosure. If disclosure is disconnected from actual operations and performance it is by nature misleading and further concerns about reliability and validity of disclosure may arouse. Legitimacy theory was tested with mixed results by studies focusing on the correlation between community's concerns and corporate disclosure like the ones performed by Guthrie and Parker (1989) and by Deegan, Rankin and Tobin (2002).

3.3 Sustainability reporting channels

Nowadays companies willing to disclose sustainability related information have at disposal various reporting channels. These channels can be divided into two families: public channels and private channels. Public channels are open to all the company's stakeholders and include annual reports, web sites, sustainability reports, stand-alone environmental or social reports and other documents related to sustainability. Private channels are addressed only to certain stakeholders and include meetings, conferences and presentations to financial analysts (Cinquini, Passetti, Tenucci and Frey, 2012). In the current subsection an overview of the channels available to the general public is provided.

Sustainability reports are also known as triple bottom line reports or corporate social responsibility reports. According to Gray (2006, p. 72) "*the focus in the reports has evolved from pure environmental reporting, through forms of selective social responsibility reporting into an increasing recognition of triple bottom line reporting*", thus sustainability reports can be considered an evolution with respect to simple stand-alone environmental reports. Sustainability reports "*offer a previously unavailable window into corporate environmental and social strategy and performance, and make it possible to evaluate this performance as an adjunct to more familiar financial performance metrics*" (Morhardt, Baird and Freeman, 2002, p. 217). These reports usually present a clear structure addressing economic, social and environmental

issues in separate sections and they follow voluntary reporting guidelines like the ones provided by GRI[8].

While sustainability reports usually cover the three sustainability aspects in a comprehensive document, stand-alone reports regarding exclusively environmental or social aspects are common as well, the most frequent being stand-alone environmental reports. Stand-alone reports may partially follow reporting guidelines but cannot provide a complete picture of corporate sustainability. Recurring information categories can be identified both for sustainability reports and for stand-alone reports. The following table (see table 3) displays the contents a report addressing sustainability related issues is likely to present .

Sustainability reporting contents

1. Corporate context and reporting principles
2. Identification of key stakeholders, their concerns and relevant issues
3. Sustainable development vision and strategy statement
4. Top management commitment, responsibilities and organizational structures
5. Objectives and programs related to sustainability
6. Risk and opportunities management
7. Sustainable development progresses description with regard to innovation, supply chain, financial implications, employees involvement and partnerships with civil society
8. Performance quantification through metrics and indicators
9. Information about data quality and accuracy
10. Performance trends and targets
11. Performance interpretation and benchmarking
12. Accessibility and interactivity for contacts, feedbacks and further information
13. Information about independent verification of disclosure

Table 3
Source: adaptation from *Deloitte Sustainability Reporting Scorecard* by Deloitte, Touche, Tohmatsu (2006).

In addition to sustainability and stand-alone reports there are other documents providing information about sustainability issues. These documents are various in nature and include HSE

[8] For a complete overview of the GRI Guidelines please refer to *G4 Sustainability Reporting Guidelines, Reporting Principles and Standard Disclosure* (2013).

policy statements, environmental values statements and brochures presenting corporate sustainability highlights.

One additional channel companies may use to report sustainability information is the annual report. While sustainability reports are completely dedicated to sustainability information, annual reports are all-inclusive documents covering all the company's activities and referring to concluded financial year. Annual reports encompass subjects like corporate strategy, marketplace analysis, past and expected performance of the business, management principles, different business units' performance review, corporate governance and financial information. Information related to sustainability can be reported by a dedicated section or just by one paragraph included in the operations review. Companies using annual reports to disclose sustainability information may publish a sustainability report as well and information provided by the two documents may be more or less overlapping. Usually sustainability disclosure provided in annual reports is shorter compared to the one provided in sustainability reports and does not follow standard reporting guidelines.

Internet based disclosure represents a growing trend probably paving the way for future truly interactive communications (Wheeler and Elkington, 2001). Internet based disclosure encompasses both properly defined web reporting and the simple disclosure of contents on the webpages of corporate website. Web reporting[9] practice consists in making paper reports electronically available on the corporate website. According to Morhardt (2009) web reports "*have begun to appear regularly on the websites of many of the world's largest firms, duplicating or more often supplanting printed copies, to the point that even when a printed copy exists it is also available electronically*". Scott and Jackson (2002) distinguish three distinct ways in which web can be used for sustainability reporting. According to the more traditional approach, the web is used only to host in electronic format (usually .pdf) a copy of the paper report. According to the integrated approach, the web is used as an additional medium to improve the paper version, so a shorter paper summary report may be published referring to the web version for further information. According to the more web oriented approach the paper report is not published and reporting is realized only through the web.

Instead of being included in ready to download documents sustainability information may be simply presented as contents on the webpages of corporate websites. Corporate websites main navigation menus usually display one tab dedicated to corporate social responsibility or to environment. Once entered the specific website section the navigation usually follows a drill-down approach through several levels of information. Online disclosure presents numerous advantages the most relevant being broader information availability for the stakeholders,

[9] For an extensive review about the peculiarities of sustainability reporting on the web please refer to *Environmental, Social and Sustainability Reporting on the Web: Best Practices* by Scott and Jackson (2002).

interactivity, real time updating and environmental impacts of publishing avoidance. Even if undeniable advantages exist, internet based disclosure reporters have to consider various issues they would not face with paper based disclosure. Essential disclosure aspects to manage are accessibility, visibility, imagery, links and navigation (Scott and Jackson, 2002).

The sustainability disclosure channels reviewed in the present subsection are not mutually exclusive and may be all used simultaneously by a given reporting company. The extent of information provided through the different channels may vary according to the company's preferences. The company can effectively manage the different channels in order to pursuit a deliberated sustainability communication strategy.

4. Internal aspects of sustainability

4.1 Environmental management

In the current section an overview of the main internal aspects related to the management of environmental issues is provided. The environmental dimension of sustainability is mainly considered since it appears to be the most developed one both in academic debate and business practice (Bennett and James, 1999; Hutchins and Sutherland, 2008). The three aspects described are environmental strategy , environmental oriented operations and EMA. These dimensions are taken into account since companies are likely to adopt them to internally manage and measure environmental performance. It is stressed that henceforward the broad expression "environmental management" will be used to indicate collectively the aspects related to the three dimensions mentioned above. As later explained in Chapter II, environmental management represents the internal perspective of this study framework.

4.2 Sustainability strategy and environmental strategy

An increasing number of companies are formulating and implementing sustainability strategies (Stead and Stead, 1995; Epstein and Roy, 2001; Eweje, 2011). Sustainability strategy can be defined as "*strategy aimed at balancing the social, environmental and economic needs of both the company and society*" (Epstein and Roy, 2001, p. 586). Pursuing a corporate strategy based on sustainable development and maintaining good profitability levels should not be seen as mutually exclusive. In fact according to Stead and Stead (1995, p. 44) "*by implementing sustainability strategies, firms can synergistically integrate long-run profitability with their efforts to protect the ecosystem, providing them with opportunities to achieve the traditional competitive advantages of cost-leadership and market differentiation*". Sustainability strategies lead the company to develop consistency between internal and general value systems and to

embrace the idea that the ultimate stakeholder the company should address is the Earth (Stead and Stead, 2000, p. 316).

Stead and Stead (2000) described sustainability strategy through the enterprise strategy formulation framework to prove its conceptual legitimacy. According to this framework strategies should be formulated through the specification of three dimensions: the network of values the strategy is based on, the societal issues the strategy aims to address and the group of stakeholders the strategy involves. Sustainability should be the core value of sustainability strategy and it should orient the organization "*toward economically beneficial ways to manage ecological issues*" (Steand and Stead, 2000, p. 317) and be supported by ancillary values instrumental for its implementation. Sustainability strategy should be defined through a complete understanding of the company's position towards ecological issues and an assessment of potential social and environmental impacts arising from corporate activities. This analysis should influence strategic choices to a great extent including the company's products selection, production processes, clients base, distribution channels and products planning. Companies should identify the stakeholders group involved by sustainability strategy implementation. As already mentioned a truly sustainable strategy should consider the whole planet as its ultimate stakeholder. Then a specific set of stakeholders should be identified along with the specific social and environmental issues associated with each of them. Once managers have defined the company's position with respect to the above mentioned points they can "*formulate a sustainability strategy that includes the company's values, commitment, and goals*" (Epstein and Roy, 2001, p. 591).

Baumgartner and Ebner (2010) identified four types of sustainability strategies companies may adopt showing a growing level of proactivity. The "*introverted strategy*" focuses on external compliance concerning environmental and social aspects. Regulations and standards are respected in a risk mitigation perspective. The "*extroverted strategy*" focuses on the external relationships in order to achieve license to operate in a legitimization perspective. Extroverted strategies can range from strategies providing only an external presentation of sustainability to strategies providing a real transformation towards sustainability inside the company. The "*conservative strategy*" focuses on internal measures and processes in order to improve operational efficiency. Cleaner production and environmental aspects are particularly important. The "*visionary strategy*" addresses sustainability issues across all the corporate activities and produces competitive advantage through differentiation and innovation. Visionary strategies can be more or less systematic according to the number of sustainability issues taken into account.

After sketching the four different types of sustainability strategy, Baumgartner and Ebner (2010, p. 78) also identify a set of sustainability issues that should provide the contents for sustainability strategies development and they refer to them as to "*sustainability aspects*". The

sustainability aspects related to the formulation of economic, environmental and social dimensions of sustainability strategy are outlined below (see table 4).

Sustainability strategy contents according to Baumgartner and Ebner

Economic dimension	
• Innovation and technology	• Processes
• Collaboration	• Purchase
• Knowledge management	• Sustainability reporting
Environmental dimension	
• Resources including recycling	• Waste and hazardous waste
• Emission into the air	• Biodiversity
• Emission into the water	• Environmental issues of the product
• Emission into the ground	
Social dimension	
• Corporate governance	• Ethical behaviour and human rights
• Motivation and incentives	• No controversial activities
• Health and safety	• No corruption and cartel
• Human capital development	• Corporate citizenship

Table 4
Source: adaptation from *Corporate Sustainability Strategies: Sustainability Profiles and Maturity levels* by Baumgartner and Ebner (2010).

Concerning environmental strategy Banerjee (2002, p. 181) defined it as "*the organisation-wide recognition of the legitimacy and importance of the biophysical environment in the formulation of organisation strategy, and the integration of environmental issues into the strategic process*". Similarly to sustainability strategies, environmental strategies can exhibit different degrees of proactivity ranging from the mere compliance with existing environmental regulations to the embrace of a truly sustainable vision and they can be integrated at different levels inside the company ranging from functional to enterprise level. Banerjee (2001) suggests that a growing degree of proactivity may be associated to a higher level of environmental issues integration into strategic planning and that such integration causes the company to perform a range of environment related activities. According to the mentioned author, actions resulting from environmental strategy implementation may focus on employees' awareness towards green themes, manufacturing eco-efficiency, corporate wide environmental engagement and market oriented environmental commitment. Empirical studies (Banerjee, 2001; Banerjee, 2002) suggest that for the time being, the environmental strategies adopted by companies exhibit a low level of proactivity being influenced mainly by regulatory forces and competitive advantages achievement. In addition it seems that companies from more environmentally sensitive industries are likely to integrate environmental considerations into corporate strategy to a greater extent.

4.3 Environmental oriented operations

It is common opinion among academics that operations management and sustainability management should be increasingly connected at organizational level (Kleindorfer, Singhal and Van Wassenhove, 2005; Epstein, 2008; Bettley and Burnley, 2008). According to Bettley and Burnley (2008) there are at least four reasons to integrate sustainability management and operations management:

1. Given the long-term nature of many decisions affecting sustainability, sustainability objectives should be considered when formulating operations strategy and designing products or processes;
2. Sustainability issues should be embedded into organizational culture and communicated to employees through daily operations;
3. Since operations management often requires trade-off decisions, sustainability should be taken into account in decision making;
4. To avoid complexity a single management system should account for all aspects of operational performance included social and environmental ones.

According to Kleindorfer et al. (2005) the integration between sustainability and operations management is evident in three areas: development of green products and processes, adoption of sustainability metrics to measure processes performance and development of closed-loop supply chains. The implications resulting from the adoption of a sustainability oriented perspective in these three areas are briefly described with particular reference to environmental aspects.

In order to develop sustainable products and processes the companies implement operations design (Bettley and Burnley, 2008) consisting of a sequence of decisions including the determination of the value elements that need to be delivered to stakeholders, the definition of the set of goods and services providing the value elements and the determination of the processes needed to deliver the set of good and services. Sustainable operations design should conceive the product as an "*integrated bundle of goods and services*" (Bettley and Burnley, 2008, p. 890) taking into account that the tangible dimension of the product offered determines the services the product requires. Sustainable operations design should take into account the entire product life cycle in order to optimize the overall environmental performance of the product from development to waste disposal or recycling. The design of the product should consider recovery options as well in order to recover the high value parts of the product at the end of its life cycle allowing as a result "*downstream savings*" (Kleindorfer et al., 2005, p. 486). Enhanced dialog with stakeholders is central as well to sustainable operations design. In fact without a clear understanding of stakeholders' expectations it is hard to design and deliver an adequate product.

Metrics related to social and environmental performance should be integrated in the performance assessment of key business processes in order to improve practices related to sustainability. According to Kleindorfer et al. (2005) such integration should be eased by the synergies existing between sustainable performance and two concepts related to operations management: lean production and total quality management. Both lean production and orientation to quality focus on the avoidance of inventory excesses, production defects, no value added activities and resources waste. Since these aspects are closely monitored through performance indicators, it is likely that such systems may prove useful in a sustainability oriented perspective.

Integrating sustainability with operations management would result in an extension of scope both at the top and at the bottom of the supply chain. Operations can be defined as "*a set of business processes that are directly responsible for converting a variety of resources into outputs*" and that provide a connection with "*external suppliers upstream and customers downstream*" according to a "*supply chain perspective*" (Bettley and Burnley, 2008, p. 880). The traditional supply chain should be extended to encompass indirect external corporate impacts. At the top of the supply chain it is necessary to consider not only the resources consumed directly by internal processes but also the resources consumed indirectly by upstream actors. At the bottom of the supply chain it is necessary to consider not only the value provided to the customers in terms of goods or services fruition but also all the other outputs associated to internal operations like environmental and social impacts. Going onward with the mentioned extension process, activities like end-of-life product management, waste disposal and recycling will be taken into account by the company causing the supply chain ends to connect, representing what can be called a "*closed loop supply chain*" (Kleindorfer et al., 2005, p.487).

4.4 Environmental management accounting

As previously mentioned, out of the three dimensions of sustainability the environmental one seems to have attracted major attention and more studies were performed on the subject while the social one was relatively left aside. One reason behind the mentioned gap may be that environmental impacts and performance measurement offered a field of research more consistent with accounting logics compared to social issues. Starting from the 1990s, when the importance of accounting in sustainable development was recognized, accounting for the environment or environmental accounting increasingly became a significant area of study (Bebbington and Gray, 2001). EMA in particular has increasingly attracted researchers' interest in recent years.

According to Burritt, Hahn and Schaltegger (2002) EMA can be viewed as part of the broader concept of environmental accounting. Environmental accounting systems "*identify,*

measure, analyze and interpret information about environmental aspects of company activities" (Burritt et al., 2002, p. 40). Environmental accounting can be represented as a two dimensional framework. On one dimension it addresses both environmental impacts on the economic situation of the company and corporate impacts on environmental systems. On the other dimension it provides information both for internal decision making and for external stakeholders' needs. EMA corresponds to the part of environmental accounting internally oriented and can be broken down into Monetary Environmental Management Accounting (MEMA) providing monetary information about environmental impacts on the company and Physical Environmental Management Accounting (PEMA) providing physical information about corporate impacts on environmental systems. Once positioned in this conceptual framework EMA can be more specifically defined as a method incorporating "*a number of techniques and tools designed to assist organizations in recognizing and managing their environmental impacts*" (Christ and Burritt, 2013, p. 163) and employing both "*physical metrics for material and energy consumption, flows, and final disposal, and monetarised metrics for costs, savings, and revenues related to activities with a potential environmental impact*" (Jasch, 2003, p. 668). Consistently with the previously described framework EMA has "*a financial as well as a physical component*" (Jasch, 2003, p. 668) because it "*seeks to bring together both financial and physical information regarding the environmental impacts and performance of a business*" (Christ and Burritt, 2013, p. 164). In general the information provided by EMA are believed to "*facilitate improved decision making from which improved environmental performance and economic benefit may ensue*" (Christ and Burritt, 2013, p. 164).

The benefits potentially arising from EMA adoption are various and different authors focused on different aspects. According to Bennett and James (1997) the main benefits arising from EMA implementation are related to improved management efficiency, Ferreira et al. (2010) suggest a wide range of further benefits that may be experienced by companies as a result of EMA practices while Christ and Burritt (2013) suggest four comprehensive categories of benefits (see table 5).

EMA benefits according to literature

Bennett and James (1997)	Ferreira et al. (2010)	Christ and Burritt (2013)
• Identifying income statement and balance sheet impact of environment-related activities • Identifying cost reduction and other improvement opportunities • Prioritising environmental actions • Guiding product pricing, mix and development decisions • Enhancing customer value • Future-proofing investment and other long-term decisions • Company's activities eco-efficiency and/or sustainability assessment	• Increased demand in green products • Increase in product margins • Increase in customer satisfaction • Cost of capital and insurance cost reduction • Operating cost reduction • Identification of new opportunities • Generation of process and product innovation • Attraction of better quality staff • Improvement in productivity • Improvement in reputation • Improvement in decision making • Product costing improvement • Production process improvement	• Identification of opportunities for cost savings • Improved product mix and pricing decisions • Avoidance of future costs associated with investment decisions • Improved environmental performance

Table 5
Source: adaptation from referenced studies.

As already mentioned EMA adoption requires to develop and to implement a set of techniques. Since a wide range of these techniques exists, Burritt et al. (2002) proposed a comprehensive framework to put them in order according to four dimensions: monetary or physical nature of information provided, time frame addressed, length of time frame addressed and routineness of information provided. The aspect of the framework and the organized techniques are displayed below (see table 6).

EMA techniques according to Burritt et al.

		Monetary environmental information		Physical environmental information	
		Short term focus	Long term focus	Short term focus	Long term focus
Past oriented	Routinely generated information	Environmental cost accounting	Environmentally induced capital expenditure and revenues	Material and energy flow accounting	Environmental capital impact accounting
	Ad hoc information	Ex post assessment of relevant environmental costing decisions	Environmental life cycle costing Post investment assessment of individual projects	Ex post assessment of short term environmental impacts	Life cycle inventories Post investment assessment of physical environmental investment appraisal
Future oriented	Routinely generated information	Monetary environmental operational and capital budgeting	Environmental long term financial planning	Physical environmental budgeting	Long term physical environmental planning
	Ad hoc information	Relevant environmental costing	Monetary environmental project investment appraisal Environmental life cycle budgeting and target pricing	Relevant environmental impacts	Physical environmental investment appraisal

Table 6
Source: adaptation from *Towards A Comprehensive Framework For Environmental Management Accounting - Links Between Business Actors And Environmental Management Accounting Tools* by Burritt et al. (2002).

Despite increasing interest about EMA some aspects of this field of study remain unclear. No consensus exists about the reasons behind EMA adoption even if monitoring internal compliance, supporting internal-decision making and providing data for external reporting seem to be plausible reasons (Henri and Journeault, 2008). The circumstances under which companies are more likely to engage with EMA were object of an extensive literature (Frost and Wilmshurst, 2000; Henri and Journeault, 2008; Ferreira et al., 2010; Christ and Burritt, 2013; Passetti et al., 2013) but there are not conclusive results.

Chapter II: Research method

1. Research framework and hypothesis formulation

The purpose of this research is to investigate the relationship between some aspects of environmental management and environmental disclosure at organizational level. The research was limited to the environmental dimension of sustainability given its higher degree of both theoretical and practical development. According to Bennett and James (1999, p. 45) "*in general there has been less debate on the social than on the environmental management […]*". Similarly according to Hutchins and Sutherland (2008, p. 1688) "*it is common practice for decision-makers to address the economic pillar of sustainability, and over the last decade, increasing effort has been directed at the environmental pillar through attention to environmental life cycle impacts. Until recently, however, the pillar associated with the social dimension of sustainability has not been well-defined. Discussion of this element has received little attention in the literature […]*".

For the reason mentioned the terms environmental management and environmental disclosure can be more properly used instead of the broader terms sustainability management and sustainability disclosure.

