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**PREDICTORS OF CORPORATE ENVIRONMENTAL
STRATEGY: THE ROLE OF ENVIRONMENTAL
ACCOUNTING SYSTEMS AND MANAGERIAL
PERCEPTION**

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INDEX

Abstract.....	1
Introduction	2
1. Environmental Accounting and Strategic Issue Management: an Innovative Interplay to Manage the Environmental Variable	6
1.1. Companies and Sustainable Development: the Rising of Environmental Accounting ..	6
1.1.1. Environmental Management Accounting: State of the Art and Future Potential...	11
1.1.2. Environmental Reporting: State of the Art and Future Potential.....	16
1.2. Strategic Issue Management: How Cognitive Categorizations Affect Organizational Decision Making.....	22
1.2.1. The Starting Point of Strategic Issue Management: Categorization Theory	23
1.2.2. Linking Cognitive Categorization to Organizational Decision Making: Strategic Issue Management.....	25
2. The Effects of Environmental Accounting and Managerial Interpretation on Corporate Environmental Strategy: Research Hypothesis Setting	29
2.1. Determinants of Environmental Strategy	34
2.1.1. Managerial Perception of the Environmental Issue	36
2.2. Determinants of Managerial Perception of the Environmental Issue	39
2.2.1. Issue Legitimation	40
2.2.1.1. Environmental Strategic Planning	42
2.2.1.2. Board-Level Environmental Accountability	44
2.2.1.3. Environmental Target Setting.....	45
2.2.1.4. Environmental Risk Management	48
2.2.1.5. Environmental Disclosure	50
2.2.1.6. ISO 14000.....	55
2.2.2. Environmental Employees Incentive System.....	57
3. Research Sample and Measurement of Constructs.....	63
3.1. Sample	63
3.2. Measurement of Constructs	68
3.2.1. Dependent Variables	68
3.2.1.1. Environmental Strategy: Environmental Initiatives Implementation.....	68
3.2.2. “Intermediate” Variables.....	74
3.2.2.1. Managerial Perception of the Environmental Issue.....	74
3.2.3. Independent Variables.....	77

3.2.3.1. Issue Legitimation	77
3.2.3.2. Environmental Employees Incentive System	81
3.2.4. Control Variables	84
3.2.5. Variables Correlations.....	85
4. Empirical Tests and Results	87
4.1. Determinants of Environmental Strategy	87
4.2. Determinants of Managerial Perception of the Environmental Issue	93
4.3. Indirect Effects of Environmental Accounting Systems on Environmental Strategy	102
4.4. Robustness Check	103
Conclusions	107
Bibliography and Sitography.....	112

ABSTRACT

Il presente lavoro di tesi si pone l'obiettivo di identificare le determinanti della strategia ambientale di un'azienda, definita su due dimensioni: intensità e ampiezza. La prima si riferisce al numero di attività di riduzione dell'impatto ambientale in cui l'impresa decide di investire. La seconda è rappresentata dal numero di tipologie di tali attività. Gli elementi esaminati come possibili predittori della strategia ambientale sono i sistemi di programmazione e controllo ambientale, e la percezione manageriale della variabile ambientale come opportunità o come rischio. La ricerca contribuisce ad approfondire la letteratura esistente con un'analisi della funzionalità dei sistemi ambientali di programmazione e controllo, e del ruolo dell'elemento individuale di percezione manageriale. Infatti, sebbene i vantaggi economici e finanziari portati dall'integrazione dell'ambiente nella strategia di business siano stati ampiamente esaminati da più autori, l'analisi degli strumenti manageriali per effettuare questa integrazione lascia ampi spazi di ricerca. Diversi studi sottolineano, da un lato, l'assenza di un framework comprensivo che declini i meccanismi di programmazione e controllo ambientale; dall'altro, la difficoltà delle aziende di mettere in atto tali meccanismi, anche per motivi afferenti alla sfera individuale e comportamentale.

L'analisi è effettuata attraverso modelli di regressione lineare, su un panel di 740 aziende quotate. I dati esaminati sono ottenuti dal questionario del Carbon Disclosure Project (CDP), a cui le aziende, tra il 2011 e il 2013, hanno partecipato fornendo dati sulla loro risposta al cambiamento climatico, per un totale di 1296 osservazioni in 3 anni. I risultati sottolineano una relazione indiretta e positiva tra i meccanismi di programmazione e controllo ambientale e la definizione di una strategia ambientale responsabile. L'elemento di mediazione tra le due variabili è la percezione manageriale della variabile ambientale. Quest'ultima, infatti, risulta essere condizionata, a monte, da sistemi ambientali di programmazione e controllo responsabilmente sviluppati. Una volta formata, la percezione manageriale impatta positivamente sulla strategia ambientale, consistentemente a quanto sostiene la letteratura dello strategic issue management.

INTRODUCTION

In the last thirty years, the concepts of natural environment preservation and ecological development have increasingly become a dominant concern for multiple actors including investors, policy makers, non-governmental organizations (NGOs) and academics. Today, environmental issue is one of the central themes considered when analyzing economic and social growth, both in the academic world and in society. More specifically, climate change has gathered a growing attention also by intergovernmental organization, urged by environmental interest groups and the scientific community to embrace the cause of reducing global warming and the related greenhouse gas (GHG) emissions. Scientific data clearly show that global average temperature has increased by about 1.4°F (0.8°C) since 1880. Carbon dioxide emissions (CO₂), the greenhouse gas mostly associated with global warming, are at their highest level in the last 650 years: 402.56 parts per million on a volume basis (ppmv). In this context, there is a growing consensus, among both management leaders and academic researchers, that sustainable development is the unique alternative to pursue. In management literature, climate change is identified as “one of the greatest challenges we confront in the 21st century”, since “organizations are [...] critical to mitigating and adapting to climate change”.¹ As a response to the pressures they are facing, corporations are increasingly identifying and addressing environmental issue as a strategic opportunity rather than a strategic threat. Indeed, a growing number of companies proactively manage and publicly report on their environmental projects and performance. Two are the fundamental rationales identified by the extant literature for organizational commitment to environment protection. On the one hand, external social pressure; in this perspective, firms pursue environmental sustainability to comply with green regulations, thus limiting the incurring in liabilities, and to avoid the deterioration of corporate reputation. On the other hand, a more business-based approach states that companies engage in environmentally responsible activities for strategic reasons, with the goal of maximizing their value-creation. Accordingly, the extant literature has widely underlined the economic and financial advantages of implementing green strategies. Firstly, they lead to an improved corporate image, opening new business and market opportunities. They help to accomplish cost reduction, which is driven not only by an increased efficiency in the use of resources, but also by the avoidance of compliance and liability costs, diminished long-term risks associated with resource depletion, pollution or waste management and avoidance of future clean-up costs or of losses in revenues due to