The research framework can be described as a comparison between an internal perspective represented by environmental management and an external perspective represented by environmental disclosure. The internal perspective encompasses environmental strategy, environmental oriented operations and EMA. Given the complex nature of environmental management concept, the three mentioned dimensions were chosen as proxies. The external perspective encompasses the different channels that can be used to disclose environment-related information: annual reports and financial statements, sustainability and environmental reports and corporate websites. Two set of data are collected to measure on one side the attention devoted by companies to environmental management while on the other side the extent of environment-related information disclosed by companies.

While previous studies (Ingram and Frazier, 1980; Wiseman, 1982; Freedman and Wasley, 1990; Patten, 2002; Al-Tuwaijri et al., 2004; Clarkson et al., 2008; Clarkson et al., 2011) mainly focused on the relationship between performance and disclosure, the present research matches the attention devoted to environmental management with the extent of information disclosed, leaving aside any consideration related to performance. This research can be considered an analysis of consistency between what companies do and what companies tell about the environmental dimension of sustainability. Previous literature suggests that both the presence and absence of consistency may have theoretical foundations. With particular reference to

legitimacy theory as argued by O' Donovan (1999, p.66) "*management may attempt to achieve legitimacy in two ways. First by changing its activities […] or, second, by attempting to alter the values, expectations or perceptions of society*". The existence of consistency between what is done and what is disclosed may support the more management oriented interpretation of legitimacy theory according to which companies are actually engaged in environmental issues and they report reliably about it. The absence of consistency would support the more critical interpretation of legitimacy theory according to which reporting provides an altered picture of organizational involvement in environmental issues showing a commitment which does not exist in reality. This view seems reasonable since according to Frost and Seamer (2002, p. 108) when environmental disclosure is "*used to achieve legitimacy through educating and informing, arguably those organisations that adopt changes in internal processes may adopt a more in depth external reporting process, which will be reflected in the quality of the information finally disclosed*".

In general the presence of a positive association between attention to environmental management and extent of environmental disclosure would support the theories according to which the company may get real benefits by engaging in sustainability and communicating this engagement to its stakeholders. On the contrary the absence of such association would support the theories skeptically looking at companies' engagement in sustainability and explaining sustainability reporting mainly with green-washing and window-dressing.

In the present study, I propose that companies more involved in environmental management will disclose more about their engagement in environmental sustainability. As such, the following hypothesis is tested:

H1: A positive correlation exists between attention to environmental management and extent of environmental disclosure

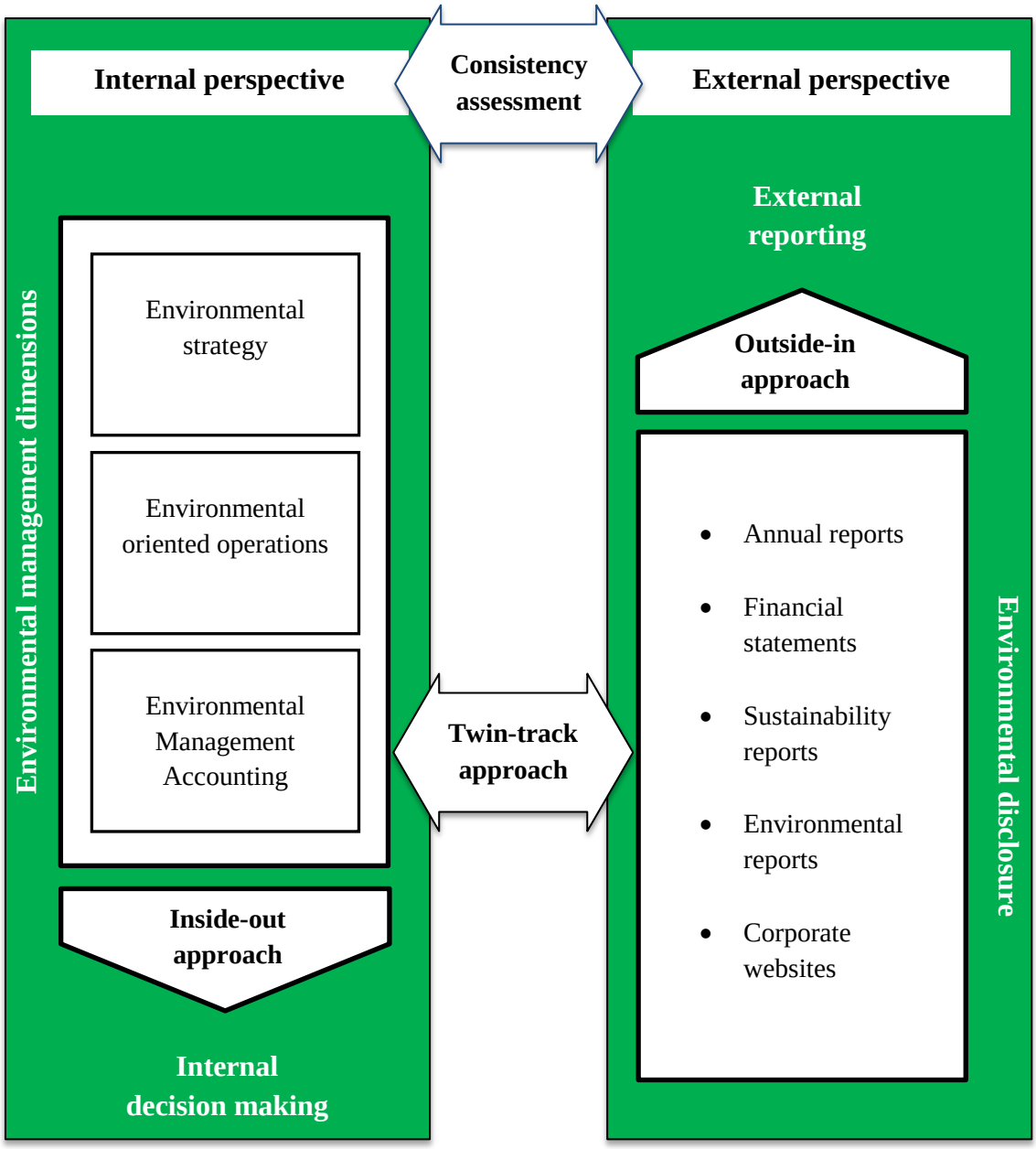
The specific field of research addressed in the present study seems to have received little attention in previous literature. Only two previous studies by Frost and Seamer in 2002 and by Van Staden and Hooks in 2007 seem to have addressed a similar research question. Frost and Seamer (2002) questioned the association between the development of internal environmental management practices and the level of environmental disclosure for a sample of 35 Australian public companies. Van Staden and Hooks (2007) questioned the association between environmental responsiveness and environmental disclosure for a sample of 32 New Zealand companies. A brief comparison between the two previous studies and the present research is outlined below. The analysis performed by Frost and Seamer (2002) focused only on managerial practices and did not take into account the internal dimension related to environmental strategy. In order to measure the extent of environmental disclosure a simple

word count was used without relying on a structured disclosure index. In addition the only information source taken into consideration was the annual report. In the analysis performed by Van Staden and Hooks (2007) a structured disclosure index was used and a complete array of information sources was considered as well but environmental responsiveness was measured relying on an external ranking instead of a survey administered by the authors. For the reasons mentioned, the present research seems to address a gap in previous literature and to possess a high degree of novelty for the Italian context in particular.

It is worth noting that particular emphasis is placed on sustainability accounting which is included in the research framework both in the internal and external perspective. On one side EMA reflects sustainability accounting internal dimension supporting managerial decision making while on the other side environmental disclosure reflects sustainability accounting external dimension providing stakeholders with information. Since the relationship between the managerial and external perspectives of sustainability accounting is studied, the present research can be considered consistent with the twin track approach formulated by Schaltegger and Burritt (2010).

A scheme outlining the research framework and its linkage with the twin track approach to sustainability accounting is provided below (see picture 1).

Research framework



Picture 1

2. Sample description

The objective of the present study is to test if consistency exists between some environmental management related aspects and environmental disclosure at corporate level. The aspects of environmental management taken into account are: environmental strategy, environmental oriented operations and EMA. In order to address this research question it was necessary to measure on one hand the attention devoted by companies to environmental

management within their organization while on the other hand the extent of environmental information disclosed by companies through their reporting channels. Environmental management adoption was measured through an Internet questionnaire survey while environmental disclosure extent was measured through a content analysis process. The two methodologies employed are different because of the different nature of the information to collect but they were applied to the same sample of companies. The sample was selected contextually to the survey questionnaire administering process and then considered as given for the content analysis phase. Since the present study relies on Passetti, Cinquini and Tenucci previous work (2013) for the measurement of environmental management adoption, extensive reference can be made to the mentioned work for what concerns the sample selection process described below. However it should be taken into account that selected contents from the mentioned work were considered since the present study addresses only the environmental dimension of sustainability.

The present section focuses on the selection process leading to determine the respondents to the survey and thus the sample of companies considered for the content analysis process. The features of the questionnaire administering process will be more precisely described in Section 3.

The initial sample counted 600 companies operating in Italy randomly selected from 2000 companies previously obtained from the AMADEUS database. The companies had to respect two selection criteria to ensure they were large enough to have a management control system (Bouwens and Abernethy, 2000): not belonging to the banking or insurance industries and being classified as "*very large*" or "*large*" by the database. The presence of a management control and accounting system is a necessary condition for the purposes of this study since sustainability management and reporting are more likely put in place if a minimum level of organizational structure exists. The initial sample was reduced following a first phone contact in response to which 255 companies declined the participation to the research. These companies were classified as "*non-participants*" and excluded from the final sample which then totaled 345 companies. The main reasons why companies did not want to participate to the research were: "*not interested in the research because the topics considered in the questionnaire are irrelevant for my organisation*" and "*too busy at the moment*".

Once obtained the final sample an e-mail containing the cover letter and the web link to the questionnaire was sent to the participant companies. A first reminder was e-mailed after ten days from the phone contact (Dillman, 2007) and a second one after additional ten days. The questionnaire was made available only for a limited time, until fifteen days after the second reminder, and then the website was disabled. In total, 72 responses were received representing 20,87 % of the final sample. Since 7 out of 72 responses were unusable, because of a large amount of missing data (more than 15% for each questionnaire caused by missing data on

sensitive constructs), 65 responses were considered usable representing an usable response rate of 18,84 %. The usable response rate seems consistent with other studies in the accounting field (Ferreira et al. 2010; Henri and Journeault, 2010; Christ and Burritt, 2013). In order to handle missing values it was decided to use the technique of the value replacement mean. In fact the missing data were around 1,5% and this technique can be used when the set of data exhibits extremely low levels of missing data (Hair et al., 2013). The role of respondents and their experience measured in terms of years of job occupation were taken into account in order to ensure reasonably reliable responses. Many of respondents were controller, accounting manager or CFO (in total more than 75% of the sample respondents). About 46% of the sample respondents had been in the position for over than 5 years and another 46% for a time ranging from 1 to 5 years. On the contrary just the 8% had a level of experience inferior to 1 year. The average experience in the position appears to be appropriate to assure the proper comprehension of the questionnaire.

Possible non-response bias was taken into account through three investigations. The first investigation addressed 10 non respondent companies, which were re-contacted after the website deactivation in order to understand the reason of their non-response. The main reason was lack of time thus not a reason influencing the validity of the sampling process. In the second investigation the characteristics of the respondents and non-respondents in terms of firm size and industry were compared. The two categories showed no substantial differences or features. The third investigation tested if biases related to early or late responses existed. The test was performed comparing the responses provided by the first 10 and the last 10 respondents. None of the variables revealed any statistically significant association with the time of response. The three examinations indicated that non-response bias does not represent a significant threat to the validity of the research and that the sample selected is adequate to make statistical inferences about the considered population.

As described in the table below (see table 7) the companies included in the respondents group belong to a wide range of different industries.

Composition of the sample by industry

Industry	Companies (n.)
Mechanical	17
Pharmaceutical and Chemical	16
Industrial Services	12
Oil and Gas	5
Electronic	4
Automotive	2
Textile and Fashion	2
Food products	2
Other sectors	5

Table 7

3. Internal perspective: the survey

3.1 Research method

The present section describes how it was possible to measure the attention devoted to sustainability management by selected companies. Detailed information will be provided about the data collection phase and the research methodologies which allowed to represent the environmental management concept through a set of variables and thus allowed to measure its adoption. Drawing upon Passetti et al.'s (2013) research framework three variables are identified in order to represent environmental management inside companies: environmental strategy, environmental oriented operations and EMA. A description of these variables was previously provided in Chapter I.

The data regarding the different dimensions of environmental management were collected through an Internet questionnaire survey administered by Passetti et al. (2013). As previously mentioned, the present dissertation selectively considers just a part of the mentioned work since Passetti et al.'s questionnaire had a broader scope encompassing not only the environmental dimension of sustainability but also the social and the economic ones. To this regard, some adaptations of the original work were necessary and are indicated when occurring. Extensive reference can be made to the mentioned work for what concerns the following description of data collection phase and variables construction. First of all some information is provided about the questionnaire administering process than, in the following subsection, the variables composition and measurement are described.

The questionnaire survey consisted of 3 major sections. The first section collected general information about the companies (number of employees and industry) and the respondent (position and experience in the position). Section two included the questions about sustainability strategy and operational practices. Section three focused on sustainability accounting techniques. The questionnaire was pre-tested to check if questions were clear and

comprehensible. Measurement methods were also discussed until agreement was achieved. After this phase some questions wording and presentation were modified (Dillman, 2007). As previously mentioned the companies belonging to the initial sample were contacted through a first phone call to present the research and to evaluate their willingness to participate. The phone call was addressed to the accounting and management control department because according to Ballou et al. (2012) and Hoopwood et al. (2010) it should have had a key role in driving sustainability throughout the organization and in integrating environmental issues within day-to-day activities through targets definition, risks identification and measurement activities.

3.2 Variables description

For what concerns the measurement of environmental management adoption, given the complex nature of the concept, it was necessary to represent it through a set of variables. Basically the environmental management aspects were translated into variables incorporating different items each measured on a seven-point Likert scale (Christ and Burritt, 2013) and then included in the questionnaire. As already mentioned, the three variables used to represent environmental management are environmental strategy, environmental oriented operations and environmental management accounting.

In order to represent the sustainability strategy variable the original work by Passetti et al. (2013) used a construct made up of 13 items belonging to environmental, social and economic dimensions of sustainability strategy, according to the theoretical framework of Baumgartner and Ebner (2010). For the purposes of the present work only the 7 items related to environmental strategy were selected. With reference to the different items the respondents were asked "*To what extent do you agree with the following sentences regarding sustainability strategy of your firm?*" and the level of agreement was measured through a seven-point Likert scale (1 = strongly disagree to 7 = strongly agree). The questionnaire part related to environmental strategy[10] looked like the table below (see table 8).

[10] Only part of the original questionnaire by Passetti et al. (2013) is considered for the reasons mentioned.

To what extent do you agree with the following sentences regarding sustainability strategy of your firm?

(1 = strongly disagree ; 7 = strongly agree)

- Systematic management and dissemination of knowledge oriented to organisational learning of environmental and social issues (SST2)
- There are continuous investments in employees training (SST4)
- Targets for air, water or land use are fixed and communicated (SST5)
- Targets for hazardous waste reduction are fixed and communicated (SST6)
- There are continuous investments in environmental friendly technologies (SST7)
- Suppliers are selected on the base of their environmental performance (SST8)
- The incentive systems are linked with environmental targets (SST9)

Table 8
Source: *Antecedents of sustainability accounting adoption: Insights from an exploratory path model* by Passetti et al. (2013).

Environmental oriented operations variable was represented by five items resulting from an adaptation of the nine environmental operational practices identified by Henri and Journeault (2009). With reference to the different items the respondents were asked "*To what extent these operational practices are taken into consideration within your firm*?" and the level of agreement was measured through a seven-point Likert scale. The questionnaire part related to environmental operational practices looked like the table below (see table 9).

To what extent these operational practices are taken into consideration within your firm?

(1 = strongly disagree ; 7 = strongly agree)

- Environmental and social product redesign (OP1)
- Environmental and social process redesign (OP2)
- Substitution of hazardous material (OP3)
- Reutilization of the waste generated by the production (OP4)
- Alliances with suppliers and customers to address environmental and social issues (OP5)

Table 9
Source: *Antecedents of sustainability accounting adoption: Insights from an exploratory path model* by Passetti et al. (2013).

The original work by Passetti et al. (2013) did not focused exclusively on EMA but considered the broader sustainability accounting concept as interpreted by Schaltegger and Burritt (2010). Consequently the sustainability accounting variable was included in the questionnaire encompassing items related to social issues which are not considered for the purposes of this study. In addition the original variable included in the questionnaire encompassed an item regarding the reporting activity which is not considered. Since the present study takes into account only the five items of the original construct related to environment, in place of sustainability accounting we can more properly refer to environmental management accounting variable.

In order to represent environmental management accounting variable, previous works used a construct made up of 12 items (Ferreira et al., 2010) and 13 items (Christ and Burritt, 2013). The five EMA tools used in the present study were selected following previous literature: eco-efficiency analysis (Schaltegger et al., 2002; Henri and Journeault, 2009), environmental budget (Mio, 2001; Gray and Bebbington, 2001; Schaltegger et al., 2002), environmental cost accounting (Parker, 2000; Jasch, 2002; Marelli, 2009), environmental performance indicators (Gray and Bebbington, 2001; Henri and Journeault, 2008) and environmental life cycle assessment (Gray and Bebbington, 2001; Rebitzer et al., 2004). A short description of each EMA tool is provided in the table below (see table 10).

Description of EMA tools included in the questionnaire

Eco efficiency analysis	Bringing together ecological and economic parameters, eco efficiency analysis supports evaluation and comparison of products and processes in terms of eco-efficiency. It helps to develop and optimize products and processes managing the relationship between their economic value added, their level of eco-efficiency and the firm's objectives.
Environmental budget	Environmental budget is a future-oriented planning tool determining the funds available for environment related issues in the upcoming period. It helps to achieve environmental objectives and to reduce the scale of firm environmental impacts.
Environmental cost accounting	Pooling different technique designs to record and measure direct and indirect environmental costs, environmental cost accounting helps to determine the production costs for different products/services.
Environmental performance indicators (EPIs)	EPIs are internal indicators measuring environmental issues (resources consumption, GHG emissions, waste management etc.) and the linkages between the business and the environment. They are expressed through numerical measures both financial and non-financial providing key information about organization environmental issues (environmental impacts of processes, environmental regulatory compliance etc.).
Environmental life cycle assessment (LCA)	Environmental LCA aims to address the environmental aspects of a product and its potential environmental impacts throughout the entire life-cycle. A product's life cycle includes all the stages comprised between product planning and wastes disposal. It supports the forecast of environmental consequences and serves for a timely identification of precautionary measures inside and outside an organization.

Table 10
Source: adaptation from referenced studies.

With reference to the different items the respondents were asked "*How often does your firm use the following techniques related to sustainability accounting?*" and the frequency of use was measured through a seven point Likert scale. The frequency of use can be interpreted as the degree an experience is repetitive over time. In the present study it refers to how often a respondent would usually adopt the techniques during its job. Even if the five techniques considered represent only a sub-set of all the techniques present in the literature, they allow to assess the role that accounting department may have in the management of sustainability issues (Ballou et al., 2012). The questionnaire part related to EMA[11] can be described by the table below (see table 11).

How often does your firm use the following techniques related to sustainability accounting?

(1 = strongly disagree ; 7 = strongly agree)

- Eco-efficiency analysis (SAT1)
- Environmental budget (SAT2)
- Environmental cost accounting (SAT3)
- Environmental performance indicators (SAT4)
- Environmental life cycle assessment (SAT5)

Table 11
Source: *Antecedents of sustainability accounting adoption: Insights from an exploratory path model* by Passetti et al. (2013).

To assess the validity and reliability of the three constructs Cronbach's alpha were later calculated. The results were satisfactory for all the constructs and are shown in the table below (see table 12).

Cronbach's Alpha test

	Environmental strategy	**Environmental oriented operations**	**EMA**
Cronbach's Alpha	0,899	0,869	0,883

Table 12

Once described all the three variables representing environmental management, the section dedicated to the research method used to investigate the internal dimension can be considered concluded. The results of the questionnaire survey will be presented in Chapter III.

[11] Only part of the original questionnaire by Passetti et al. (2013) is considered for the reasons mentioned.