¹ Howard-Grenville, J., Buckle, S. J., Hoskins, B. J., & George, G. (2014). Climate change and management. *Academy of Management Journal*, 57 (3), p. 615.

customer boycotts. Moreover, several researchers have examined how the stock market positively reacts to improved environmental performance through market returns.² However, to date, although the important implications of climate change for organizations have widely been acknowledged, the extant literature has made little progress towards providing an understanding about the mechanisms available for companies to achieve good environmental performance. The focus of research has been primarily on showing how the integration of environmental commitment in business can drive positive economic and financial results, besides an improved environmental performance. However, how to effectively implement this fruitful integration is still rather ambiguous. Many researchers and professionals highlight the difficulty for companies to incorporate green aspects into management processes and underline a divide between good intention and practice. Specifically, environmental accounting literature has widely focused on environmental reporting techniques, while less attention has been paid to the internal dimension of environmental accounting: environmental management accounting (EMA). In fact, there is still a lack of consensus on a general framework encompassing and identifying the whole set of EMA practical tools, although some guidance on these mechanisms has been developed. Moreover, and most importantly, effective execution of EMA systems among companies is still volatile. Some researchers ascribe this to the use of conventional management accounting tools, with no adaptation of them to environmental accounting aims. In order to understand and solve the poor effectiveness of EMA tools in driving environmental results, Burrit (2004) underlines how a different level of analysis, afferent to the individual and behavioral sphere, should be considered. Understanding how managers personally interpret the information from EMA systems, would help to gain a greater knowledge of EMA tools' effectiveness and of their potential impact on managerial choices of environmental strategy. The aim of this work is to make a first step in this direction, in order to give a significant contribution to the literature and to promote the practical integration of EMA mechanisms within corporate traditional management accounting systems. More specifically, we develop a research framework, basing on Sharma (2000), that draws upon two streams of the research: environmental accounting literature and strategic issue management literature. The former, as just underlined, offers a guidance on the accounting and control tools that can be used to address the environmental matter, while lacking in the individual and behavioral elements analysis, that can potentially explain the volatile execution of such tools. The latter, instead, theorizes on how the cognitive interpretation of a strategic issue by a decision maker is influenced by the internal

² Dowell, G., Hart, S.L. & Yeung, B. (2000). Do Corporate Global Environmental Standards Create or Destroy Market Value? *Management Science*, 46 (8): 1059-74.

organizational context, and how it eventually affects corporate actions. Hence, it provides important insights on the potential role of managerial perception in the effectiveness of environmental accounting tools. However, strategic issue management literature does not deal, in its traditional development, with the environmental matter.

Linking these two streams of research, our investigation pursues a twofold objective, which embodies two important contributions to the literature. Firstly, it focuses on understanding whether specifically designed environmental accounting tools can drive the development of a responsive environmental strategy. Further, it tests whether, in this influence of the environmental accounting systems on green strategy, the individual element of managerial perception of the environmental variable plays the determinant role of intermediate element.

In order to address these research questions, we test them over panel data set of 1296 firm-year observations, corresponding to 740 listed firms that, in the period 2011-2013, voluntarily reported their climate-change information to CDP. This investigation is developed, through the use of ordinary least squares (OLS) models, in two stages. In the first one, we test the influence of managerial interpretation of the environmental variable over corporate choices on environmental strategy. In so doing, we evaluate whether the assumptions of strategic issue management literature are still valid when they are applied to the environmental variable. Hence, we assess whether this innovative integration is a fruitful path to understand the differences among firms' green strategies.

In the second stage of this investigation, we evaluate the influence of several, specifically designed environmental accounting tools on managerial perception itself. This will allow us to underline potential indirect relations between environmental accounting tools and corporate choices of environmental strategy, while assessing whether the individual element of managerial perception performs the intermediate role in this process. Finally, we check for the existence of direct relations between environmental accounting systems and green strategy, beside the indirect ones. This will lead us to underline that, in the impact of one environmental accounting tool on the environmental strategy, the managerial perception is the determinant, intermediate element, since no direct relations between those two factors exist. This research contributes to a deeper understanding of the effectiveness of environmental accounting systems in driving environmental results. Moreover, the importance of cognitive and behavioral factors in this process, only theorized by the extant literature, is empirically acknowledged.

The structure of this work is organized as follows. The first chapter reports an extensive review of the two streams of the literature on which this investigation is based: environmental accounting literature and strategic issue management literature. The second chapter explains

how these two research fields are linked, thus presenting the research framework hypothesis and their theoretical rationales. In the third chapter, the research sample is presented and analyzed. Moreover, the measures of the theoretical constructs identified in the second chapter are explained, and an analysis of variables' descriptive statistics is reported. Finally, on the basis of the results extensively presented in the fourth chapter, the principal conclusions of our investigation are drawn.

CHAPTER 1

Environmental Accounting and Strategic Issue Management: an Innovative Interplay to Manage the Environmental Variable

In the following chapter, two streams of literature are presented: Environmental Accounting, analyzed through its two components, and Strategic Issue Management, discussed in its principal characteristics. The research framework of this study draws from them both and links them, as it will be later explained.

1.1. Companies and Sustainable Development: the Rising of Environmental Accounting

The concepts of natural environment preservation and ecological development have become dominant in the last thirty years. Environmental issue is one of the central themes considered when analyzing economic and social growth, both in the academic world and in society. This growing commitment to the issue can be traced back to a widely accepted historical reconstruction, which underlines two consequences of the fast economic development occurred in the decades following the Industrial Revolution. On the one hand, economic growth momentum has caused a progressive reduction of the stock of natural resources. On the other hand, it has increasingly raised the attention to the environmental impact of production and consumption phenomena.³ This reconstruction necessarily leads to recognize a link between natural degradation and the activities of corporations at a micro-level. In this context, organizational commitment to environmental sustainability has sharply grown, becoming one of the critical issues within firms. Today, corporations have widely recognized the importance of structuring their own activities compatibly with the concept of sustainable development, defined in the Brundtland Report⁴ as the “development that meets the needs of the present without compromising the ability of future generations to meet their own needs”.⁵ Nevertheless, if it is true that the organizational focus on environmental sustainability is far

³ Donato, F. (2000). *La variabile ambientale nelle politiche aziendali: sostenibilità economica ed ecologica*. Giuffrè, Milano.

⁴ The Brundtland Report was written by the World Commission on Environment and Development (WCED) in 1987, before its official dissolution. Known as the Brundtland Commission because of the name of the Chairman, it was established by the UN General Assembly to evaluate the degree of environmental deterioration and to unite countries to pursue sustainable development.

⁵ World Commission on Environment and Development (1987). *Report of the World Commission on Environment and Development: Our Common Future*. In: <http://www.un-documents.net/our-common-future.pdf>.

more stressed today, it is also worth underlining that the reasons for green strategies go beyond moral factors and originate from several sources of rationale.⁶ It is possible to categorize them in two distinct kinds of reasons: external social pressure and internal business-related factors.⁷ These two rationales are respectively linked to two main theories in the academic research. The former presents a socio-political approach and identifies forces that are external to the organizations and that exert pressure for environmental commitment and thus create calls for green management. Such forces are mainly represented by environmental regulation and stakeholders concerned about the impact of corporate activities on the environment.⁸ The actual manifestation of stakeholder pressure can take multiple forms: from consumer preferences for green products and services, through the media attention to environmental damage, to rising community concerns for sustainable and responsible corporate behavior, to end with shareholders investment decisions that take into account environmental corporate management. Failing in either complying with the environmental regulation or engaging with external green-oriented stakeholders can not only deteriorate corporate reputation, thus potentially leading to a loss of sales⁹, but also can cause the incurring in liabilities and fines. Given this, the causal interdependence between the externally- and the internally- driven kinds of rationales for green strategies becomes clear: the sociopolitical external forces can lead to potential costs for corporations, should they fail to internalize such external calls for green commitment. Hence, sociopolitical pressures can actually have an impact on firms' economic performance, thus reinforcing the business-related rationales for green strategies. Such rationales represent, as said before, the other category of reasons for corporate needs of environmental issue management. This second research theory is represented by academics that have developed an economics-related paradigm to shed light on the pressures driving corporate environmental behavior. Therefore, here the key elements acting as motivators for green commitment are no more external, but internal to the organization and business-based. The central hypothesis of this line of thought is that environmental commitment of firms is rewarded by the market in monetary terms.¹⁰

⁶ Derchi, G. B., Burkert, M. & Oyon, D. (2013). Environmental management accounting systems: A review of the evidence and propositions for future research. In: Songini L., Pistoni A., Herzig C. (ed.). *Accounting and Control for Sustainability (Studies in Managerial and Financial Accounting, Volume 26)*, Emerald Group Publishing Limited, 197 – 229.

⁷ Burritt, R. L. & Schaltegger, S. (2010). Sustainability accounting and reporting: Fad or trend?. *Accounting, Auditing, & Accountability Journal*, 23(7), 829-846.

⁸ Parker, L. D. (2000). Green Strategy Costing: Early Days. *Australian Accounting Review*, 10 (1), 46-55.

⁹ Marcus, A. & Fremeth, A. (2009). Green management matters regardless. *Academy of Management Perspectives*, 23(3), 17–26.

¹⁰ Schaltegger, S. (2011). *Sustainability as a driver for corporate economic success. Consequences for the development of sustainability management control*. Centre for Sustainability Management, University of Lueneburg, Germany.

Thus, companies decide to implement environmentally responsible activities as they recognize them as a source of value-creation, resulting in improved economic and financial performance, together with a strengthened environmental one. Much of the literature developing this hypothesis focuses on and empirically shows the economic and financial advantages driven by green strategies. One of the oldest reasoning supporting this approach assumes a production-based point of view and introduces the concept of resilience in an economics-based paradigm. This concept refers to an eco-system capacity to keep the level of productivity stable when pressures or shocks occur. When the resilience edge is exceeded, it means that the environmental impact and the withdrawal of natural resources by the economic system has destroyed the self-healing capacity of the eco-system. This situation necessarily leads to negative consequences not only for the natural environment, but also for firms themselves. The key element of this theory, in fact, is that nature should be considered a productive factor.¹¹ Consequently, the relationship between companies and the environment is no more perceived as univocal, but mutual: if it is true that firms' productive activities somehow alter the environment, it is also true that their short-term industrial policies, that exploit natural resources and badly impact on them, eventually harm the firms themselves.¹² Other authors more directly analyze the economic benefits of environmental practices on firms' economic performance. Firstly, corporate image and reputation benefit from a good green performance, which in turns leads to a potential increase in revenues by satisfying the needs of environmental conscious customers.¹³ This represents the second advantage of green strategies: they can be a determinant for new business and market opportunities, embodied by the growing number of green customers, willing to pay a premium price for more environmentally friendly products.¹⁴ Related to this, are the competitive marketing advantages: given the increasing consumers' consciousness, green strategies – especially the ones leading to innovations in products with low environmental impacts – are likely to attract the media attention, for which high advertising expenditures would normally be necessary. Another advantage of green strategies underlined by many researchers is cost reduction. In fact, ecological improvements such as raw material reprocessing and reuse, energy conservation, waste reduction and a life-cycle approach can increase the efficiency of the

¹¹ Catturi, G. (1990). *Produrre e consumare: ma come?* Cedam, Padova.