4. External perspective: the content analysis

4.1 Clarkson, Li, Richardson and Vasvari's Disclosure Index

In the present study, the index developed by Clarkson et al. and applied in two different studies[12], published respectively in 2008 and 2011, was used. The index was developed by the mentioned authors in collaboration with an environmental disclosure expert and it is based on the Global Reporting Initiative guidelines[13]. The choice can be widely shared if one considers the significant importance gained by GRI in the sustainability reporting global scene during the last decade[14]. The Clarkson Disclosure Index can be considered a scoring model aiming to measure the extent of a company's environmental disclosure. For what concerns the typology of information sources the index can be employed with, further clarifications are given in the following subsections.

The disclosure index is structured in 95 disclosure items grouped into seven categories coded from A1 to A7. Each disclosure item represents an environmental information unit and refers to a particular section of the GRI guidelines. The disclosure items are equally weighted meaning that the score assigned for each item satisfied is 1 and the maximum score a company can be awarded with for a particular information source is 95. It is worth noting that for the disclosure items related to environmental performance indicators grouped in the category A3, the maximum score that can be assigned is 60 since each of the 10 disclosure items the category is

[12] The studies of reference are Clarkson P., Li Y., Richardson G., Vasvari F. (2008) Revisiting the relation between environmental performance and environmental disclosure: An empirical analysis, *Accounting, Organizations and Society*, Vol. 33, N. 4-5, pp. 303-327 and Clarkson P., Overell M., Chapple L. (2011) Environmental reporting and its relation to corporate environmental performance, *ABACUS*, Vol. 47, N. 1, pp. 27-60.

[13] Since 2000 four different generations of guidelines were elaborated and published by GRI, the most recent one, the G4 Guidelines generation, was launched in May 2013. Clarkson relied for the purpose of his studies on the guidelines published in 2002 or the G2 Guidelines generation. It was decided to base the content analysis on G2 Guidelines as well without updating the Clarkson Disclosure Index according to G3.1 Guidelines for two different reasons. The first reason is that no major evolution took place between the G2 and G3.1 generations for what concerns the environmental section of the guidelines. The second reason is that it was more cautious to employ a content analysis index whose reliability and validity were already been confirmed by previous literature without introducing any modification.

[14] The GRI is an international non-profit organization promoting economic sustainability through sustainability reporting guidelines elaboration. GRI guidelines are regarded as sustainability reporting standards thanks to their wide geographical adoption and to the multi-stakeholder GRI governance structure ensuring general consensus on the guidelines across both business and civil-society organizations stakeholders groups. The guidelines can be applied not only to business organizations but also to public agencies and NGOs. The GRI guidelines encompass all the three sustainable development aspects, not only the environmental one but also the economic and the social ones. From an operational point of view the core of the guidelines consists of a list of information which has to be disclosed by the reporting organization. The single disclosure items are grouped into different categories according to their subject and identified by alphanumerical codes. Disclosure items can be defined as the information elements whose existence in a defined information source researchers are interested in. Disclosure items represent the a priori part of the research framework and are usually arranged in different categories encompassing items referring to the same subject.

made up of can have a score ranging from 0 to 6 according to the quality of the information provided[15].

The major feature dividing the disclosure items in two broad groups is the information objectivity degree: quantitative and more verifiable information can be defined as "*hard disclosure*" whereas qualitative and less verifiable information can be defined as "*soft disclosure*". The categories encompassing hard disclosure items are A1, A2, A3 and A4 corresponding to a maximum score of 79. The categories encompassing soft disclosure items are A5, A6 and A7 corresponding to a maximum score of 16. The different relevance placed on soft disclosure items mirrors the spirit of GRI guidelines and the willingness to give prominence to more objective information. A brief overview of the seven disclosure categories is now provided, by this way some modifications introduced to adapt the index to the Italian context will be presented and some clarifications about not easily interpretable disclosure items will be given.

Category A1 considers the governance structure and the management systems adopted by the company in order to deal with environmental aspects. The category did not require particular interpretation efforts, it is just worth noting that the fulfillment of the A1.5 item "*Implementation of ISO 14001 at the plant and/or firm level*" influenced the coders' judgment in reference to disclosure items of other categories because of simple inferential reasoning. In particular if a company implements the ISO 14001 certification it is undeniable that it will be subjected to periodic independent verifications on its environmental performance and systems. So if the A1.5 disclosure item is fulfilled the A2.3 item "*Periodic independent verifications/audits on environmental performance and/or systems*" will be fulfilled as well for sure. With exception for such obvious cases anyway, it is worth to stress that during the content analysis the inferential reasoning was minimized according to the general principle that disclosure items are fulfilled only when the related information is written down in black and white by the company.

Category A2 inquires the credibility level the disclosure provided by the company has with particular reference to third parties assurances. The interpretation of A2.4 disclosure item was not immediate, eventually it was decided to consider the condition "*Certification of environmental programs by independent agencies*" fulfilled when the company is granted an environmental certification like ISO 14001 or EMAS (Iraldo, Testa and Frey, 2009) by a third party. For A2.8 disclosure item an adaptation to the Italian context was necessary since the item wording refers to EPA and Department of Energy, two US institutions. The condition "*Participation to environmental initiatives*" was considered fulfilled when the mentioned

[15] Please refer to Clarkson et al.'s previously indicated studies for further details.

initiatives are endorsed by Italian institutional entities like Ministero dell'Ambiente, Regioni, Province and Comuni or by acknowledged opinion leaders like WWF or Legambiente.

Category A3 verifies the presence of some specific environmental performance indicators about company's natural resources consumption, polluting emissions and environmental impacts. The information requested is quantitative in nature and it represents hard disclosure in the strict sense. Assessing the items fulfillment the coders referred to charts and graphs in particular and considered the reporting of any absolute or percent figure as necessary in order to assign the score, in addition the figures had to be referred to almost the whole scope of company's activities. For 3.5 disclosure item an adaptation to the Italian context was necessary since the item wording refers to NPI and TRI, two Anglo-Saxon wastes surveillance institutions. The indicator was replaced with the following: "*EPI on materials not renewable in the short term like minerals, metals, oil and other raw materials*". With reference to A3.9 disclosure item about impacts of products and services, reporting resources consumption and emission figures divided by some variable related to the volume of production was considered enough to have the score assigned. The interpretation of A3.10 disclosure item was not immediate, eventually it was decided to consider the condition "*EPI on compliance performance (excedances, reportable incidents)*" fulfilled when some indicator is reported about company's capacity to comply with law requirements. A common example is the comparison between the emission rights granted for free to the company and the emission rights the company had to purchase because of the EU Emission Trading Scheme.

Category A4 focuses on the economic impact of environment related activities, the presence of figures about environmental spending, investments, savings and fines is verified. No particular issue was raised by the items included in the category.

Category A5 measures the extent to which the firm discloses its environmental vision and strategy. Being soft disclosure, this kind of information risks to lack substance and part of the text can be window dressing. In order to minimize the mentioned problems, for the disclosure items included in the category, as a general rule the coders tended to be stricter and assigned the score only when the information provided seemed to have an adequate level of detail. Following the mentioned criteria A5.1 disclosure item was considered fulfilled only when the CEO's statement actually presented some environmental performance achievement or figure. The disclosure of some future environmental objective was considered enough to fulfill the A5.2 item but it was not sufficient to fulfill the A5.5 item, in this case the targets quantification was regarded as necessary. A5.5 disclosure item was considered fulfilled even if only one quantitative environmental target was disclosed like an emission reduction target.

Category A6 focuses on company's environmental profile referring in particular to its compliance with specific environmental standards and to its environmental impacts. It is just worth noting that the fulfillment of the A6.1 item "*A statement about the firm's compliance (or*

lack thereof) with specific environmental standards" depended on the actual specification of a precise environmental law and on a clear compliance or non-compliance declaration by the company.

Category A7 measures the extent to which the company discloses its participation to different environmental initiatives. With reference to A7.4 disclosure item about internal environmental audits execution the score was assigned only when the term "*audit*" was specifically employed in the disclosure provided because a broad interpretation of the item would have been resulted in an overlap with the A5.4 item "*A statement that the firm undertakes periodic reviews and evaluations of its environmental performance*".

4.2 Content analysis process

Since prior studies have measured environmental disclosure mainly through content analysis techniques (Clarkson et al., 2008; Clarkson et al., 2011), this methodology was adopted to assess the intensity of disclosure provided by the companies included in the sample selected. According to Krippendorff (2004), content analysis can be defined as a research technique which allows to make replicable and valid inferences from texts to the contexts of their use. From an operational point of view, the aim of content analysis is to verify if certain information units are present in a defined information source, attributing a frequency or quality based score correspondingly. Slightly different content analysis techniques are used depending on the research context and objectives. The main differences concern the recording unit, the categories, the information source and the coding rules adopted. Despite some differences exist all the techniques rely on a coding system specifying the information to search and how the information should be classified in order to ensure reliable and valid results.

The employed content analysis coding system was based on the index developed by Clarkson et al. and used in two different studies published in 2008 and 2011. This index was chosen as reference because of its widely established acceptance[16] and because it was specifically designed in order to assess the intensity of environmental disclosure. The index has been already described in the previous subsection while in the present subsection explanations are provided about the coding system development. Weber's eight steps scheme (1985) can be a helpful framework to follow in order to develop a proper coding system:

1. The first step required us to choose the recording unit or the unit of information with respect to which the presence of a certain disclosure item in the information source is

[16] Clarkson et al.'s (2008) article employing the index for the first time, is the most cited one published on *Accounting, Organizations and Society* (AOS) journal since 2008. AOS is a major international journal focusing on the relationships between accounting, human behavior, organizations, society and political environment.
See: http://www.journals.elsevier.com/accounting-organizations-and-society/most-cited-articles.

verified. Recording units can be single words, sentences, graphics, charts, tables and photographs (Unerman, 2000). Since the Clarkson Index score attribution is based on the merely presence of a disclosure item in the information source, the recording unit definition did not need to be as strict as in the content analysis where the score attribution is frequency based. In order to verify the presence of disclosure items in the information source it was simply considered the information provided both in a textual and graphical form. Graphics, charts and tables were carefully analyzed in particular when the presence of quantitative information had to be verified;

2. The second step required us to define the disclosure items categories. The Clarkson Index already provided us with a two level hierarchical structure: disclosure items are grouped in seven categories;
3. The third step required us to test the coding procedure in order to ensure the methodology proper application and the shared interpretation of disclosure items. The test was carried out comparing the coding results obtained by two different members of the research team, one of which having significant previous experience in the field. The test was performed at the beginning of the content analysis schedule on a sample of four reports;
4. In the fourth step the test results were assessed in order to ensure the reliability of coding procedure. The comparison showed that the results obtained by the two different coders were almost identical and no significant issue was raised. The more experienced coder's opinion was taken as definitive when the interpretation of disclosure items was more controversial but substantially the two coders agreed on all the coding decisions;
5. In the fifth step the coding procedure should have been revised in order to take into account eventual issues but no major modification was necessary since the methodology adopted was considered adequate;
6. In the sixth step the previous steps of the scheme should have been repeated in order to reach satisfactory reliability but such repetition was not necessary;
7. The seventh step required us to perform the content analysis for the whole sample going through all the information sources. This step was particularly time demanding given the amount of information which had to be analyzed. As clarified in the following subsections the information sources considered in the study were annual reports and financial statements, sustainability reports, environmental reports and corporate websites. Taking into account that for all the documents a two-year analysis was performed, the overall documents subjected to content analysis were: 50 annual reports, 80 financial statements, 29 sustainability reports and 8 environmental reports. It is worth noting that with reference to environmental reports typology a document sometimes just represented the update of the previous one. In these cases even if two

documents were analyzed, they were considered as one and the final score resulted from an aggregation of the two separately calculated scores. The corporate websites analyzed were 62;

8. In the eighth step the analysis overall reliability was checked through a final revision carried out by the most experienced coder on all the cases of uncertain score attribution.

4.3 Data collection and scope of reports analyzed

The index was originally developed by Clarkson et al. to be used to assess companies' voluntary environmental disclosure. The rationale behind the choice is that voluntary disclosure is usually GRI guidelines based and therefore it mostly relies on objective environmental information or hard disclosure items. If the environmental information is objective it can be hardly mimicked by poor environmental performing companies meaning that voluntary disclosure is more reliable in environmental performance discrimination because of its more unlikely forgery. In other words according to Clarkson et al. (2008) the voluntary disclosure is the only kind of information which allows to properly distinguish good and bad environmental performers. Consistently with the above mentioned assumption the scholars employed the index with environmental reports, social responsibility reports and web based disclosures in their 2008 study, excluding corporate annual reports from the analysis. In 2011 study, environmental reports and social responsibility reports were analyzed again but this time annual reports were included in the analysis as well, on the contrary web based disclosures were excluded. As mentioned the literature validated the employment of the index with all the following information sources: environmental stand-alone reports, sustainability reports, annual reports and corporate website contents. Financial statements were not analyzed by Clarkson et al. but this should not be a point of concern since it resulted that financial statements provide no environmental disclosure at all. In the present study the Clarkson Disclosure Index was employed with sustainability reports, annual reports, stand-alone documents regarding environmental performance and corporate website contents. Financial statements were taken into account when annual reports were not published but, as already mentioned, their contribution to environmental disclosure was null.

The scope of corporate information to be analyzed was firstly determined by the willingness to have a comprehensive informative base in order to carry out an exhaustive content analysis giving insights on different communication channels. Secondly the wide scope determination was suggested by the sample of companies selected and thus by the Italian business landscape. Limiting the scope of analysis to sustainability reports only would have been resulted in a severe data availability restriction considering that usually significant financial resources are needed to provide this kind of reporting. Similar considerations can be made about limiting the

scope of analysis to annual reports only since annual reports are mainly produced by listed companies. Thirdly the choice is legitimized by literature as showed previously. Finally it seemed interesting to perform the analysis on all the information sources mentioned in a single study since this research choice seems quite innovative.

Operationally performing the content analysis required a significant amount of time and a rigorous methodological approach. In the very first phase of the process it was necessary to search the different typologies of documents to be analyzed for each company of the sample and to verify if a corporate website existed. The documents research was performed online and when a particular document was actually available it was downloaded for later analysis. Documents were mainly obtained from corporate websites but a wider research was sometimes necessary. All documents were downloaded in .pdf format and a database was created where documents were categorized by typology, year and reporting company. Data availability broadly varied across the different companies of the sample so the rationale followed during this data collecting phase was to find and download as much documents as possible as long as the documents belonged to the period and to the typologies previously defined. Documents were collected on a two-year basis in order to have at disposal two set of data and to calculate average figures, making the content analysis more reliable.

Later a working sheet was realized in order to have a proper idea of the typologies of documents available for each company and a little selection was carried out. The documents and websites eventually taken into account in order to be analyzed are described in the scheme provided below (see table 13).

Reporting sources analyzed

	Annual reports or financial statements (n.)	**Sustainability reports (n.)**	**Env. reports (n.)**	**Corporate websites (n.)**	**Documental sources (n.)**	**Overall sources (n.)**
2010	65	15	1	n.a.	81	n.a.
2011	65	14	4	n.a.	83	n.a.
Total	130	29	5	62	164	226

Table 13

The following table (see table 14) describes the distribution of documental sources across the sample of companies specifying how many companies adopted one particular typology and how the adoption of different documents was combined over the biennium. Since financial statements drafting is always mandatory this source is not included in the table[17]. These figures

[17] While all the companies of the sample issued one financial statement, only 25 of them issued one annual report as well. Consequently for the content analysis 25 annual reports and 40 financial statements were considered for each year.

account only for the adoption of the documents without any consideration about the possible disclosure of sustainability-related information.

Reporting sources adoption choices

	Annual report	**Sustainability report**	**Env. Report**
Companies adopting only	11	2	2
Companies adopting with Annual report		12	2
Companies adopting with Sustainability report	12		1
Companies adopting with Environmental report	2	1	
Total companies adopting	25	15	5

Table 14

In the subsequent phase the coding process was performed on each document selected, company by company. The score attribution procedure was carried out according to the Clarkson Disclosure Index through an Excel based compilation. The standard procedure consisted in creating one Excel sheet for each company with the following framework: the index disclosure items were positioned on the rows and the different typologies of documents available (divided by year) were positioned on the columns. An additional column was created for the website contents analysis as well. Websites contents analysis required us to set clear boundaries, all relevant documents and sections on the official corporate websites were analyzed with exception for website pages clearly unrelated to corporate communication of environmental information. Press review, press releases and news sections were excluded from the analysis as well. As the contents of any website can be changed on a regular basis the complete analysis of the website of each company was performed on a single day and the date was registered for each company. The overall content analysis of the websites was performed between May and June 2013. According to the framework of the present study, documents and website contents are different information sources so already downloaded documents present on the websites were not considered as web contents.

The output of this phase was a single Excel sheet for each company in the sample presenting any environmental information where the extent of the information disclosed was clearly measured and broken down by information source: annual reports, sustainability reports, environmental reports and corporate websites.

Once calculated the disclosure scores the data collection stage can be considered concluded. In Chapter III the data will be presented and the interpretation of the results will be provided.

Chapter III: Analysis and results interpretation

1. Content analysis results

In the current section the empirical results of the content analysis are presented. First the data collected are presented according to an overall perspective then a focus on the single reporting channels is provided. As previously mentioned the final sample consisted of 65 large Italian companies belonging to different industries. Data were collected for 2010 and 2011 and then single average values were obtained to provide the analysis with more reliability. The extent of discretionary environmental disclosure was assessed through Clarkson Disclosure Index for each of the reporting channels considered: annual reports and financial statements, sustainability and environmental reports and corporate websites. The values measured for sustainability reports and environmental reports are presented as an aggregated figure given the affinity between the two sources. Since no environmental information was disclosed through financial statements, this source is not taken into account in the results presentation. Out of the 65 companies included in the final sample 36 (55,38%) chose to provide to any extent discretionary disclosure about the environment through any of the reporting channels. The 29 companies not disclosing any information were allowed in the sample since "*non-disclosure is a choice in a partial disclosure equilibrium setting*" (Clarkson et al., 2008, p. 316) and were attributed an overall disclosure score of zero. Of the overall sample, companies using exclusively one reporting channel were 9. Companies using both annual report and corporate website to disclose environmental information were 8 while companies using both sustainability/environmental report and corporate website were 6. Companies using all the reporting channels together were 13. Companies disclosing environmental information through corporate website were 34 while companies relying exclusively on corporate website were 7. Figures about the general disclosing activity observed for the selected sample are provided in the table below (see table 15)

Reporting channels adoption

	Number of companies disclosing	Percent of companies disclosing (n = 65)
Through at least one reporting channel	36	55,38%
Through Annual report only	2	3,08%
Through Sustainability/Env. report only	0	0,00%
Through Corporate website only	7	10,77%
Through Annual report and Sustainability/Env. report	0	0,00%
Through Annual report and Corporate website	8	12,31%
Through Sustainability/Env. report and Corporate website	6	9,23%
Through Annual report and Sustainability/Env. report and Corporate website	13	20,00%
Through Annual report only + (through Annual report and Corporate website)	10	15,38%
Through Sustainability/Env. Report only + (through Sustainability/Env. Report only and Corporate website)	6	9,23%
Through Corporate website	34	52,31%

Table 15

Once identified the number of disclosing companies and specified how many companies used the different disclosing channels, the figures about the disclosing score can be presented (see table 16). The overall score attributed to the sample across all sources was 1197 representing 19,38% of the maximum score potentially assignable. The average score assigned to the companies was 18,42 out of 95 which is the maximum score a company could be awarded with, according to the disclosure index.

If the overall score is calculated by reporting channel it can be noticed that sustainability and environmental reports are the richest information sources showing a score more than twice with respect to annual reports and almost triple with respect to corporate websites. Annual reports and corporate websites show low and similar scores.

Disclosing scores

	Annual reports	Sustainability and Env. reports	Corporate websites	All sources
Overall score	385	988,5	341	1197
Overall score (%)	6,23%	16,01%	5,52%	19,38%
Overall score average (n = 65)	5,92	15,21	5,25	18,42

Table 16

The following table (see table 17) shows the average awarded scores for all the categories and the disclosure items of the index. The average scores are calculated considering all the sample regardless of different channels actual adoption to provide an overall picture of disclosure across the sample.