¹² Mio, C. (2002). *Il budget ambientale. Programmazione e controllo della variabile ambientale*. Egea, Milano.

¹³ Shrivastava, P. (1995). Environmental Technologies and Competitive Advantage. *Strategic Management Journal*, 16, 183-200

¹⁴ Epstein, M. J. (2008). *Making sustainability work: Best practices in managing and measuring corporate social, environmental and economic impacts*. Greenleaf Publishing, Sheffield (UK).

production process, thus reducing costs.¹⁵ Additional potential savings can be less tangible in the short-term, but with a high impact on firms' performance. They are related to compliance and liability costs reduction, diminished long-term risks associated with resource depletion, pollution or waste management and avoidance of future clean-up costs or of losses in revenues due to customer boycotts. Moreover, long-term financial returns are increasingly dependent on corporate environmental responsibility as perceived by shareholders and community, since they are interested not only in the financial performance but also in the environmental one. Finally, the active implementation of green strategies leads to an important first-mover advantage. Developing new processes and products and acquiring organizational and technical capabilities before competitors or regulatory duties give the organization an important competitive advantage, at least temporary.¹⁶

So, basing on the analyzed literature, it is possible to maintain that any activity aimed at introducing the environmental issue within the set of variables considered critical in the organization is business-related in nature, because its rationale is to strengthen the competitive position of the company. In this context, there is a growing consensus, among both management leaders and academic researchers, that "...there's no alternative to sustainable development".¹⁷ Environmental issue is no longer considered only as an obligation from companies, but rather a critical factor to be included in the business strategy's definition and implementation. Consistently, "corporations are seen to be identifying and proactively addressing environmental issue as a strategic opportunity rather than a strategic threat"¹⁸, by increasingly collecting, using and distributing information related to their impact on natural environment. But if the necessity to account for the environment is by now widely recognized, the tools available to firms' management for that purpose are far less defined. In other words, "it is no longer a discussion of why, what or whether to focus on sustainability, but how".¹⁹ The discipline addressing this issue is represented by the environmental accounting. It can be defined as a specific section of social and environmental accounting, which instead focuses on the broader socio-ethical commitment of companies. In particular, environmental accounting is related to the development and analysis of the techniques aiming at collecting and measuring firms' environmental information, to make them available for

¹⁵ Porter, M. E. & Van der Linde, C. (1995). Toward a new conception of the environment-competitiveness relationship. *Journal of Economic Perspectives*, 9(4), 97–118.

¹⁶ Taylor, S. R. (1992). Green management: The next competitive weapon. *Futures*, 24 (7), 669-680

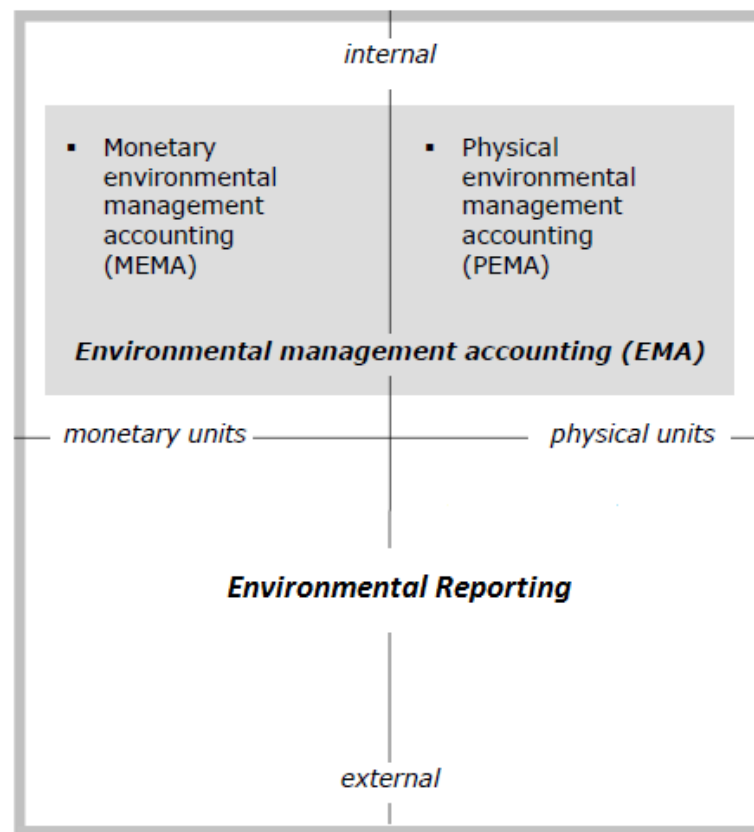
¹⁷ Nidumolu, R., Prahalad, C.K. & Rangaswami, M.R. (2009). Why sustainability is now the key driver to innovation? *Harvard Business Review* 87, p.57.

¹⁸ Parker, L. D. (2000a). Green Strategy Costing: Early Days. *Australian Accounting Review*, 10 (1), p.46.

¹⁹ Epstein, M. J. (2010). The challenge of simultaneously improving social and financial performance: New research results. In: M. J. Epstein, J-F. Manzoni, & A. Davila (Eds.), *Performance measurement and management control: Innovative concepts and practices*. Emerald Group Publishing, UK. p.4.

both internal managerial processes and external disclosure. Consistently, environmental accounting can be divided into two broad conceptual sections, as Figure 1 depicts: environmental management accounting (EMA), in the upper section, and environmental reporting, in the lower section, with the difference between them represented by the recipients of environmental information (external vs. internal actors), as the vertical axis of the figure shows. In fact, EMA is defined as the implementation of accounting tools for collecting and measuring environmental-related information with the aim of supporting internal business decisions; environmental reporting, instead, focuses on the external disclosure of these pieces of information.²⁰ As Burrit et al. (2000) underline, this conceptual separation between internal and external accounting finds its reason in the fact that the level of detail, aggregation and confidentiality of information differ between management and other stakeholders' needs.²¹

FIGURE 1. Environmental Accounting Systems.
 Source: Modified from Bartolomeo et al. 2000, p. 33.



While considerable knowledge on corporate environmental disclosure practices is now available, the focus of researchers to the process of accounting information for internal decision-making and control systems has only recently developed. Moreover, it is following

²⁰ Burritt, R. L. (2004). Environmental management accounting: Roadblocks in the way to green and pleasant land. *Business Strategy and the Environment*, 13(1), 13–32.

²¹ Burrit, R. L., Schaltegger, S. & Hahn, T. (2000). *Environmental Management Accounting – Overview and Main Approaches*. Centre for Sustainability Management, University of Lueneburg, Germany.

multiple directions, with a consequent lack of common understanding for EMA practices. This imbalance should be solved, because if it is undeniable that accounting is necessary for reporting environmental costs and outcomes, it might be even more useful in ex ante, internal processes to manage the environmental variable. Furthermore, this lack of a standardized framework for EMA application makes it simpler and more immediate, for companies, to implement only sustainability reporting, without a well-structured environmental management system driving the decisional process. In this case, “these reports may serve as veils hiding activities, whose sole purpose is the reconstruction of an eroded legitimacy”²². Hence, for sustainability to be really implemented, not only reporting is necessary, but also, and more importantly, an organizational strategic renewal and the implementation of EMA systems. All this given, in the following the two macro-components of environmental accounting are presented.

1.1.1. Environmental Management Accounting: State of the Art and Future Potential

EMA, as previously underlined, can be defined as the development and implementation of accounting practices aimed at identifying and measuring all environmental information to support internal business decisions. The already cited increased organizational focus on the environmental issue has caused a growing need and request of management control and performance measurement systems by managerial practitioners. They look for performing tools that could help them in accounting for the environment and thus fostering green management practices. Therefore, in the last twenty years, the accounting literature has increasingly made an effort in integrating the concept of environmental sustainability in accounting, in both the academic and the professional fields. Consistently, the majority of the work on EMA was published after 2000, indicating that the research commitment to the environmental matter is quite new. Despite this increased attention, two critic observations arise from the literature analysis: on the one hand, there is still a lack of consensus on a general framework encompassing and identifying the whole set of EMA practical tools; on the other hand, the actual difficulty that corporations face when integrating the environmental matter in business processes has been highlighted. In other words, effective execution of EMA systems is still volatile.²³ Some researchers ascribe this to problems in both planning

²² Gond, J., Grubnic, S., Herzig, C. & Moon, J. (2012). Configuring management control systems: Theorizing the integration of strategy and sustainability. *Management Accounting Research*, 23, p. 205.

²³ Berns, M., Townend, A. Khayat, Z., Balagopal, B., Reeves, M., Hopkins, M. & Krushwitz, N. (2009). The business of sustainability. Findings and insights from the first annual business of sustainability survey

and execution, that are mostly seen to be caused by the use of conventional management accounting tools, with no adaptation of them to environmental accounting aims. Management accounting is defined as “the identification, measurement, accumulation, analysis, preparation, and interpretation of information that assist executives in fulfilling organizational objectives”²⁴, and in its conventional applications, it does not normally give explicit and separate recognition to company-related environmental impacts. Internal management accounting, in fact, is defined to be driven by external professional accountancy rules rather than by internal needs for relevant environmental information. In particular, several are the limits that prevent it from being a performing tool when the environment needs to be assessed within business processes. Firstly, environmental costs are accounted with an excessively low level of detail. In fact, indirect environmental expenses are normally lumped in with general business overheads and thus they are not accurately traced to specific products and services. Rather, they are allocated to cost centers and then to cost objects, indirectly and through a general absorption rate, which is not correlated to environmental sustainability measures, but is usually represented by a production volume index. This can lead to the under-costing of products with a heavy environmental impact, and thus to the cross-subsidizing phenomenon, where more eco-friendly productions are burdened by the costs of dirty products. The resulting cost information is thus extremely unclear and misleading, since it does not show how highly environmental-impacting production processes are more costly than the “green” ones. Tracing environmental costs to process, rather than hiding them in general overheads, would be a more effective implementation of management accounting, towards EMA.²⁵

A lack of information for decision-making is also caused by the fact that green externalities are not accounted for. Moreover, performance appraisal mechanisms are built on financial accounting rules, thus resulting too short-term in focus to fully evaluate the environmental performance, that is multidimensional and long-term by nature. Also, the environmental dimension is generally not integrated in performance measurement and rewarding practices, so that the individual effort for sustainable development is often not measured and accordingly rewarded. This inevitably results in little motivation for committing to the environment during planning, implementation and control.

Besides these problematic aspects of conventional management accounting, the effective execution of EMA is also seen to be hampered by factors belonging to behavioral and

and the global thought leaders’ research project. *MIT Sloan Management Review*, Special report (September).

²⁴ Horngren, C., Foster, G. & Datar S. M. (2000). *Cost Accounting: A Managerial Emphasis*. Prentice-Hall, Englewood Cliffs, NJ.

²⁵ Carrera, R. M. & Iannuzzi, A. (1998). Getting Started with Environmental Cost Accounting. *Environmental Quality Management*, 8 (1), 63-68.

cultural, rather than technical dimensions. Consistently, Epstein (2010) underlines the important impact of informal control systems, embodied by organizational culture, leadership and people, on green management execution. Skepticism caused by managerial inertia, lack of requisite skills and reluctance to change can heavily hamper the decision to adapt existing control systems to environmental concerns, and their effective implementation.