Index (average scores all sample)

			Average scores all sample (n = 65)			
		Maximum score	Annual reports	Sustainability and Environmental reports	Corporate websites	All sources
	Hard disclosure items					
A1	**Governance structure and management system**	**6**	**0,52**	**1,05**	**0,85**	**1,48**
1	Existence of a Department for pollution control and/or management position for env. management	1	0,11	0,18	0,08	0,25
2	Existence of an environmental and/or a public issues committee in the board	1	0,05	0,10	0,03	0,12
3	Existence of terms and conditions applicable to suppliers and/or customers regarding env. practices	1	0,07	0,26	0,14	0,29
4	Stakeholder involvement in setting corporate environmental policies	1	0,06	0,19	0,20	0,28
5	Implementation of ISO 14001 at the plant and/or firm level	1	0,22	0,26	0,38	0,46
6	Executive compensation is linked to environmental performance	1	0,02	0,05	0,02	0,07
A2	**Credibility**	**10**	**1,14**	**2,08**	**1,77**	**2,79**
1	Adoption of GRI sustainability reporting guidelines or provision of a CERES report	1	0,09	0,18	0,08	0,18
2	Independent verification/assurance about environmental information disclosed in the EP report/web	1	0,08	0,22	0,05	0,23
3	Periodic independent verifications/audits on environmental performance and/or systems	1	0,21	0,28	0,40	0,48
4	Certification of environmental programs by independent agencies	1	0,21	0,26	0,35	0,45
5	Product certification with respect to environmental impact	1	0,02	0,09	0,09	0,12
6	External environmental performance awards and/or inclusion in a sustainability index	1	0,10	0,15	0,11	0,22
7	Stakeholder involvement in the environmental disclosure process	1	0,07	0,24	0,12	0,27
8	Participation in voluntary environmental initiatives endorsed by institutional entities or acknowledged opinion leaders	1	0,13	0,23	0,18	0,28
9	Participation in industry specific associations/initiatives to improve environmental practices	1	0,15	0,25	0,25	0,36
10	Participation in other environmental organizations/associations to improve environmental practices (if not awarded under 8 or 9 above)	1	0,08	0,18	0,14	0,21
A3	**Environmental performance indicators (EPIs)**	**60**	**2,73**	**9,25**	**1,22**	**10,51**
1	EPI on energy use and/or energy efficiency	6	0,48	1,12	0,26	1,38
2	EPI on water use and/or water use efficiency	6	0,52	1,25	0,23	1,52
3	EPI on GHG emissions	6	0,45	1,32	0,20	1,47
4	EPI on other air emissions	6	0,25	1,12	0,06	1,16

5	EPI on materials not renewable in the short term like minerals, metals, oil and other raw materials	6	0,03	0,86	0,02	0,90
6	EPI on other discharges, releases and/or spills	6	0,15	0,79	0,05	0,79
7	EPI on waste generation and/or management (recycling, re-use, reducing, treatment and disposal)	6	0,42	1,20	0,18	1,41
8	EPI on land and resources use, biodiversity and conservation	6	0,01	0,45	0,00	0,45
9	EPI on environmental impacts of products and services	6	0,20	0,61	0,15	0,83
10	EPI on compliance performance (excedances, reportable incidents)	6	0,22	0,55	0,06	0,59
A4	**Environmental spending**	**3**	**0,17**	**0,32**	**0,06**	**0,38**
1	Summary of dollar savings arising from environment initiatives to the company	1	0,02	0,03	0,00	0,03
2	Amount spent on technologies, R&D and/or innovations to enhance environmental performance and/or efficiency	1	0,08	0,16	0,06	0,19
3	Amount spent on fines related to environmental issues	1	0,07	0,13	0,00	0,16
	Soft disclosure items					
A5	**Vision and strategy claims**	**6**	**0,86**	**1,39**	**0,89**	**1,89**
1	CEO statement on environmental performance in letter to shareholders and/or stakeholders	1	0,04	0,18	0,00	0,19
2	A statement of corporate environmental policy, values and principles, environmental codes of conduct	1	0,19	0,28	0,40	0,48
3	A statement about formal management systems regarding environmental risk and performance	1	0,12	0,19	0,05	0,23
4	A statement that the firm undertakes periodic reviews and evaluations of its environmental performance	1	0,13	0,22	0,14	0,28
5	A statement of measurable goals in terms of future environmental performance (if not awarded under A3)	1	0,11	0,25	0,06	0,28
6	A statement about specific environmental innovations and/or new technologies.	1	0,27	0,28	0,25	0,43
A6	**Environmental profile**	**4**	**0,27**	**0,47**	**0,22**	**0,62**
1	A statement about the firm's compliance (or lack thereof) with specific environmental standards	1	0,11	0,19	0,03	0,24
2	An overview of environmental impact of the industry	1	0,05	0,03	0,05	0,06
3	An overview of how the business operations and/or products and services impact the environment	1	0,12	0,22	0,12	0,28
4	An overview of corporate environmental performance relative to industry peers	1	0,00	0,03	0,02	0,05
A7	**Environmental initiatives**	**6**	**0,24**	**0,63**	**0,25**	**0,74**
1	A substantive description of employee training in environmental management and operations	1	0,02	0,07	0,00	0,08
2	Existance of response plans in case of environmental accidents	1	0,02	0,12	0,00	0,13
3	Internal environmental awards	1	0,01	0,02	0,02	0,02
4	Internal environmental audits	1	0,09	0,18	0,03	0,22
5	Internal certification of environmental programs	1	0,00	0,00	0,00	0,00

6	Community involvement and/or donations related to environment (if not awarded under A1.4 or A2.7)	1	0,10	0,25	0,20	0,29

Table 17

First of all it is worth noting that, with reference to all sources figures, hard disclosure categories and soft disclosure categories perform similarly since they are attributed respectively with 19,19% and 20,31% of the maximum score assignable. Hard and soft disclosure categories perform almost the same also with reference to sustainability and environmental reports. With reference to annual reports and corporate websites the result changes since soft disclosure categories perform better than the hard ones. This asymmetry is probably due to the great difference of performance concerning category A3. On average sustainability and environmental reports are attributed with 9,25 points while annual report and corporate websites respectively with 2,73 and 1,22 points.

With reference to all sources figures, the best performing category is A5 "Vision and strategy claims" (31,5% of maximum score) followed by A2 "Credibility" (27,9% of maximum score) while the worst performing one is A7 "Environmental initiatives" (12,3% of maximum score) followed by A4 "Environmental spending" (12,8% of maximum score). This exact ranking is repeated with reference to sustainability and environmental reports. With reference to annual reports the ranking is almost the same except for the worst performing categories: A7 "Environmental initiatives" followed by A3 "Environmental performance indicators". With reference to websites the ranking varies, the best performing category is A2 "Credibility" followed by A5 "Vision and strategy claims" while the worst performing one is A3 "Environmental performance indicators", followed by A4, "Environmental spending".

The most frequently mentioned disclosure items are the ones related to independent verifications (48% of maximum score) corporate environmental policy (48% of maximum score), UNI EN ISO 14001 certification (46% of maximum score) and environmental innovations or new technologies (43% of maximum score). On the opposite the barely mentioned disclosure items are the ones related to internal environmental programs and awards (respectively 0% and 2% of maximum score), savings arising from environmental initiatives (3% of maximum score), environmental performance relative to industry peers (5% of maximum score) and the environmental impact of the industry (6% of maximum score). The table below (see table 18) indicates for each category the two most frequently mentioned items and the least frequently mentioned one.

Most and least disclosed items by category

Category	Most disclosed items	Least disclosed item
A1 Governance structure and management system	• Implementation of ISO 14001 at the plant and/or firm level • Existence of terms and conditions applicable to suppliers and/or customers regarding env. practices	• Executive compensation is linked to environmental performance
A2 Credibility	• Periodic independent verifications/audits on environmental performance and/or systems • Certification of environmental programs by independent agencies	• Product certification with respect to environmental impact
A3 Environmental performance indicators (EPIs)	• EPI on water use and/or water use efficiency • EPI on GHG emissions	• EPI on land and resources use, biodiversity and conservation
A4 Environmental spending	• Amount spent on technologies, R&D and/or innovations to enhance environmental performance and/or efficiency • Amount spent on fines related to environmental issues	• Summary of dollar savings arising from environment initiatives to the company
A5 Vision and strategy claims	• A statement of corporate environmental policy, values and principles, environmental codes of conduct • A statement about specific environmental innovations and/or new technologies	• CEO statement on environmental performance in letter to shareholders and/or stakeholders
A6 Environmental profile	• An overview of how the business operations and/or products and services impact the environment • A statement about the firm's compliance (or lack thereof) with specific environmental standards	• An overview of corporate environmental performance relative to industry peers
A7 Environmental initiatives	• Community involvement and/or donations related to environment • Internal environmental audits	• Internal certification of environmental programs

Table 18

The following table (see table 19) shows again the average awarded scores for all the categories and the disclosure items of the index but this time the average scores are calculated considering for each channel only the actual adopters. Instead of providing an overall picture of

disclosure, interesting insights are given about the information contents of the different channels.

Index (average score by source users)

		Maximum score	Average scores by source users: Annual reports (n = 25)	Sustainability and Environmental reports (n = 19)	Corporate websites (n = 62)
	Hard disclosure items				
A1	**Governance structure and management system**	**6**	**1,34**	**3,61**	**0,89**
1	Existence of a Department for pollution control and/or management position for env. management	1	0,28	0,63	0,08
2	Existence of an environmental and/or a public issues committee in the board	1	0,12	0,34	0,03
3	Existence of terms and conditions applicable to suppliers and/or customers regarding env. practices	1	0,18	0,89	0,15
4	Stakeholder involvement in setting corporate environmental policies	1	0,16	0,66	0,21
5	Implementation of ISO 14001 at the plant and/or firm level	1	0,56	0,89	0,40
6	Executive compensation is linked to environmental performance	1	0,04	0,18	0,02
A2	**Credibility**	**10**	**2,96**	**7,13**	**1,85**
1	Adoption of GRI sustainability reporting guidelines or provision of a CERES report	1	0,24	0,63	0,08
2	Independent verification/assurance about environmental information disclosed in the EP report/web	1	0,20	0,76	0,05
3	Periodic independent verifications/audits on environmental performance and/or systems	1	0,54	0,95	0,42
4	Certification of environmental programs by independent agencies	1	0,54	0,89	0,37
5	Product certification with respect to environmental impact	1	0,06	0,32	0,10
6	External environmental performance awards and/or inclusion in a sustainability index	1	0,26	0,53	0,11
7	Stakeholder involvement in the environmental disclosure process	1	0,18	0,82	0,13
8	Participation in voluntary environmental initiatives endorsed by institutional entities or acknowledged opinion leaders	1	0,34	0,79	0,19
9	Participation in industry specific associations/initiatives to improve environmental practices	1	0,38	0,84	0,26
10	Participation in other environmental organizations/associations to improve environmental practices (if not awarded under 8 or 9 above)	1	0,22	0,61	0,15
A3	**Environmental performance indicators (EPI)**	**60**	**7,10**	**31,66**	**1,27**
1	EPI on energy use and/or energy efficiency	6	1,24	3,84	0,27
2	EPI on water use and/or water use efficiency	6	1,34	4,26	0,24
3	EPI on GHG emissions	6	1,16	4,53	0,21
4	EPI on other air emissions	6	0,66	3,82	0,06
5	EPI on materials not renewable in the short term like minerals, metals, oil and other raw materials	6	0,08	2,95	0,02

6	EPI on other discharges, releases and/or spills	6	0,40	2,71	0,05
7	EPI on waste generation and/or management (recycling, re-use, reducing, treatment and disposal)	6	1,10	4,11	0,19
8	EPI on land and resources use, biodiversity and conservation	6	0,02	1,53	0,00
9	EPI on environmental impacts of products and services	6	0,52	2,08	0,16
10	EPI on compliance performance (excedances, reportable incidents)	6	0,58	1,87	0,06
A4	**Environmental spending**	**3**	**0,44**	**1,11**	**0,06**
1	Summary of dollar savings arising from environment initiatives to the company	1	0,06	0,11	0,00
2	Amount spent on technologies, R&D and/or innovations to enhance environmental performance and/or efficiency	1	0,20	0,55	0,06
3	Amount spent on fines related to environmental issues	1	0,18	0,45	0,00
	Soft disclosure items				
A5	**Vision and strategy claims**	**6**	**2,24**	**4,76**	**0,94**
1	CEO statement on environmental performance in letter to shareholders and/or stakeholders	1	0,10	0,61	0,00
2	A statement of corporate environmental policy, values and principles, environmental codes of conduct	1	0,50	0,95	0,42
3	A statement about formal management systems regarding environmental risk and performance	1	0,32	0,66	0,05
4	A statement that the firm undertakes periodic reviews and evaluations of its environmental performance	1	0,34	0,74	0,15
5	A statement of measurable goals in terms of future environmental performance (if not awarded under A3)	1	0,28	0,87	0,06
6	A statement about specific environmental innovations and/or new technologies.	1	0,70	0,95	0,26
A6	**Environmental profile**	**4**	**0,70**	**1,61**	**0,23**
1	A statement about the firm's compliance (or lack thereof) with specific environmental standards	1	0,28	0,66	0,03
2	An overview of environmental impact of the industry	1	0,12	0,11	0,05
3	An overview of how the business operations and/or products and services impact the environment	1	0,30	0,74	0,13
4	An overview of corporate environmental performance relative to industry peers	1	0,00	0,11	0,02
A7	**Environmental initiatives**	**6**	**0,62**	**2,16**	**0,26**
1	A substantive description of employee training in environmental management and operations	1	0,04	0,24	0,00
2	Existance of response plans in case of environmental accidents	1	0,06	0,39	0,00
3	Internal environmental awards	1	0,02	0,08	0,02
4	Internal environmental audits	1	0,24	0,61	0,03
5	Internal certification of environmental programs	1	0,00	0,00	0,00
6	Community involvement and/or donations related to environment (if not awarded under A1.4 or A2.7)	1	0,26	0,84	0,21

Table 19

Hard and soft disclosures provided by sustainability and environmental reports adopters perform almost equally since the score awarded to hard disclosure categories is 55,06% of the maximum assignable while the one awarded to soft disclosure categories is 53,29%. The most disclosed categories are A5 "Vision and strategy claims" and A2 "Credibility" while the less disclosed ones are A7 "Environmental initiatives", and A4 "Environmental spending". The first two categories reach respectively 79,39% and 71,32% of the potential score while the least two respectively 35,96% and 36,84%. The most frequently mentioned disclosure items are the ones related to independent verifications, corporate environmental policy, environmental innovations or new technologies, terms and conditions regarding environmental practices applicable to suppliers and UNI EN ISO 14001 certification. The percentage of potential score reached for all these disclosure items is particularly high, ranging between 94,74% and 89,47%. On the opposite the barely mentioned disclosure items are the ones related to internal environmental programs and awards, savings arising from environmental initiatives, environmental performance relative to industry peers and environmental impact of the industry.

Soft disclosure provided by annual reports adopters performs better than the hard one since the score awarded to soft disclosure categories is 22,25% of the maximum assignable while the one awarded to hard disclosure categories is 14,99%. The most disclosed categories are A5 "Vision and strategy claims" and A2 "Credibility" while the less disclosed ones are A7 "Environmental initiatives" and A3 "Environmental performance indicators". The first two categories reach respectively 37,33% and 29,60% of the potential score while the least two respectively 10,33% and 11,83%. The most frequently mentioned disclosure items are the ones related to environmental innovations or new technologies, independent verifications, UNI EN ISO 14001 certification and corporate environmental policy. On the opposite the barely or not at all mentioned disclosure items are the ones related to internal environmental programs and awards, environmental performance relative to industry peers, EPIs on land, resources or biodiversity and environmental performance linked compensations.

Similarly also for corporate websites adopters soft disclosure is higher since the score awarded to soft disclosure categories is 8,87% while the one awarded to hard disclosure categories is 5,17%. The most disclosed categories are A2 "Credibility", followed by A5 "Vision and strategy claims" while the less disclosed ones are A3 "Environmental performance indicators" and A4 "Environmental spending". The first two categories reach respectively 18,55% and 15,59% of the potential score while the least two respectively 2,12% and 2,15%. The most frequently mentioned disclosure items are the ones related to independent verifications, corporate environmental policy, UNI EN ISO 14001 certification, environmental innovations or new technologies and participation in industry specific green associations and practices. On the opposite seven disclosure items are not mentioned at all: EPIs on land,

resources or biodiversity, savings arising from environmental initiatives to the company, amount spent on fines related to environmental issues, CEO's letter on environmental performance, description of employee environmental training, response plans in case of environmental accidents, internal environmental programs and awards.

2. Survey results

In the current section the empirical results of the survey concerning the management of environmental aspects are presented.

The overall score totaled through the survey was 4424 corresponding to an average score by item of 4,00 out of 7. If the overall score is broken down by question it can be noticed that the survey section related to environmental oriented operations was the one to score better (4,48 average score by item) closely followed by environment oriented strategy related section (4,36 average score by item) while the section related to EMA was the one to score worse (3,03 average score by item). Standard deviation values of average scores are similar with reference to all the questions. The results obtained point out clearly that, for the sample selected, the attention devoted to EMA is inferior with respect to the one devoted to environment oriented strategy and operations. The described results are shown in the table below (see table 20).

Survey scores

	Environmental oriented strategy	**Environmental oriented operations**	**EMA**	**All questions**
Overall score	1982	1456	986	4424
Average score by item (sample average)	4,36	4,48	3,03	4,00
Standard deviation	1,35	1,34	1,44	1,25

Table 20

The table below (see table 21) indicates for each question the two items awarded with the highest scores and the two items awarded with the lowest ones.

Top and bottom survey items by question

Question	Top items	Score	Bottom items	Score
Env. oriented strategy	• Targets for hazardous waste reduction are fixed and communicated	4,83	• The incentive systems are linked with environmental targets	3,32
	• There are continuous investments in environmental friendly technologies	4,75	• Systematic management and dissemination of knowledge oriented to organisational learning of environmental and social issues	4,15
Env. oriented operations	• Substitution of hazardous material	5,45	• Alliances with suppliers and customers to address environmental and social issues	3,63
	• Reutilization of the waste generated by the production	4,66	• Environmental and social product redesign	4,25
EMA	• Environmental performance indicators	3,63	• Eco-efficiency analysis	2,62
	• Environmental life cycle assessment	3,48	• Environmental cost accounting	2,62

Table 21

3. Environmental management matching with environmental disclosure

3.1 Variables presentation and normality testing

In the present section the data set collected through the survey is matched with the data set collected through the content analysis to test if consistency exists between environmental management and environmental disclosure for the sample selected. In the current subsection the variables are described and tested for normality in order to select the adequate correlation method to apply. In the next subsection the correlation analysis is performed for all the sample then the sample is broken down into two sub-samples to check if the results obtained for the sample as a whole are still valid. The matching will be performed through a correlation analysis between the two set of variables. One set measures the attention devoted by the single companies to the three different aspects of environmental management separately and jointly. The other set measures the extent of environmental information disclosed by the single companies through the different channels separately and jointly. The two set of variables are identified in the tables below (see table 22).

Variables related to environmental management

Variable description	Variable code
Average environmental oriented strategy items survey scores	**EOS_Average**
Average environmental oriented operations items survey scores	**EOP_Average**
Average EMA items survey scores	**EMA_Average**
Average scores (all dimensions)	**EM_Average**

Variables related to environmental disclosure

Variable description	Variable code
Overall disclosure scores through annual reports	**AR**
Overall disclosure scores through sustainability or environmental reports	**SR_SAER**
Overall disclosure scores through corporate websites	**WEB**
Overall disclosure scores (all sources)	**TOT_Disclosure**

Table 22

In the following table (see table 23) the variables main statistics are presented comprehensively. For environmental management variables, mean and median values are almost equivalent suggesting the normal distribution of data. For environmental disclosure variables, mean and median values widely differ suggesting non-normal distribution of data. Median values in particular are very low or zero suggesting a right-skewed distribution.

Variables statistics

	Mean	Median	Minimum	Maximum	Std. Deviation
EOS_Average	4,36	4,57	1,71	7,00	1,35
EOP_Average	4,48	4,60	1,00	7,00	1,34
EMA_Average	3,03	3,00	1,00	6,00	1,44
EM_Average	4,00	4,18	1,59	6,41	1,25
AR	5,92	,00	,00	48,50	11,82
SR_SAER	15,21	,00	,00	71,00	25,14
WEB	5,25	3,00	,00	37,00	7,70
TOT_Disclosure	18,42	4,00	,00	72,00	25,19

Table 23

Normality testing was performed for all variables according to Kolmogorav-Smirnov and Shapiro-Wilk methods even if the latter should be mainly taken into account since it is more appropriated for small sample sizes. The normality testing results are showed in the table below (see table 24).

Variables normality testing

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
EOS_Average	,089	65	,200*	,970	65	,118
EOP_Average	,087	65	,200*	,973	65	,160
EMA_Average	,083	65	,200*	,952	65	,013
EM_Average	,095	65	,200*	,966	65	,070
AR	,338	65	,000	,576	65	,000
SR_SAER	,435	65	,000	,618	65	,000
WEB	,248	65	,000	,716	65	,000
TOT_Disclosure	,313	65	,000	,717	65	,000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 24

According to numerical analysis the variables related to environmental disclosure are not normally distributed and further graphical analysis confirmed this result. The absence of normality can be explained by the presence of 29 companies not disclosing at all, causing the distributions to be asymmetric. The presence in the model of not normally distributed variables influenced the choice of the correlation test to use since parametric correlation testing has stricter underlying assumptions[18] with respect to non-parametric one. Since non-parametric correlation testing does not require normally distributed data this methodology is used in the present study. Non parametric testing is also suggested by the ordinal nature of Likert scale based variables. This methodological choice is confirmed by previous literature (Ax and Marton, 2008).

3.2 Correlation analysis

In the current subsection the results of non-parametric correlation analysis are presented (see table 25). Spearman's rank correlation method is employed since it was preferred to Kendall's one by previous literature performing similar analyses (Frost and Seamer, 2002; Van Staden and Hooks, 2007).

[18] Underlying assumptions for parametric correlation analysis are: both variables are continuous, data are interval or ratio measured, both variables are normally distributed, the relationship between the two variables is linear.
For further reference on parametric and non-parametric correlation see: *Handbook of Parametric and Nonparametric Statistical Procedures* by Sheskin (2003).

Correlations

			AR	SR_SAER	WEB	TOT_Disclosure
Spearman's rho	EOS_Average	Correlation Coefficient	,431**	,470**	,490**	,518**
		Sig. (2-tailed)	,000	,000	,000	,000
		N	65	65	65	65
	EOP_Average	Correlation Coefficient	,276*	,342**	,338**	,379**
		Sig. (2-tailed)	,026	,005	,006	,002
		N	65	65	65	65
	EMA_Average	Correlation Coefficient	,351**	,266*	,366**	,352**
		Sig. (2-tailed)	,004	,032	,003	,004
		N	65	65	65	65
	EM_Average	Correlation Coefficient	,389**	,402**	,447**	,470**
		Sig. (2-tailed)	,001	,001	,000	,000
		N	65	65	65	65

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 25

All the tested correlations proved positive and statistically significant. All correlations are significant at the 0.01 level with exception for two which are significant at the 0.05 level. Results support the argument that the level of attention to environmental management is positively associated to the extent of environmental disclosure. The association is positive both for the single reporting channels and for the whole disclosing activity. Correlation analysis results are discussed in a later section.

In order to corroborate the results obtained for the sample as a whole, the analysis was repeated for two sub-samples identified according to disclosing performance. Good communicators (GC) sub-sample included the companies scoring above the average for TOT_Disclosure variable while poor communicators sub-sample (PC) included the companies scoring below. The following table compares the main characteristics of the sub-samples and of the sample as a whole (see table 26).

Sub-samples and entire sample statistics

	N	Average EOS_Average	Average EOP_Average	Average EMA_Average	Average EM_Average	Average TOT_Disclosure
GC	21	5,37	5,20	3,73	4,84	52,64
PC	44	3,87	4,14	2,70	3,60	2,08
Whole sample	65	4,36	4,48	3,03	4,00	18,42

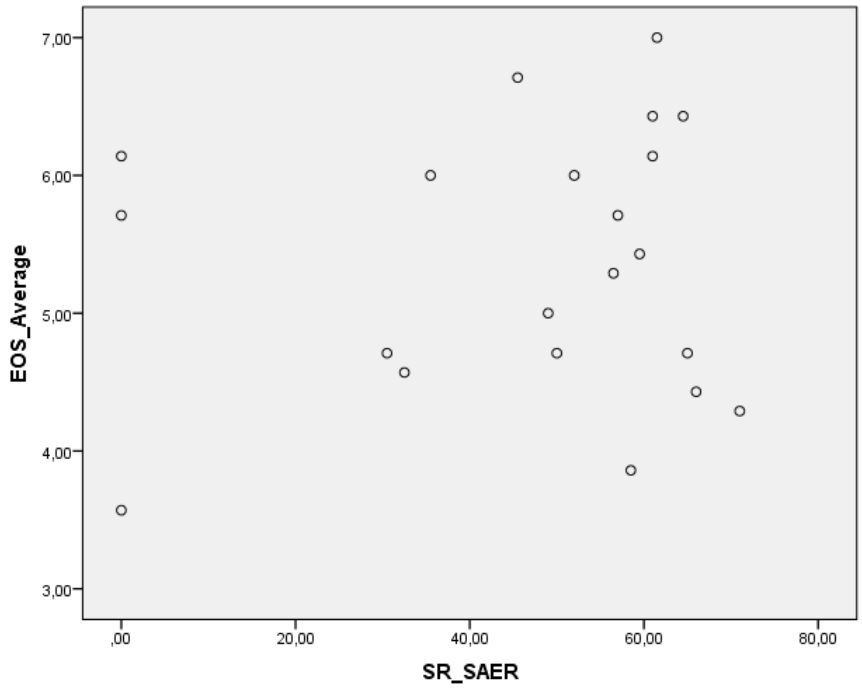
Table 26

The figures in the table provide a first confirmation of the results previously obtained through the correlation analysis. In fact GC sub-sample on average scores above the entire sample for all the variables related to environmental management while PC sub-sample on

average scores below. This is a rough evidence that a positive association exists between attention devoted to environmental management and extent of environmental disclosure even at sub-sample level. On the contrary, the correlation analysis repeated for the single sub-samples did not provide significant results. Nevertheless this should not be a reason of concern since different explanations can be found for this result both for GC sub-sample and PC sub-sample.

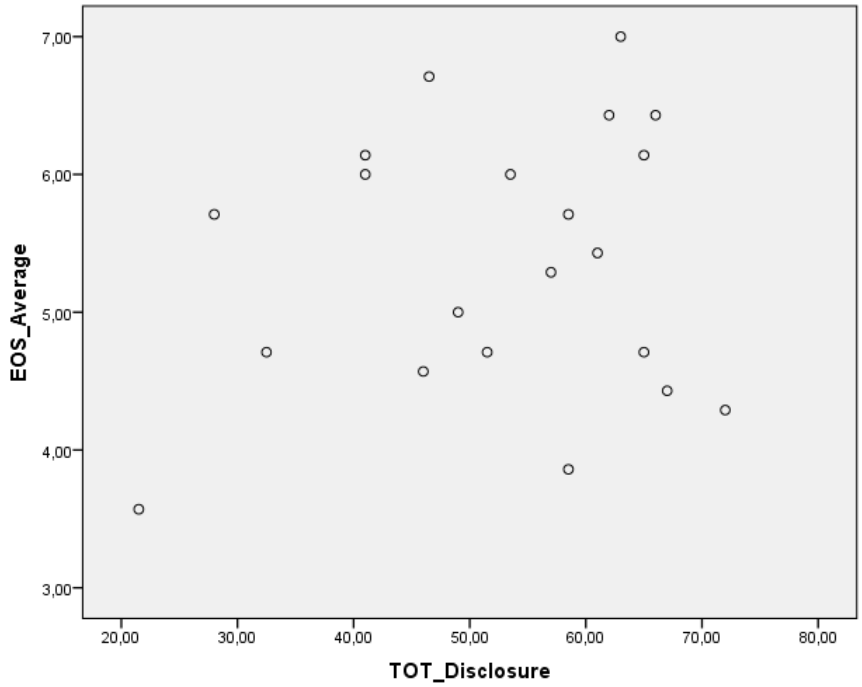
For what concerns GC sub-sample, since it counts only 21 observations, the small size is probably the reason behind correlation non-significant results. This explanation is supported by scatter graph at least for the correlation between EOS_Average and SR_SAER (see graph 1) and between EOS_Average and TOT_Disclosure (see graph 2). Even if the observed values are quite dispersed, they can be supposed to follow a linear positive trend.

Scatter graph for environmental strategy and sustainability/environmental reports disclosure variables (GC sub-sample)



Graph 1

Scatter graph for environmental strategy and overall disclosure variables (GC sub-sample)



Graph 2

For what concerns PC sub-sample, correlation non-significant results are probably due to the high number of not disclosing companies, scoring zero with respect to TOT_Disclosure variable. It is argued that the absence of disclosure may be explained by companies' dimension or by industry environmental sensitivity, maintaining the hypothesis of a positive correlation between environmental management and disclosure. The smaller companies of the sample may not have the financial resources necessary to disclose sustainability related information despite actual managerial commitment[19]. The companies belonging to less environmentally sensitive industries are expected to face lower environmental pressure by stakeholders, so it is reasonable to assume that they will disclose less about environment (Frost and Wilmshurst, 2000). In order to verify if the smaller size of some companies belonging to the sample could be associated to null disclosure, Spearman's rank correlation between SIZE, a proxy[20] for corporate dimension, and TOT_Disclosure was performed (see table 27).

[19] According to Clarkson et al. (2008) the size is widely accepted as a determinant of voluntary disclosure in literature.

[20] The proxy for corporate size was calculated as the total number of employees with reference to 2011 fiscal year. The figure was not available for three companies.

Correlation between overall disclosure and size

			TOT_Disclosure
Spearman's rho	**SIZE**	Correlation Coefficient	,513**
		Sig. (2-tailed)	,000
		N	62

**. Correlation is significant at the 0.01 level (2-tailed).

Table 27

The correlation results are positive and statistically significant at the 0.01 level supporting the hypothesis that the behavior of not disclosing companies may be influenced by size. Further support is provided by the comparison of SIZE mean and median values between the group of disclosing and not disclosing companies (see table x).

Disclosing and not disclosing companies size statistics

	N	SIZE mean	SIZE median
Not disclosing companies	28	427,21	334,00
Disclosing companies	34	5573,68	625,50

Table 28

In order to verify if the membership in less environmentally sensitive industries of some companies belonging to the sample could be associated to null disclosure, Pearson correlation between INDUSTRY, a proxy[21] for industry environmental sensitivity, and TOT_Disclosure was performed (see table 29).

Correlation between overall disclosure and industry membership

			TOT_Disclosure
Pearson Correlation	**INDUSTRY**	Correlation Coefficient	,561**
		Sig. (2-tailed)	,000
		N	65

**. Correlation is significant at the 0.01 level (2-tailed).

Table 29

The correlation results are positive and statistically significant at the 0.01 level supporting the hypothesis that the behavior of not disclosing companies may be influenced by industry

[21] The proxy for industry environmental sensitivity was calculated as a dichotomous variable. According to Frost and Wilmshurst (2000) the following industries were considered as more environmentally sensitive: mining and resources, chemicals and pharmaceutics, oil gas and consumable fuels, utilities, forest, paper and pulp.

membership. Further support is provided by the fact that 21 out of 29 not disclosing companies belong to less environmentally sensitive industries.

4. Results interpretation

4.1 Contribution to literature

This study has explored the disclosure and the management of environmental issues according to both stand-alone and combined perspectives in the Italian context. It contributes to previous literature on environmental management and reporting in a number of ways. First, it provides insights on environmental disclosure activity through different reporting channels. Second, it provides insights on environmental management different aspects. Third, it examines the relationship between external disclosure and internal aspects in the light of legitimacy theory. All the mentioned contributions are discussed in the following subsections.

4.2 External perspective

The analysis of environmental disclosure provided an interesting overview of environmental reporting activity, channels and contents with reference to the Italian context.

With reference to overall reporting activity the main results to observe are the number of not disclosing companies and the disclosure score awarded on average. The percentage of not disclosing companies out of the entire sample was 44,62% while the percentage of disclosure score awarded on average out of the maximum assignable was 19,38% considering the entire sample. In order to provide an interpretation of these figures a comparison can be performed with the results obtained by Clarkson et al. in previous studies. With reference to not disclosing companies ratio in Clarkson et al.'s 2008 study the corresponding figure was 36,13%, a clearly lower value with respect to the one resulting from the present study. With reference to the average score awarded ratio in Clarkson et al.'s 2008 study the figure was 12,83% and in 2011 study it was 16,68%. The comparison between average score ratios should be performed taking into account that the figures obtained by Clarkson et al. refer respectively to 2003 and 2006 fiscal years and result from the analysis of less reporting channels[22]. Given these specifications it is quite clear that even if the average score ratio obtained in the present study is slightly higher than the ones obtained in Clarkson et al.'s previous studies, it may suggest a poorer extent of disclosure in relative terms. Even if the methodological peculiarities of the different studies do not allow to draw decisive conclusions, the different results may suggest that

[22] In Clarkson et al.'s 2008 study annual reports were not considered while in 2011 study web disclosure was not considered.

environmental reporting in the Italian context may be less developed with respect to the Anglo-Saxon one. This deduction is neither confirmed nor denied by a recent KPMG research (KPMG, 2011) ranking Italy in an intermediate position between US and Australia for what concerns sustainability reporting adoption ratio and maturity. In any case the development of environmental reporting activity observed for the sample selected did not seem high.

With reference to reporting channels the most relevant findings concern respectively channels adoption choices and the relative extent of information disclosed. If disclosing companies have to choose one unique reporting channel their choice more likely falls on corporate website even if companies do not seem likely to use one single reporting channel (only one fourth of disclosing companies). If companies decide to provide environmental information through annual report or sustainability/environmental report, web disclosure is almost always present, in fact almost no companies use annual report or sustainability/environmental report as unique reporting channels and no companies use them jointly without using the web. If disclosing companies have to choose one reporting channel between annual report and sustainability or environmental report their choice more likely falls on annual report (more than one fourth of disclosing companies). The choice to disclose environmental information using all the reporting channels is quite popular (more than one third of disclosing companies).

These findings are rather consistent with the results obtained in a previous study by Van Staden and Hooks (2007) in the New Zealand setting, according to which more than one third of disclosing companies adopted a stand-alone environmental report while half of them used the annual report as main disclosing channel. The fact that web disclosure very often sides annual reports and sustainability or environmental reports may be consistent with an integrated approach to web and documental disclosure. As suggested by Scott and Jackson (2002, p. 197), companies may use the web "*as an additional medium to improve and add value*" to other channels. Annual reports leading role as unique document to disclose environmental information may be due to the mandatory nature of annual reports for larger companies compared to the voluntary nature of sustainability and environmental reports. Since companies have to publish the annual report to account for financial performance, they may be more likely to account for environmental performance in the same document instead of publishing an additional one. Web disclosure advantages are well-known in previous literature (Scott and Jackson, 2002) and may be the reason behind the observed wide adoption of websites to disclose environmental information. The advantages of web disclosure were previously described in Chapter I, Section 3. According to content analysis results, sustainability and environmental reports are by far the richest environmental information source. Since sustainability and environmental reports are specifically designed to provide sustainability

related information this finding is not surprising, in addition it is consistent with previous literature (Van Staden and Hooks, 2007).

With reference to information contents the most interesting findings concern the information nature and the topics most frequently disclosed. Data collected show that at aggregated level hard and soft disclosure categories scored almost equally with respect to the maximum score assignable. However considering that in absolute terms the disclosure index used places more weight on hard disclosure categories, it results that on average the information disclosed is prevalently objective in nature. This result is confirmed with reference to sustainability and environmental reports only. The results obtained by Clarkson et al. in previous works are quite different since both in 2008 and 2011 studies the score awarded to soft disclosure in relative terms was higher than the one awarded to hard disclosure. This may suggest that a general progress is in act towards more objective and verifiable disclosure or that in the Italian context the environmental information provided is on average higher quality than the one provided in the Anglo-Saxon context. The first hypothesis would be supported by the fact that the number of sustainability reports registered on the GRI Reports List increased sharply in the last decade (GRI, 2011) suggesting that an increasing number of companies worldwide is adopting stricter and more objective sustainability reporting standards. The second hypothesis would be supported by the previously mentioned research by KPMG ranking Italy above all Anglo-Saxon countries with regard to sustainability disclosure quality. It is worth noting that, with reference to annual reports and websites only, the information disclosed was less objective in nature with respect to aggregated results, probably because of the deep gap observed concerning the results of environmental performance indicators.

It is interesting to observe the most frequently reported topics resulting from the scores attributed to the different categories of the disclosing index. The themes related to A5 "Vision and strategy claims" and A2 "Credibility" are the most disclosed and concordance exists between aggregate and single channel level. A5 "Vision and strategy claims" category was the most disclosed one. The reasons why companies (more than half of the disclosing ones) communicate to a great extent information about environmental policies, values, targets and innovations may be various. Possible reasons may be the importance placed on the subject internally, stakeholders' pressure and the relative ease of collecting related information. First, the internal relevance of environmental strategy should not be surprising if it is considered that strategy formulation is at the base of all environment related objectives, management systems and operations. In fact environmental strategy development was found to have a central role in explaining companies activities in a number of previous studies (Passetti et al., 2013; Christ and Burritt, 2013). Second, previous literature (Buysse and Verbeke, 2003) suggested that stakeholders are likely to influence to some extent the environmental strategy adopted by companies. In a context of "*increasing pressure from various stakeholders to reduce the impact*

of its activities on the physical environment" (Christ and Burritt, 2013, p. 163) the company may disclose environmental strategy related information to a greater extent in order to respond to stakeholders' pressures more effectively. Third, environmental strategy and principles related information should be easy for the company to collect given its soft nature and internal provenience. The fact that environmental strategy and principles related category resulted to be the most disclosed one is consistent with Clarkson et al.'s previous studies (2008; 2011). Instead credibility of disclosure related category was not one of the top disclosed categories according to Clarkson et al.'s studies. This finding is consistent with the hypothesis formulated previously about growing objectivity of environmental information disclosed or the superior quality of environmental information in the Italian context. The themes related to environmental initiatives and environmental spending are the less disclosed at aggregated level while at single channel level some diversity exists. The observation that marginal room is left to monetary and economic aspects of sustainability is supported by previous literature (Van Staden and Hooks, 2007). Even if this finding contrasts with previously observed orientation towards objective disclosure it may be explained by really sensitive nature of information (investments and fines related to environment) or by measuring difficulties (savings arising from environmental initiatives). An additional explanation for the lack of disclosure concerning environmental investments may be the possible negative short-term stock market's reactions (Halme and Niskanen, 2001). With reference to low disclosure of environmental initiatives a comprehensive interpretation is not easy to provide because of the heterogeneous nature of items included in this category of the index.

Although a general orientation towards objective disclosure was registered, it is possible to observe that the preeminence accorded by companies to certain themes confers to the disclosure provided an overall positive tone. Themes more likely to shed a good light on the stance of the companies towards environmental sustainability seem to be addressed to a greater extent than the ones more likely to show criticalities and deficiencies. Environmental strategy and principles related subjects allow the company to mainly describe good intentions, positive values and commitment for the future. Information related to credibility of disclosure allows the company to reassure its stakeholders about reliability of disclosure and to show engagement in initiatives recognized by third entities. On the contrary information concerning environmental spending may reveal a lack of actual engagement towards environmental sustainability exposing the company to criticisms. Similarly information related to internal environmental initiatives may show managerial deficiencies and generate a poor impression in stakeholders. This view is supported by a study performed by Deegan and Gordon (1996) in the Australian context and by a more recent study performed by Tregidga, Kearins and Milne (2013) in the New Zealand context. According to Deegan and Gordon (1996, p. 187) the environmental disclosure provided by the sample of companies examined was "*self-laudatory, with companies promoting positive*

aspects of their environmental performance, but failing to disclose negative aspects". According to Tregidga et al. (2013, pp. 111, 114) companies tend to be "*silent on the concept of limits*" and "*silence is present around any solutions to business threatening challenges presented by sustainable development. Instead the organizational discourse is optimistic*". Consequently despite "*challenges being recognized, the broad discourse of sustainable development is optimistic in tone*" and an "*overriding tone of practicality is present*" (2013, pp. 115, 117).

Considering the single reporting channels it is worth noting that environmental performance indicators are scarcely present on annual reports and corporate websites. Three explanations are suggested for this result. Since the measurement of EPIs requires accounting systems able to collect the needed data, they may be more likely calculated and reported by companies approaching to sustainability in a more developed way and thus opting to disclose through comprehensive sustainability or environmental reports rather than through annual reports or corporate websites. Another explanation may be that EPIs are more likely used for internal monitoring reasons rather than to provide data for external reporting, as supported in a previous study by Henri and Journeault (2008). Finally, since data generated by EPIs may be regarded as sensitive information they may be more likely reported by most committed companies thus by companies disclosing through comprehensive sustainability or environmental reports.