Moving to a deeper characterization of EMA, it is worth underlining that the definition of its boundaries has remained quite confused until recently, with an important contribution coming from the work of Burritt et al. in 2002. In the literature, in fact, EMA was defined in two different ways: in the first approach, it was seen to use only monetary measures and information for the internal environmental accounting; in the second approach, instead, both monetary and physical internal information are seen to be considered in EMA, with no analytical distinction between the two dimensions.²⁶ Burritt et al. (2002) move from the awareness that a common understanding of both EMA and the related tools is necessary to foster its adoption, and propose a definition combining the two just cited approaches and a comprehensive framework on which to map EMA tools.²⁷ Drawing from the second approach, this definition includes in EMA both the monetary and the physical dimensions, consistently with the wide consensus that there are two main groups of environmental impacts related to company activities: environmentally-driven impacts on the economic situation of companies (expressed in monetary terms) and company-driven impacts on environmental systems (expressed in physical terms). Anyway, a distinction is made between monetary and physical accounting, as suggested in the first approach, in order to define different conceptual tools of management decision making and accountability, that respectively use monetary and physical measures. So, this definition of EMA, as depicted in the upper section of Figure 1, is made up of two components: Monetary Environmental Management Accounting (MEMA) and Physical Environmental Management Accounting (PEMA). MEMA is the accounting tool for assessing the economic impact of the environmental issue on corporate activity and generates information for internal management use expressed in monetary units (e.g., expenditures for cleaner production; costs of fines for breaching environmental laws; monetary value of environmental assets). In terms of methods, MEMA can be considered as a further development of conventional management accounting systems, since it originates from these tools, that are extended and adapted for the environmental aspect of company activities

²⁶ Bennet, M. & James, P. (1998). The Green Bottom Line. In: Bennet M., James P. (eds), *The Green Bottom Line: Environmental Accounting for Management, Current Practice and Future Trends*, Greenleaf Publishing, Sheffield, 30-60.

²⁷ Burritt, R. L., Hahn, T. & Schaltegger, S. (2002). Towards a comprehensive framework for environmental management accounting – Links between business actors and environmental management accounting tools. *Australian Accounting Review*, 12(2), 39-50.

to be assessed. Also PEMA works as an information tool for internal management decisions, but it focuses on the company's impact on natural environment, expressed in physical units. As components of EMA, they contribute to strategic and operational planning, by providing the main basis for decisions about how to set and achieve the desired targets and by acting as accountability and control devices.

On the basis of this, EMA is more specifically defined as the design and implementation of accounting practices that identify, collect and measure physical and monetary environment-related information to support day-to-day internal business decisions. It is like "simply doing better, more comprehensive management accounting while wearing an "environmental hat""²⁸. As already said, in Burrit et al. (2002), the authors also provide a prescriptive framework to identify EMA tools and how they can be useful for different business actors and in different decision contexts. These tools are categorized on the basis of not only the unit of measure used (MEMA and PEMA), but also of elements of time frame (future and past), length of time frame (short term and long term) and routines of information gathered (routine and ad-hoc).

Although several authors, besides Burrit et al. (2002), investigate on EMA tools and practices, a prescriptive and precisely defined set of tools is actually not available. In fact, while some authors seem to identify environmental cost accounting as the representative and almost unique EMA practice, in the research, multiple tools are defined as possible applications of EMA, from environmental investment appraisal to environmental budgeting; from material and energy flow accounting to environmental risk management; from environmental performance measurement to a balanced scorecard approach; from environmental target and standard setting to environmental employees rewarding.

Besides the just cited stream of literature analyzing the design of EMA practices and their level of diffusion across firms, it is possible to enucleate two other dimensions of analysis of EMA: the determinants of its adoption and its effects on organizational performance.

As for the first group, Frost and Wilmhurst (2000) report environmental sensitivity of the industry to be one of the factors contributing to the implementation of environmental cost accounting and management control practices, but not the only one influencing this choice.²⁹ Expectation of stakeholders, together with political and social pressures and organizational factors are all seen as important determinants for environmental practices. Industry type and

²⁸ UNDSO, United Nations Division for Sustainable Development (2001). *Environmental management accounting, procedures and principles*, p.3. In: <http://www.un.org/esa/sustdev/publications/proceduresandprinciples.pdf>.

²⁹ Frost, G. R. & Wilmhurst, T. D. (2000). The adoption of environment-related management accounting: An Analysis of corporate environmental sensitivity. *Accounting Forum*, 24(4), 344-365.

stock-market listing are instead identified as elements influencing the choice of integrating environmental metrics in performance measurement systems.³⁰

As for EMA effects, instead, the concept at the basis of their analysis is the one already underlined for the rationales of green strategy implementation: these practices are believed to result in an improved economic and financial performance.

From a theoretical point of view, the most widespread reasonings supporting this vision in EMA literature are several: firstly, accounting for the environment leads to the availability of relevant data that can help the managers to implement a more informed decision process, on the basis of the concept underlined by Epstein and Roy (1997) : “we manage what we measure”.³¹ A clear example of this advantage is represented by the uncovering of the environmental costs usually hidden in overheads. It leads to an improved quality of the information available for decision making and thus to a potential fostering of cost efficiency, compliance and liability reduction, that can be achieved by decreasing or eliminating such environmental costs, once they are traced.³² Moreover, a competitive advantage approach suggests that EMA can create an awareness that will potentially lead, on the one hand, to the identification of new business and market opportunities; on the other hand, to the transformation of the production process towards efficiency, thus reducing costs and wastes. Finally, EMA leads to the double advantage of supporting environmental protection, by helping the implementation of eco-efficient initiatives and, consequently, of improving the company’s image and relationship with stakeholders.