4.3 Internal perspective

The survey was addressed to some aspects of environmental management to assess to what degree they were relevant for the companies interviewed. At aggregated level, the results obtained show an intermediate level of environmental management diffusion for the sample selected suggesting that companies may still be in a development phase for what concerns the management of environmental aspects. On average companies recognized moderate and similar importance to subjects related to environmental oriented strategy and operations while EMA resulted to be less relevant. The possible reasons behind the results observed for environmental oriented strategy and operations may be various and to some extent common to the two dimensions.

The moderate relevance observed for environmental strategy and operations may be due to a development process towards greater awareness of sustainability related subjects. The fact that this development seems to have impacted strategy and operations more than EMA may be explained by the different exposure of the different dimensions to external stakeholders. Environmental strategy is likely to involve stakeholders since it should be formulated identifying them and addressing their needs (Stead and Stead, 2000). In addition stakeholders may play a role in environmental strategy definition through external pressure (Buysse and Verbeke, 2003). Environmental oriented operations are likely to be visible to stakeholders since

many of them involve suppliers and customers. Alliances may be stipulated to address environmental issues, wastes may be recovered and reutilized thanks to closed loop supply chain logic or hazardous materials supplied may be substituted. On the contrary EMA is made up of a set of techniques and tools more likely to have internal relevance (Henri and Journeault, 2008) rather than external visibility. Since EMA practices are not likely to directly involve external stakeholders, companies may have less incentives in developing them.

Another possible reason explaining both strategy and operations relevance may be corporate size. Larger size is often associated to an increased scrutiny by third entities (Ullmann, 1985), higher availability of financial resources for environmental related issues and increased need of internal coordination (Marshall and Brown, 2003), control and performance evaluation concerning environment (Merchant, 1981). For all these reasons larger size may be associated with more developed environmental oriented strategies and operations. This would be the case of the sample selected in the present study since large companies were considered. However this explanation does not seem satisfactory for two reasons: firstly previous literature does not provide conclusive results about the association between environmental strategy and size (Henri and Journeault, 2008; Christ and Burritt, 2013), secondly size would have a similar effect on EMA as well contrary to the results observed in the present study.

Beyond specific reasons for the observed relevance of environmental oriented strategy and operations, it is interesting to question the reason why they should be developed to a similar extent. Environmental strategy is likely to be closely linked to operations simply because it is necessary to ensure the translation of strategic objectives and plans into operational objectives and processes (Epstein and Roy, 2001; Kleindorfer et al., 2005). Without such alignment the environmental strategy would not be implemented effectively. This view is supported by a study by Passetti et al. (2013) finding sustainability strategy to be a strong predictor of operational practices development.

The scarce relevance of EMA at organizational level is a finding widely supported by previous studies and a number of reasons may be suggested. Some studies interpreted this result as an outcome of the limited role played by accounting and accountants in environmental management systems (Wilmshurst and Frost, 2001). Other studies suggested that the low relevance currently attributed to EMA reflects the fact that companies are in an early stage of the evolutionary progress towards sustainability accounting (Ferreira et al., 2010; Christ and Burritt, 2013). Others suggest as possible explanation the failure to properly monitor and allocate environmental costs (Frost and Wilmshurst, 2000) or to fill the gap between EMA related knowledge generation and application (Burritt and Tingey, 2012).

The overall results observed with reference to the internal perspective in the present study seem to be supported by previous literature. The attention devoted to environmental strategy was measured by Christ and Burritt (2013) in a recent study with similar results. The moderate

importance of environmental strategy and operations are results consistent with previous works performed by Henri and Journeault respectively in 2008 and 2010. The fact that the results observed by Henri and Journeault were slightly lower than the ones surveyed in the present study may support the hypothesis that a development process towards greater awareness of sustainability related subjects is currently taking place or it may be simply due to sampling or variables measurement differences. The relative lower importance of EMA with respect to broader environmental management subjects is supported by a previous work by Frost and Seamer (2002) finding that a construct for environmental management systems was more relevant than a construct for environmental accounting practices.

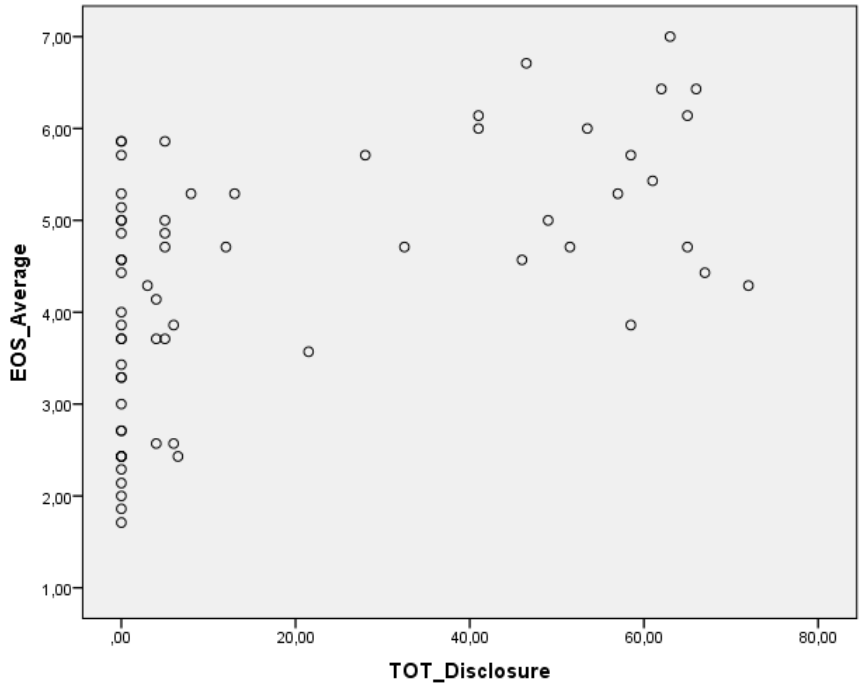
4.4 External and internal perspectives matching

The principal hypothesis tested in the current study was substantially confirmed by the empirical results of the correlation analysis performed between the relevance of environmental management inside the organization and the extent of environmental disclosure. A certain degree of consistency between internal and external perspectives exists since significant results were found for all the correlations tested. Rank correlations are positive meaning that higher levels of attention to environmental management are associated to higher levels of environmental disclosure and that lower levels of attention to environmental management are associated to lower levels of environmental disclosure.

These results are consistent with Frost and Seamer (2002) who found environmental disclosure to be positively correlated with the development of environmental management practices and with Van Staden and Hooks (2007) who found environmental disclosure to be positively correlated with environmental responsiveness.

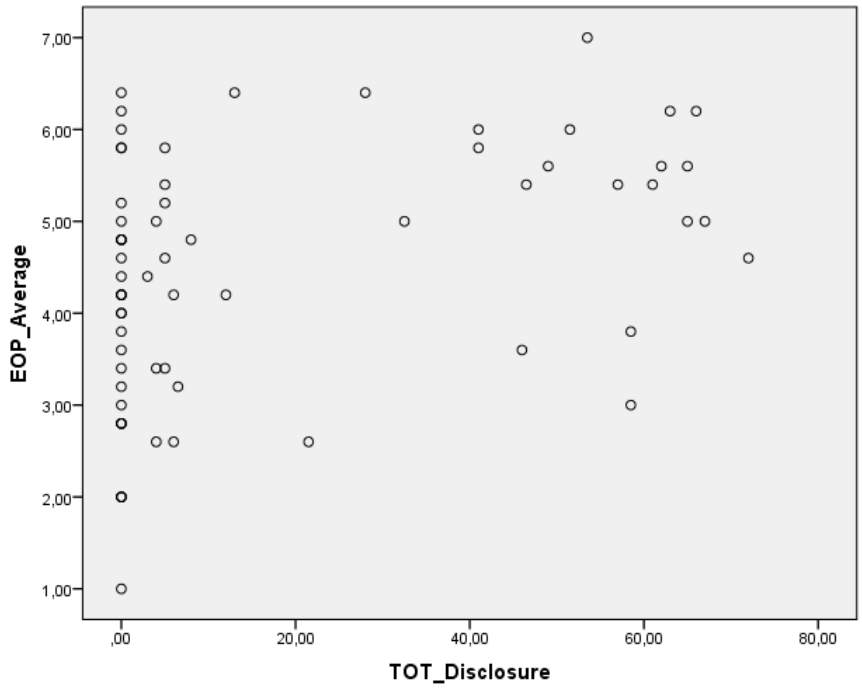
With reference to environmental management dimensions the correlation results are stronger for environmental strategy while they are weaker, but however positive, for both environmental oriented operations and EMA. With reference to disclosing channels the correlation results are similar even if with reference to EMA some variability across the channels emerges. As logically expected the correlation tends to be stronger for the variables encompassing all channels with respect to the ones referring to single channels. Since correlation coefficients vary mainly with reference to the three dimensions of environmental management a deeper graphical analysis matching the attention devoted to each dimension to the overall extent of disclosure may be useful in order to interpret the results observed. Below the scatter graphs associating environmental strategy, environmental oriented operations and EMA variables with overall disclosure variable are presented (see graphs 3, 4, 5). Although only the most significant ones are discussed, all the scatter graphs showing the correlations tested in the study are provided in the appendix.

Scatter graph for environmental strategy and overall disclosure variables



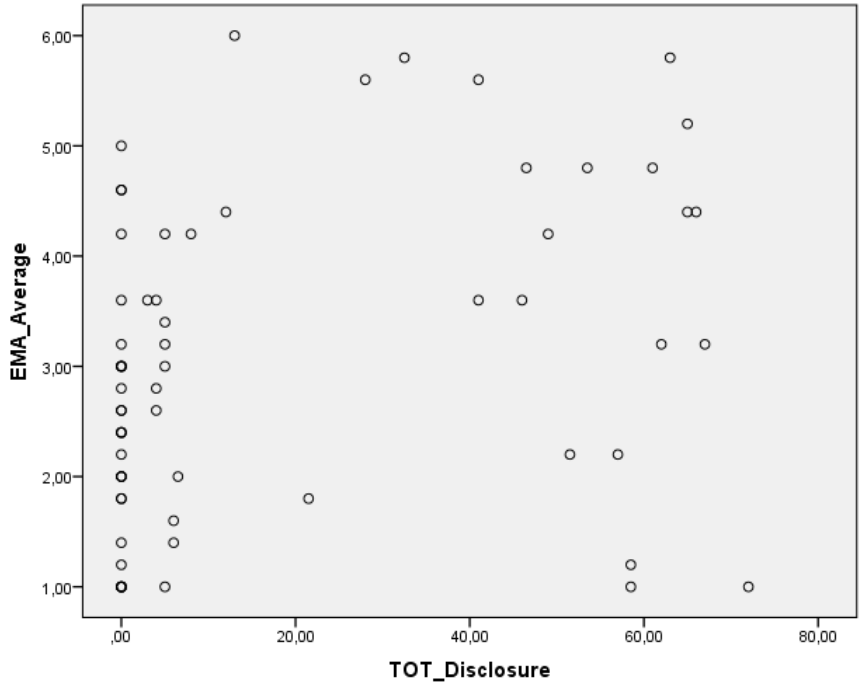
Graph 3

Scatter graph for environmental oriented operations and overall disclosure variables



Graph 4

Scatter graph for EMA and overall disclosure variables



Graph 5

As it can be noticed, in general the companies tend to be positioned in the bottom left and in the top right quadrants of the graphs. This observation is consistent with the research hypothesis according to which a positive correlation exists between attention to environmental management dimensions and extent of environmental disclosure. This can be observed for all the dimensions even if to a different degree. The behavior associated to companies positioned in bottom left and top right quadrants can be labeled behavior 1. Some companies are positioned in the top left quadrant of the graphs. This observation does not appear consistent with the research hypothesis since it substantially means that the level of attention to environmental management is high while the level of environmental disclosure is low. This can be observed for all the dimensions even if to a different degree. The behavior associated to companies positioned in top left quadrant can be labeled behavior 2. Few companies are positioned in the bottom right quadrant of the graphs. This observation does not appear consistent with the research hypothesis since it substantially means that the level of attention to environmental management is low while the level of environmental disclosure is high. Interestingly this can be observed almost exclusively for the EMA dimension of environmental management. The behavior associated to companies positioned in top left quadrant can be labeled behavior 3.

It is suggested that the behaviors observed may be interpreted according to legitimacy theory since both environmental management and disclosure seem to be focal themes of the academic debate around organizational legitimacy. According to previous literature (Dowling and Pfeffer, 1975; Buhr, 1998; O'Donovan, 1999; Milne and Patten 2002) companies have at disposal two

main ways to achieve legitimacy: one based on actions and one based on presentation. As effectively expressed by Van Staden and Hooks (2007, p. 199), "*the process of legitimisation can therefore involve real, material change in the operations of the organisation and voluntary environmental disclosures in this instance are intended to inform relevant stakeholders (publics) that the organisation is indeed meeting their expected standard of performance. The process of legitimisation can, on the other hand, involve the portrayal of goals, methods and outputs in ways that relevant publics may find acceptable. In this case legitimisation is achieved by symbolically managing stakeholder expectations/perceptions through voluntary environmental disclosures, rather than the organisation actually changing its operations*". The first conduct is likely to involve disclosing activity since according to Newson and Deegan (2002) in any case "*legitimacy is assumed to be influenced by disclosures of information and not simply by changes in corporate actions*". On the contrary the second conduct does not necessarily involve real managerial engagement since "*the chosen level of environmental disclosure may have everything or nothing in common with the environmental management record of the organization*" (Buhr, 1998, p. 165). This difference makes the actions based conduct preferable with respect to presentation based one. In fact, presentation based conduct is often associated to social perceptions alteration (O' Donovan, 1999) or to "s*ymbolic management*" (Milne and Patten, 2002, p. 375) involving denial or concealment of information. As pointed out by Frost and Seamer (2002) this interpretation of legitimization activities is the preferred one by literature, in fact according to Buhr (1998, p. 165) "*attempts are made by companies to achieve legitimacy by appearing to be doing the "right things" or not be involved in doing the "wrong things" when this appearance may have little in common with a company's actual environmental performance*".

Behavior 1 seems to be consistent with an actions based legitimization conduct. Environmental disclosure and environmental management tend to be positively associated. Companies doing less about environment are likely to disclose less (bottom left quadrant) while companies doing more are likely to disclose more (top right quadrant). The levels of environmental disclosure and managerial commitment range along a continuum from low to high but they seem to move together. The internal and the external perspectives of environmental sustainability are consistent and the legitimization process is interpreted in a management oriented way. Environmental legitimization is achieved both through disclosure and commitment encompassing strategy, operations and management accounting. With few relevant exceptions (Frost and Seamer, 2002; Van Staden and Hooks; 2007), the observation of legitimization conducts showing consistency between environmental disclosure and environmental management is relatively new to literature. Given the lack of academic debate on this specific subject it is not simple to find a rationale for the adoption of this particular behavior but two possible explanations are provided.

First, it is suggested that since "*disclosure alone would not be sufficient to guarantee these firms long-term legitimacy*" (Frost and Seamer, 2002, p. 107), real actions towards environmental sustainability are undertaken by firms to satisfy stakeholders' expectations and achieve legitimacy in the long term. In fact stakeholders are likely to be dissatisfied by the management's incapacity to meet its commitments. This means that presentation based legitimization conduct may reveal shortsighted and that actual engagement is a necessary complement to disclosure in the long run to achieve legitimacy.

Second, it is suggested that companies may get actually involved in environmental management to obtain further benefits in addition to mere legitimization. While the environmental disclosure allows the company to face stakeholders' pressures, managerial commitment towards sustainability is necessary to achieve cost savings, risk reduction, reputation enhancement, competitive advantage through differentiation and win-win outcomes (Carroll and Shabana, 2010). This means that the observed behavior may be explained by the willingness of companies to take advantage of business case for environmental sustainability according to a broader approach rather than focusing only on strengthening their legitimacy. In fact, according to Carroll and Shabana (2010, p. 102) "*growing support for the business case among academic and practitioners is evident*".

Behavior 2 does not seem consistent with the legitimization theoretical framework since companies provide scarce environmental disclosure despite good internal commitment. Neither the actions based conduct nor the presentation based conduct seem suitable to explain this behavior. Previous literature suggests a number of reasons may cause the companies not to disclose sustainability related information (Stubbs, Higgins and Milne, 2012; Vinnari and Laine, 2013). According to Adams (2002, p. 224) these reasons can be broken down into three categories: "*corporate characteristics*" like size or industry grouping, "*general contextual factors*" like specific events or social, political, cultural and economic context and "*internal context*" including management personal features. Although numerous reasons may be found acceptable for the observed behavior, corporate size and industry environmental sensitivity are mainly taken into account to provide an explanation for behavior 2. Previous literature indicates that smaller corporate size and less environmentally sensitive industries are generally associated to a lower extent of environmental disclosure (Hackston and Milne, 1996; Adams, Hill and Roberts, 1998). Consequently it was verified if a positive correlation exists between size and overall disclosure and between industry environmental sensitivity and overall disclosure for the sample selected. Then it was verified if companies positioned in the top left quadrant are characterized by an average size significantly inferior to the sample average and if they mainly belong to less environmentally sensitive industries. These verifications[23] substantially supported

[23] Correlations results proved positive and significant, as previously showed in Section 3.

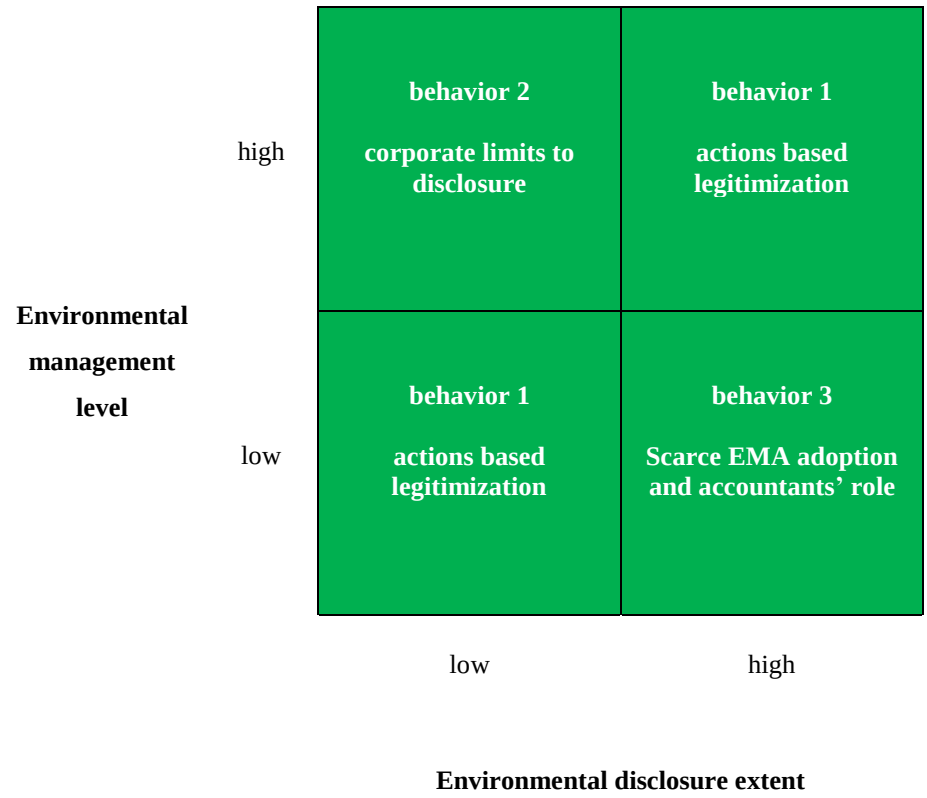
the hypothesis that behavior 2 may be associated to small size companies operating in less environmentally sensitive industries, consistently with previous literature. According to Stubbs et al. (2012) "*larger and more visible companies would have more stakeholder pressure to produce sustainability reports*". Both smaller size and membership in less environmentally sensitive industries may attract less external scrutiny allowing companies to disclose to a poorer extent. Financial resources constraints associated to smaller size may be another plausible reason for the negative impact of small size on corporate environmental disclosure, in fact Vinnari and Laine (2013, p. 20) found that for the companies included in their study "*the reduction of social and environmental reporting seems to have come about as a result of economic pressures*". It is worth noting that a scarce environmental disclosure does not necessarily implies a scarce internal adoption of environmental management. A study by Frost and Wilmshurst (2000) found that while industry influenced environmental reporting practice, there was no similar effect for EMA activities. Similarly a study by Masanet-Llodra (2006, p. 405) found that despite companies may have "*an integrated environmental management system*" they may have not "*any interest in disclosing any environmental information in the Annual report*".

Behavior 3 is exhibited by companies positioned in the bottom right quadrant providing extensive environmental disclosure despite low internal commitment. This behavior does not seem very relevant since it can be observed almost exclusively with reference to EMA and it is limited to few companies. In any case an attempt of interpretation is made. This behavior may appear consistent with a presentation based legitimization conduct and it may suggest some green washing intention. However the fact that the discrepancy with disclosure extent is observed only for EMA and not for environmental strategy and operations makes this interpretation unlikely, in fact it should imply that companies follow two different conducts towards legitimization at the same time. It seems more rational that the observed behavior mainly depends on scarce adoption of EMA technique and on limited accountants' role in EMA development. This view is supported by the results collected about EMA adoption in the current study as well as by previous literature. A study performed by Bebbington, Gray, Thomson and Walters (1994) in the UK setting and a study more recently performed by Christ and Burritt (2013) in the Australian setting are substantially consistent with the suggested interpretation. According to Bebbington et al. (1994, p. 113) only "*a minority of accountants appear to be aware of and responding to the environmental agenda*" and they "*are not exercising anything like the level of involvement necessary for full corporate response to the environment*". The mentioned study registers a particularly low degree of involvement for accountants in a set of corporate activities related to environment, included some of the ones used in the present study to represent the EMA variable. Similar results are obtained by Christ and Burritt (2013, p. 171) observing that "*many organisations are failing to engage with EMA activities*". The mentioned

study finds the perceived level of EMA use inside the organizations to be low. The reasons behind these results are not clear although explanations like accountants' inadequate education and training programs or constraints related to organizational context are suggested (Bebbington et al. 1994; Christ and Burritt, 2013). It was verified that this behavior concerns large companies operating into environmentally sensitive industries and mainly adopting the UNI EN ISO 14001 certification. With respect to environmental disclosure the observed size and industry membership are consistent with the previously mentioned effect of size and industry environmental sensitivity on reporting extent. With respect to EMA adoption the observed size and industry membership partially contrast with previous literature even if no general consensus exists about this subject (Frost and Wilmshurst, 2000; Ferreira et al. 2010; Christ and Burritt, 2013). The fact that EMA adoption is scarce even if the company is UNI EN ISO 14001 compliant is quite surprising but this phenomenon is already acknowledged by previous literature (Christ and Burritt, 2013). Eventually, the scarce attention devoted to EMA is quite alarming since according to Burritt et al. (2002, p. 41) EMA "*contributes to strategic and operational planning, provides the main basis for decisions about how to achieve desired goals or targets, and acts as a control and accountability device*". Consequently the fact that environmental strategy, environmental oriented operations and EMA are not developed to the same extent may cause defectives approaches to environmental sustainability to emerge and to become mature.

A graphical representation of the behaviors observed with respect to the levels of environmental disclosure and management is provided below (see picture 2).

Companies' behavior towards environmental disclosure and management



Picture 2

Summarizing, in the present study it is argued that the interpretation of legitimization initiatives as a conduct based on actual engagement and real actions should not be neglected. The results observed suggest that in business practice the actions based legitimization conduct may be the leading behavior with respect to the presentation based one. In order to support this claim, the degree of consistency between the extent of environmental disclosure and the intensity of managerial commitment towards environmental issues was questioned. It was assumed that a good degree of consistency between disclosure and actions allows to discriminate a façade conduct from an environmentally conscious one. The results of the current research even if far from disproving the adoption of façade conducts by certain companies prove the not minor adoption of real environmentally conscious conducts at organizational level and their association with external disclosure. Anyway the mentioned consistency was not always present suggesting that some factors are likely to cause companies to diverge from it. Corporate characteristics like size and industry membership seem to play a role influencing the extent of environmental disclosure. In fact companies showing a low level of environmental disclosure notwithstanding a high level of managerial commitment towards environment are mainly found to be small sized and to belong to non-environmentally sensitive industries. The

scarce level of EMA adoption and development seems to play a role as well influencing the attention devoted to environmental management. In fact companies showing a high level of environmental disclosure are found to have a low level of managerial commitment only with reference to EMA dimension.

5. Limitations and avenues for future research

The results of this study should be carefully considered and viewed in light of several limitations. First, this study is subject to the limitations of survey-based research. It should be assumed that the survey results are biased towards more environmentally engaged companies since they are more willing to respond with respect to less committed ones (Hamschmidt and Dyllick, 2001) even if non-response bias was taken into account during the surveying process. In addition the analysis considers managerial evaluations and not actual companies' conducts so data may partially lack objectivity. Second, the possibility exists that the constructs used to measure environmental management and disclosure may have failed to capture some information. This risk was limited through Cronbach analysis for the internal perspective and through the adoption of an acknowledged disclosure index for the external perspective. Third, it is unlikely that the subjectivity involved in content analysis process was completely avoided even if specific procedures were undertaken to control it (Weber, 1985). Fourth, some approximations were necessary during the documental sources research when reports were published only at group level and not at subsidiary level. Fifth, the fact that the survey was mainly addressed to accounting trained personnel may have biased the results showing a low rate of adoption of EMA due to the low involvement of these employees in environment related issues (Adams, 2002). Sixth, this research suffers from geographic limitations since it was addressed to Italian companies only. This may cause findings generalization to be problematic while providing specific insights on the Italian context. Seventh, the limited size of the sample did not allow statistical analyses to be conclusive. However it should be noticed that many studies in literature used small samples to perform similar analyses (Van Staden and Hooks, 2007) and that the sample used in the present study is large in comparison.

Finally, since regression analysis was not performed the direction of the relationship between environmental disclosure and management is not defined even if from a rational point of view the influence of environmental management towards environmental disclosure would make more sense. In addition to specific limitations it can be observed that this study is subjected to a generic risk associated to the exploratory and original nature of the research performed.

Further empirical work should be carried out to address the limits of the current study and to improve our understanding of the interplay between sustainability reporting and management. The research method adopted may be improved for what concerns the measurement of the

variables related to environmental disclosure and management. Alternative techniques may be used to account more for disclosure quality and less for disclosure extent. At the same time the actual relevance of environmental management dimensions may be taken into account rather than managerial evaluations of them. In depth interviews may be useful to better understand the specific motivations behind companies' disclosure and managerial choices, in particular for anomalous cases exhibiting great discrepancy between the external and the internal perspectives. In addition interviews may be useful to clarify the direction of the relationship between environmental reporting and management. The survey may be addressed to other staff than the one belonging to the accounting department to verify if the observed results for EMA change. For instance, employees from a specific environmental department may be selected. Despite a legitimacy theory based interpretation was preferred, the results observed in the current study may have been interpreted according to the organizational change framework since a recent body of literature is studying the interplay between environmental disclosure and management in an organizational change perspective (Tilt, 2006; Bouten and Hoozée, 2013). A deeper consideration of general contextual factors like specific events occurred to companies and internal context related factors like management's personal features or philosophy may shed more light on our findings (Tilt, 2006). Finally the extension of the study to the social dimension of sustainability may allow to have a comprehensive view of sustainability related issues reporting and management at organizational level.

Conclusions

The present study addresses one subject of current relevance: the relationship between environmental reporting and environmental management. To explore this issue the attention devoted to some aspects of environmental management and the extent of environmental disclosure were measured for a sample of Italian companies. In particular it was argued that a positive correlation exists between attention devoted to environmental management and extent of environmental disclosure. Answering the call for further research in corporate sustainability related studies the present research contributed to previous literature in three ways. First, an overview of environmental reporting activity through different channels was provided. Second, an overview of different environmental management aspects was provided. Finally, the relationship between environmental management and environmental disclosure was examined.

With reference to reporting activity the main findings are the high number of not disclosing companies and the low disclosure score awarded on average suggesting that environmental reporting in the Italian context may still be in an early phase of development. Further findings concern the choice of reporting channels and the contents of information disclosed. Companies appear to disclose environmental information through different reporting channels at the same time. Corporate websites are almost always used and they often complement annual reports or sustainability and environmental reports. The richest reporting channels seem to be sustainability and environmental reports. The information disclosed appear to be mainly objective in nature suggesting that a general progress may be in act towards more objective and verifiable disclosure or that in the Italian context the environmental information provided may be good in quality despite scarce in quantity. The most disclosed contents concern environmental strategy and the credibility of information suggesting that companies may opt to disclose more relevant themes or that themes more likely to shed a good light on the company are preferred.

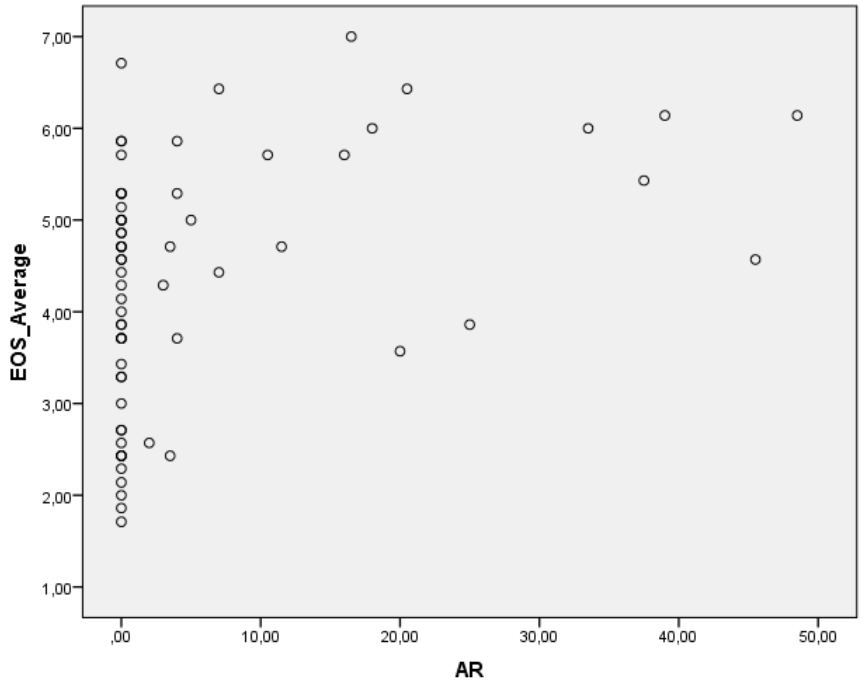
With reference to environmental management the main finding is the intermediate level of adoption observed for the sample selected suggesting that in the Italian context companies may still be in a development phase for what concerns the management of environmental aspects. Further findings concern the moderate and similar importance recognized to environmental strategy and environmental oriented operations on one side and the low relevance recognized to EMA on the other side. It is suggested that this difference may arise from the different exposure of the different dimensions to external stakeholders. EMA scarce adoption is a result widely acknowledged by previous literature but no consensus about the reasons for it has been reached yet.

With reference to the relationship between environmental management and environmental disclosure the research hypothesis that a positive correlation exists between the two perspectives is substantially supported. This finding represents the most innovative contribution to previous literature since the interplay between environmental management and environmental disclosure has been rarely addressed so far. The presence of consistency between the level of attention devoted to environmental management and the extent of environmental disclosure is interpreted according to legitimacy theory. It is argued that the presence of consistency suggests that companies try to achieve environmental legitimization not only through communication but also through a real engagement. This view provides an alternative to the critical interpretation of legitimacy theory according to which companies try to achieve environmental legitimization mainly through the presentation of information which may be completely decoupled from actual managerial actions. Although companies mainly show consistency between the two perspectives, in some cases discrepancy is observed. When companies' disclosure is low despite a good managerial commitment it is argued that factors like size and industry environmental sensitivity may be the reasons. When companies' disclosure is high despite a poor managerial commitment it is argued that the scarce adoption and development of EMA techniques may be the reasons.

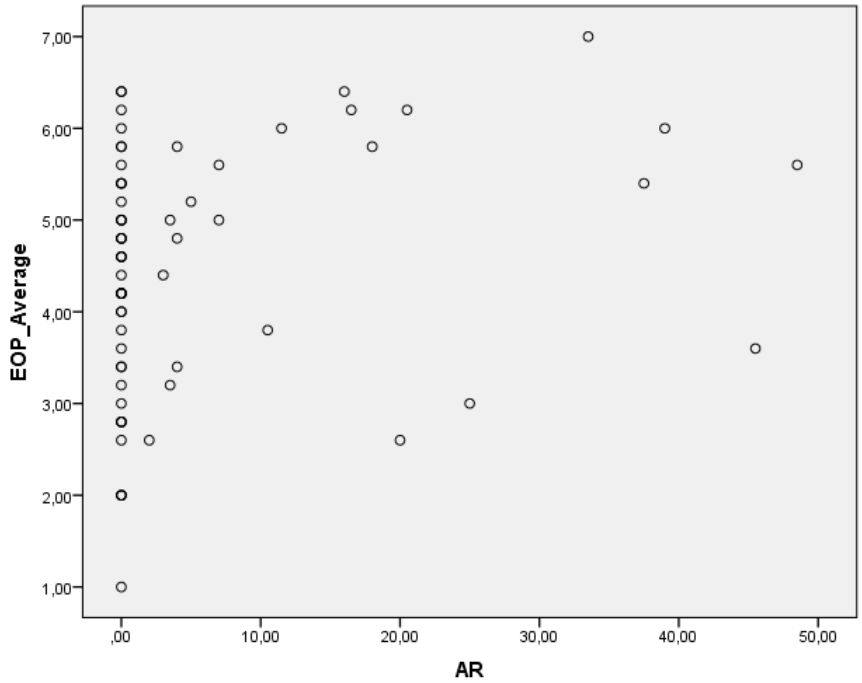
Although the findings of this study need to be interpreted carefully and further research on the interplay between environmental management and disclosure is required, this work shed some light on certain aspects that so far have received little attention. The complex nature of corporate sustainability issues should not discourage researchers' efforts towards a deeper understanding of this subject since business practitioners are likely to need further support to face sustainability challenges in the near future.

Appendix

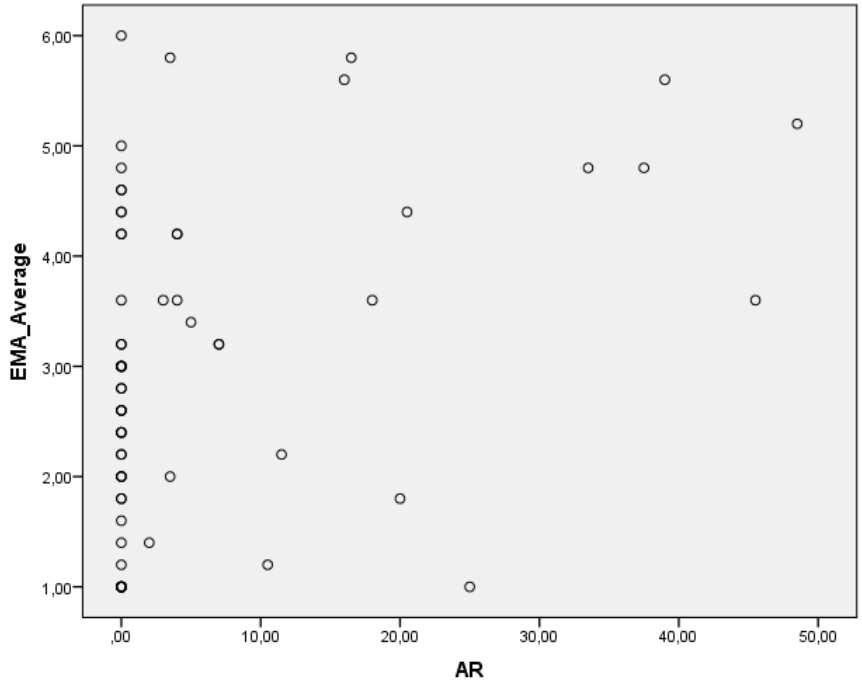
Scatter graph for environmental strategy and annual report disclosure variables



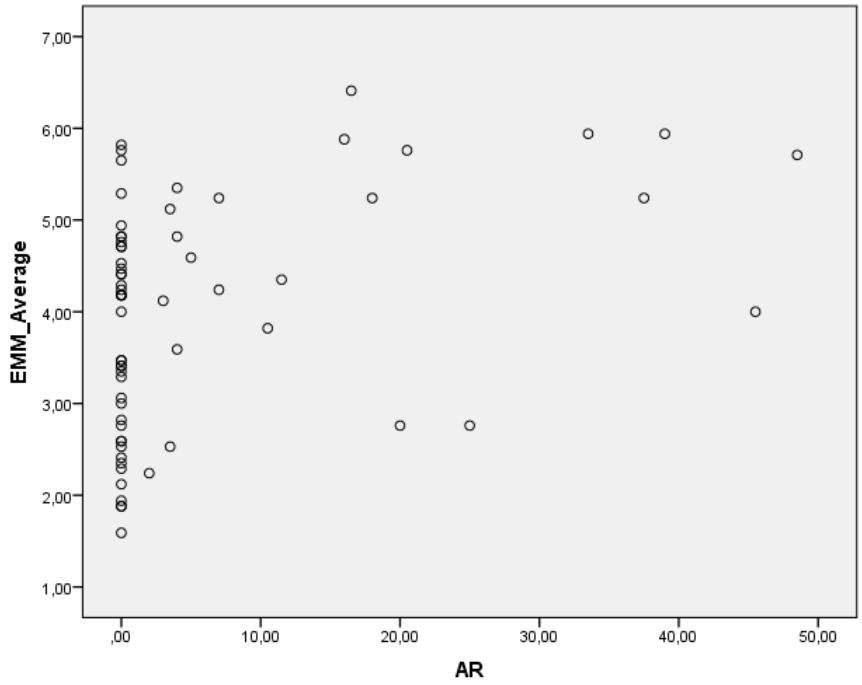
Scatter graph for environmental oriented operations and annual report disclosure variables



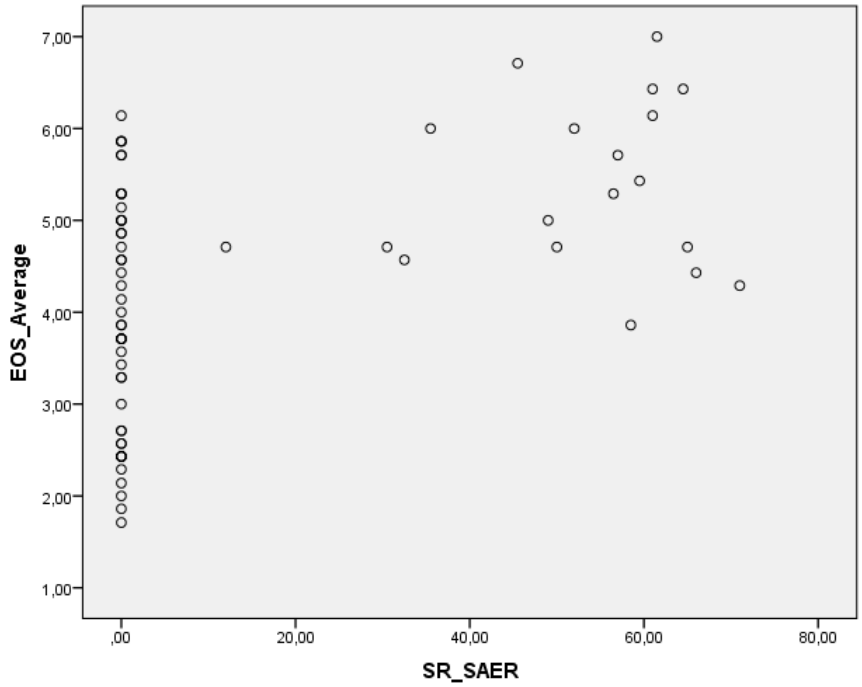
Scatter graph for EMA and annual report disclosure variables