From an empirical point of view, several surveys and case studies in literature analyze the effects of EMA tools by attempting to show their relevance in helping organizations to foster both environmental and financial performance. In a number of studies, environmental performance and non-financial performance are found to be positively associated with, respectively, CEO’s remuneration levels linked to green targets execution metrics³³ and the integration of environmental information in management control mechanisms.³⁴ Environmental strategic planning is demonstrated to improve green economic performance³⁵

³⁰ Gates, S. & Germain, C. (2010). Integrating sustainability measures into strategic performance measurement systems: An empirical study. *Management Accounting Quarterly*, 11(3), 1-7.

³¹ Epstein, M. J. & Roy, M. (1997). Environmental Management to Improve Corporate Profitability. *Journal of Cost Management*, January, p. 28

³² Cullen, D. & Whelan, C. (2006). Environmental Management Accounting: The State of Play. *Journal of Business & Economics Research*, 4(10), 1-6

³³ Campbell, K., Selfik, S. E. & Soderstrom, N. S. (2007). Executive compensation and non-financial risk: An empirical examination. *Journal of Accounting and Public Policy*, 26(4), 436–462.

³⁴ Perez, E. A., Ruiz, C. C. & Fenech, F. C. (2007). Environmental management systems as an embedding mechanism: A research note. *Accounting, Auditing & Accountability Journal*, 20(3), 403-422.

³⁵ Wisner, P. S., Epstein, M. J. & Bagozzi, R. P. (2006). Organizational antecedents and consequences of environmental performance. *Advances in Environmental Accounting and Management*, 3, 143–167.

and environmental performance.³⁶ Moreover, environmental cost accounting systems and their extent of use are found to stimulate process innovation level.³⁷

On the basis of what has been presented, it is possible to say that environmental management accounting appears to be, somehow, a reinvention of management accounting. As such, it has largely been presented in a technical way and basing on economic theories. This is considered, by a number of researchers, a gap in the literature, that should be addressed through further studies and that, as we will see later, is one of the elements at the basis of our research hypothesis. What needs to be analyzed, are alternative theoretical assumptions and different levels of analysis, to shift the focus from economic theories and organizational levels to behavioral models and individual perspective. Consistently, Burrit (2004) underlines that it is believed that EMA has at its disposal “the right tools to motivate managers commitment to implement and stimulate positive attitudes towards “green” initiatives, but it might not produce the expected results due to behavioral problems”. He also wonders whether these application breakdowns could be solved through “top management commitment to environmental goals and support for implementing an environmental responsibility accounting system where clear areas of responsibility for environmental impacts are defined; managers being involved in formulating the targets for which they will be held responsible; and the introduction of positive incentive system to reward target achievement, rather than conventional negative information produced by conventional budgetary control systems”³⁸, or whether a radical change in leadership and control is needed to encourage environmental conservation. So, accounting researchers could complement existing EMA knowledge by analyzing how managers individually use environmental accounting information to make green decisions and how to design and use green management control tools to shape the managers’ choices for green management execution.

1.1.2. Environmental Reporting: State of the Art and Future Potential

The second component of Environmental Accounting is the external disclosure of environment-related organizational information: environmental reporting. These pieces of information are generally jointly reported with social and sustainability data, hence environmental reporting is often included in the wider denominations of corporate

³⁶ Henri, J.F. & Journeault, M. (2010). Eco-control: The influence of management control systems on environmental and economic performance. *Accounting, Organizations and Society*, 35(1), 63–80.

³⁷ Ferreira, A., Moulang, C. & Hendro, B. (2010). Environmental management accounting and innovation: An exploratory analysis. *Accounting, Auditing & Accountability Journal*, 23(7), 920-948.

³⁸ Burritt, R. L. (2004). Environmental management accounting: Roadblocks in the way to green and pleasant land. *Business Strategy and the Environment*, 13(1), p. 28.

responsibility (CR) or sustainability or triple bottom line (TBL) reporting.³⁹ In particular, the third concept was developed by Elkington (1999) and presents an even wider scope of reporting, with the inclusion of corporate economic impacts besides the environmental and social ones, that are representative of a sustainability report.⁴⁰ It is possible to assess that the research on environmental reporting has flourished before the EMA one and that, as already underlined, the common knowledge on disclosure practices is deeper and more developed than management accounting tools understanding. This is probably due to the fact that, by nature, reporting is simpler to standardize, at least in the formal dimension, than management accounting techniques. Moreover, from a research standpoint, organizational disclosures are more immediately and objectively analyzable, while the internal dimension of management accounting processes is far more complex to assess and thus to study. Also for this reason, statistics on the diffusion of environmental reporting practices, which will be later presented, are simpler to find in the research field. Nevertheless, there is still room for academic and practical research on environmental reporting. In particular, future studies could follow two different paths in order to solve reporting knowledge gaps. On the one hand, concerns remain about the credibility of corporate environmental reports and the rationales of managers developing them.⁴¹ In other words, the duality between environmental disclosure as a mere public relations exercise or as the concrete external side of a credible accounting system should be further analyzed. On the other hand, far more research is needed on what is considered the future of reporting: integrated reporting. In fact, its meaning is still evolving and, although a framework has recently been developed to provide companies with guidance, its adoption remains limited.⁴² Integrated reporting consists in developing only one comprehensive document in which to disclose both the financial and the social-environmental results of a corporation, instead of separating sustainability report from the mainstream financial report. For the purpose of this work, integrated reporting, together with the duality between voluntary versus mandated environmental reporting, will be examined in the next chapter. In the following, the level of diffusion of environmental reporting, the more widespread standards, the rationales and the advantages of environmental reporting are examined.

The starting point to understand the development of environmental reporting is, as for EMA,

³⁹ For this reason, in this work these 4 denominations will be used indifferently to indicate Environmental and Social Reporting.

⁴⁰ Elkington, J. (1999). Triple bottom-line reporting: Looking for balance. *Australian CPA*, 69 (2), 19–21.