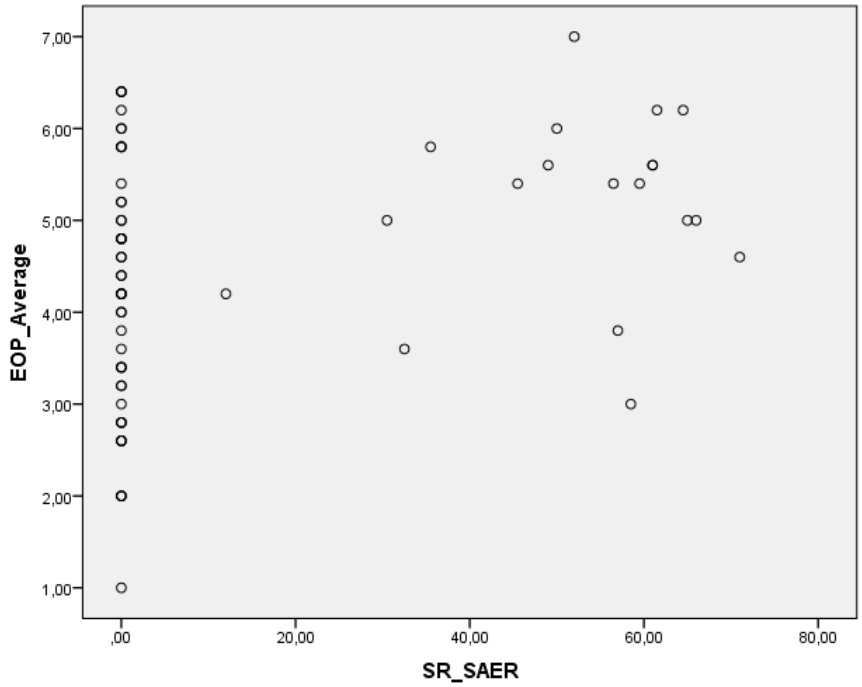
Scatter graph for environmental management and annual report disclosure variables



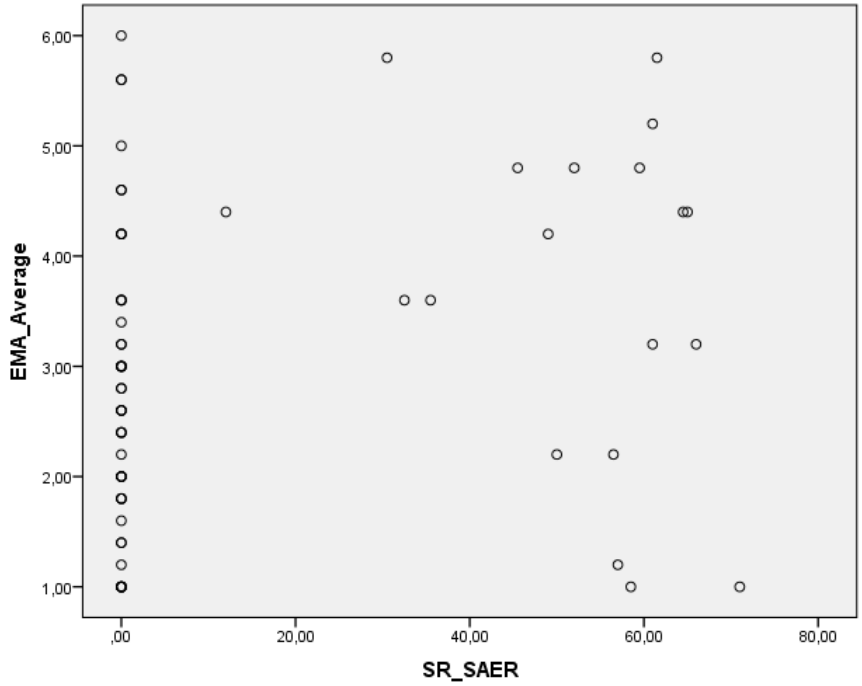
Scatter graph for environmental strategy and sustainability/environmental report disclosure variables



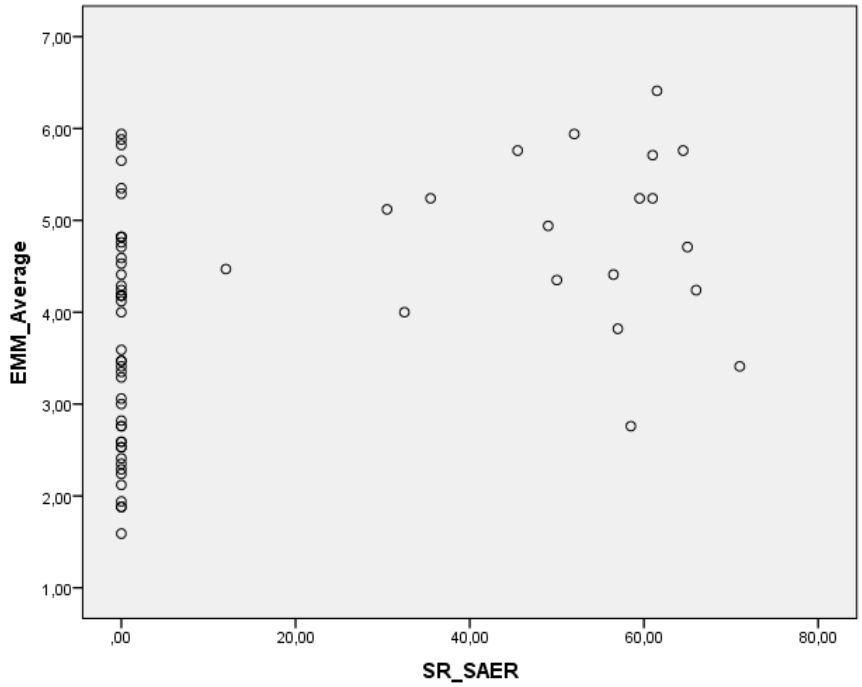
Scatter graph for environmental oriented operations and sustainability/environmental report disclosure variables



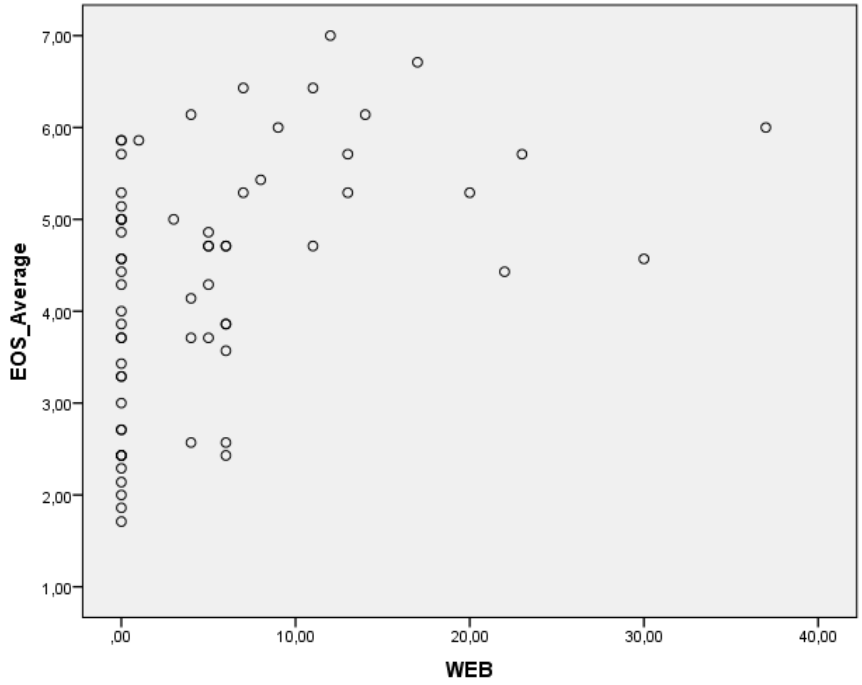
Scatter graph for EMA and sustainability/environmental report disclosure variables



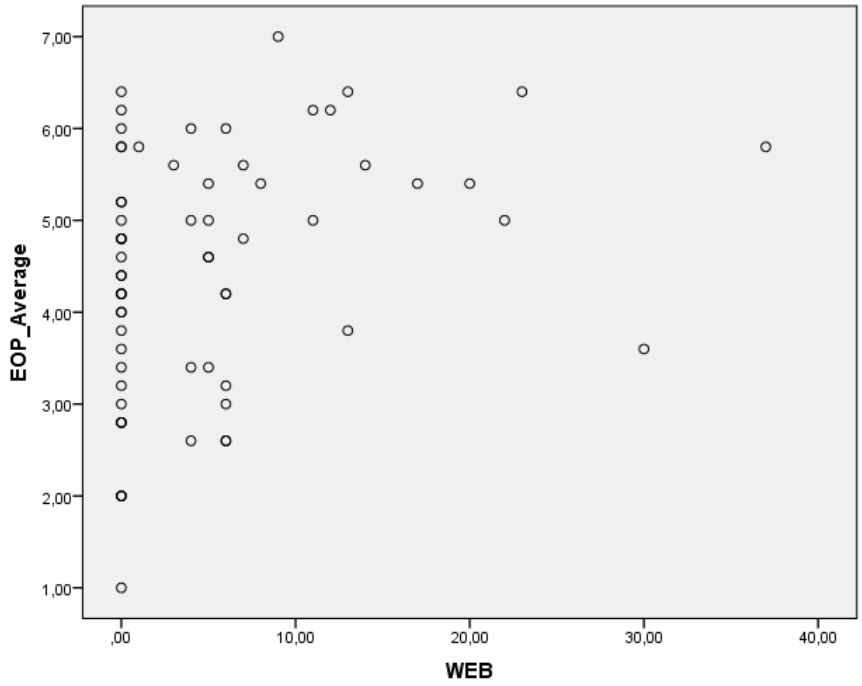
Scatter graph for environmental management and sustainability/environmental report disclosure variables



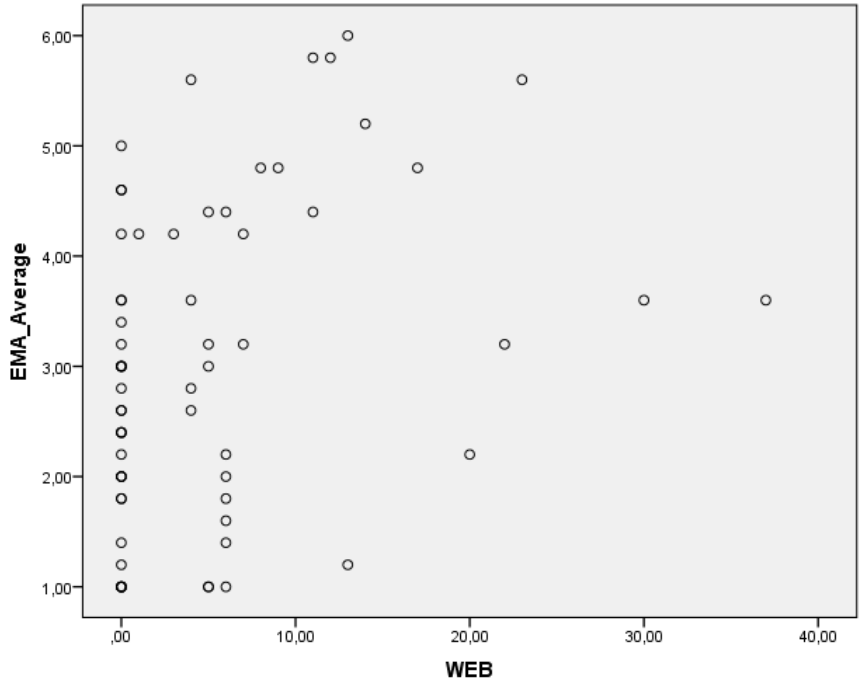
Scatter graph for environmental strategy and corporate website disclosure variables



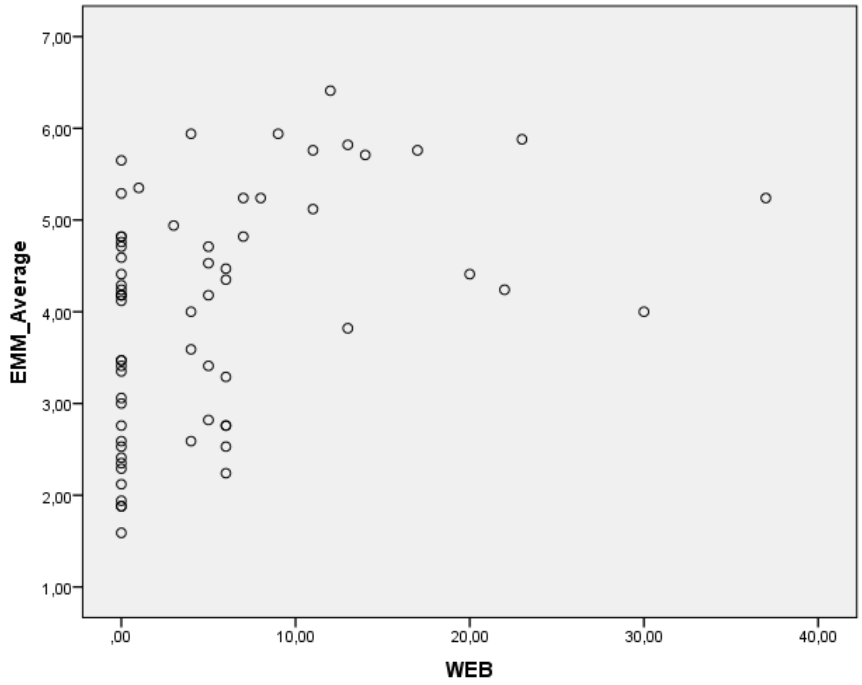
Scatter graph for environmental oriented operations and corporate website disclosure variables



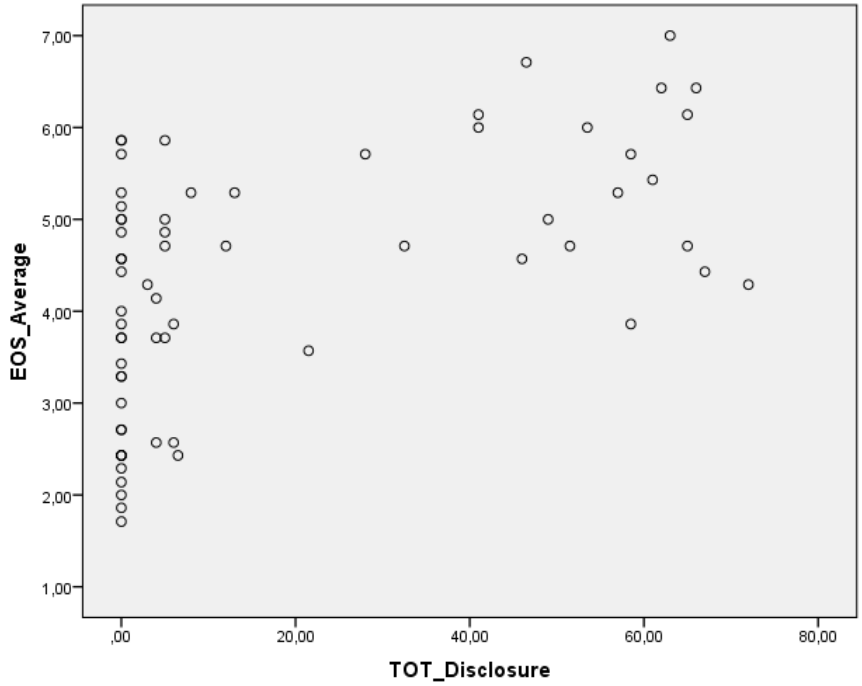
Scatter graph for EMA and corporate website disclosure variables



Scatter graph for environmental management and corporate website disclosure variables



Scatter graph for environmental strategy and overall disclosure variables



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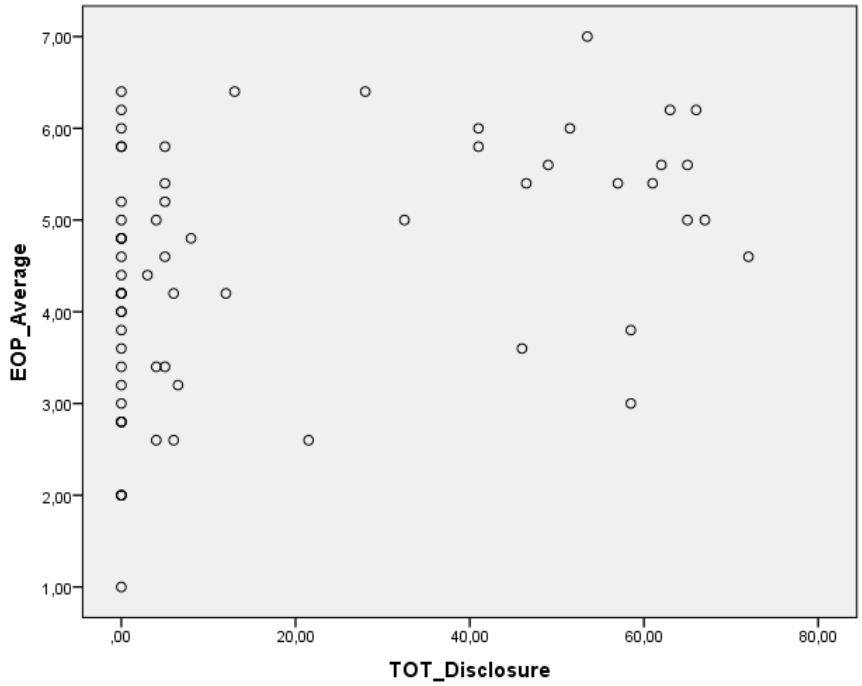

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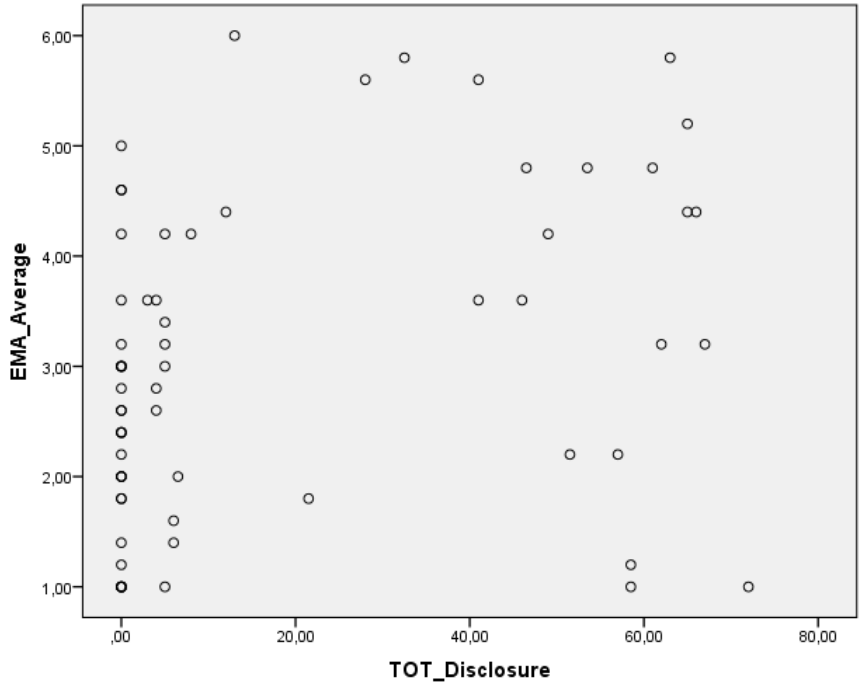
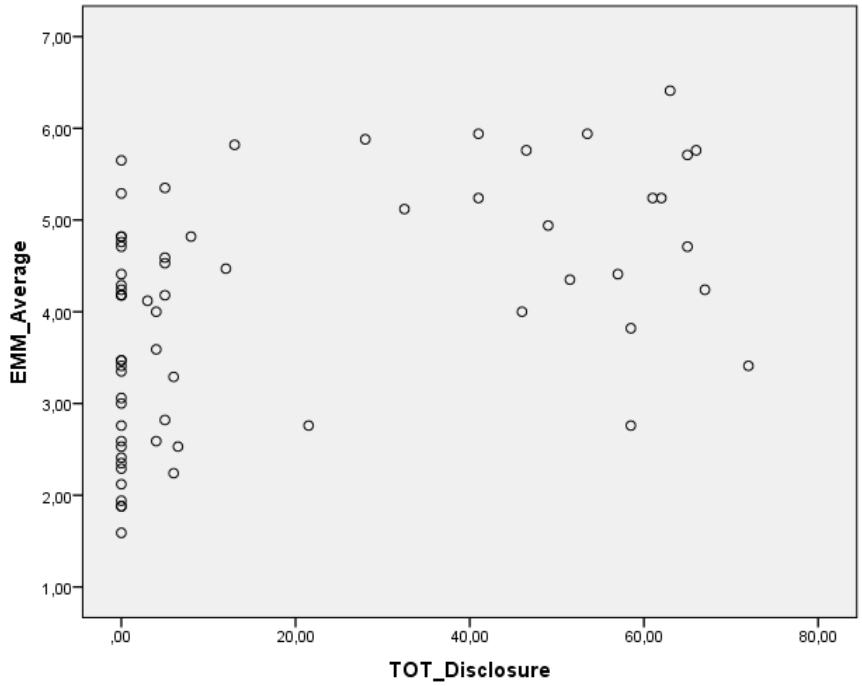


Scatter graph for environmental management and overall disclosure variables



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