⁴¹ Adams, C. A. (2004). The ethical, social and environmental reporting—Performance portrayal gap. *Accounting, Auditing and Accountability Journal*, 17(5), 731–757.

⁴² Adams, C. A. & Frost, G. R. (2008). Integrating Sustainability Reporting into Management Practices. *Accounting Forum*, 32, 288-302.

its socio-economic contextualization. With the economy becoming more knowledge- and information-based rather than machinery-based on the one hand, and with the environmental issue gaining always more prominence on the other hand, criticisms to financial reporting have become more frequent over the past 20 years. The growing importance of intangible assets and of organizational sustainability information that are not captured on the balance sheet, in fact, is increasingly seen as a failure of financial reporting to perform its information function in the actual context. It has been generally accepted that, in order to be competitive in the long run, corporations need to go beyond the quarterly financial results. Sustainability reporting aims at filling this gap and, while once it was typical of a few unusually green or community-oriented companies, today it is considered a best practice employed by companies worldwide. Consistently, the ninth edition of KPMG's Survey of Corporate Responsibility Reporting shows a high rate of CR reporting implementation. The survey refers to the G250 companies – the world's largest companies by revenue – and to the top 100 companies of each among the 45 countries analyzed: N100 (a total of 4,500 companies). In particular, as Figure 2 shows, CR disclosure practice has deeply grown over the last 20 years and is implemented today by 73% of the N100 and 92% of the G250. KPMG also underlines that overall, although this growth has continued between 2013 and 2015, its rate has slowed down, suggesting that future increase in CR reporting is likely to occur in smaller increments unless driven by mandatory reporting legislation. From a regional standpoint, as depicted in Figure 3, Asia Pacific has risen to become the leading region for CR reporting over the last four years, from a position lagging behind other regions with a 2011 reporting rate below 50%, to 79% in 2015. It is followed by the Americas (77 %) and then Europe (74%), whose ranking (3rd) is due to a significant difference in reporting rates between Western European (79 %) and Eastern European companies (61%), with the latter reducing the average European CR reporting rate. Interestingly, the situation is reversed when analyzing the more specific practice of Carbon Reporting, with Europe ranking first (93%), followed by Americas (80%) and Asia Pacific (74%).⁴³

⁴³ KPMG. (2015). *Currents of change: The KPMG Survey of Corporate Responsibility Reporting*, in <http://www.kpmg.com/>.

FIGURE 2. CR reporting rate, by year.
 Source: KPMG Survey of Corporate Responsibility Reporting 2015.

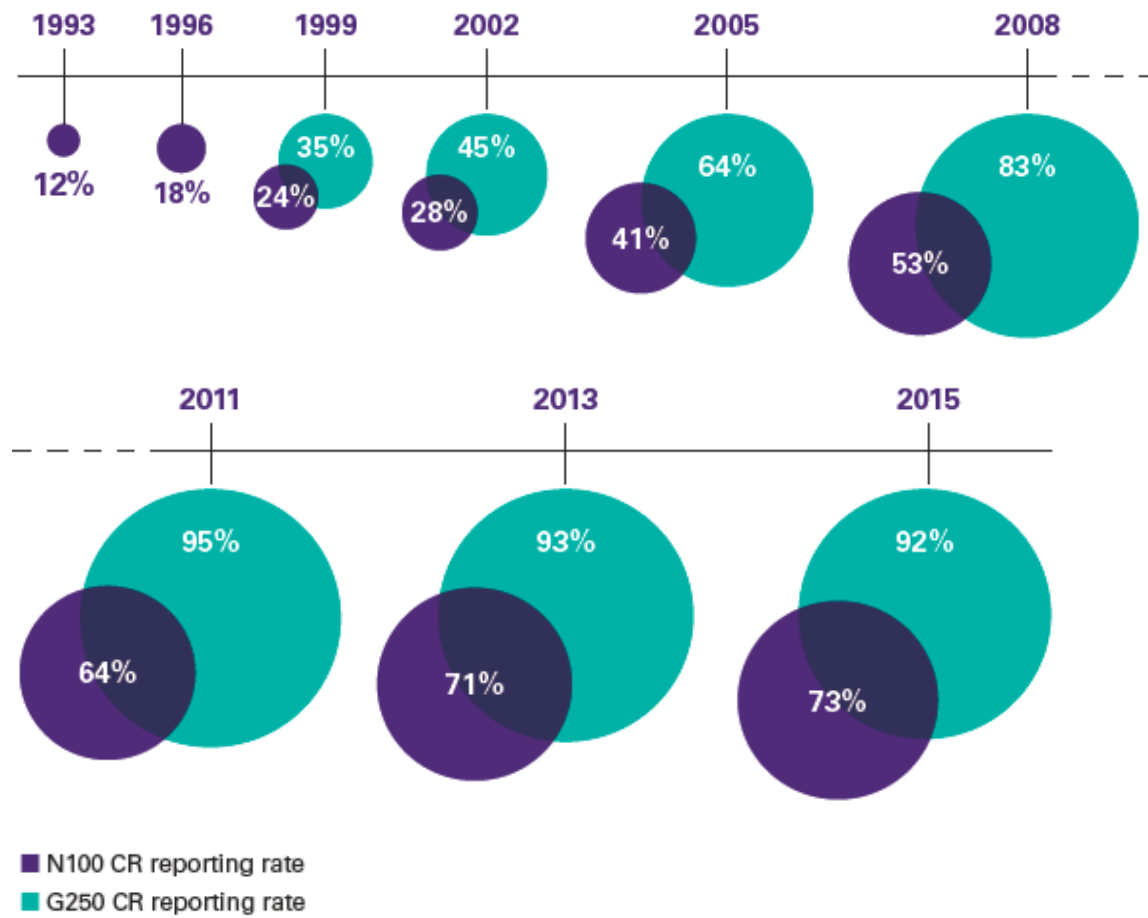
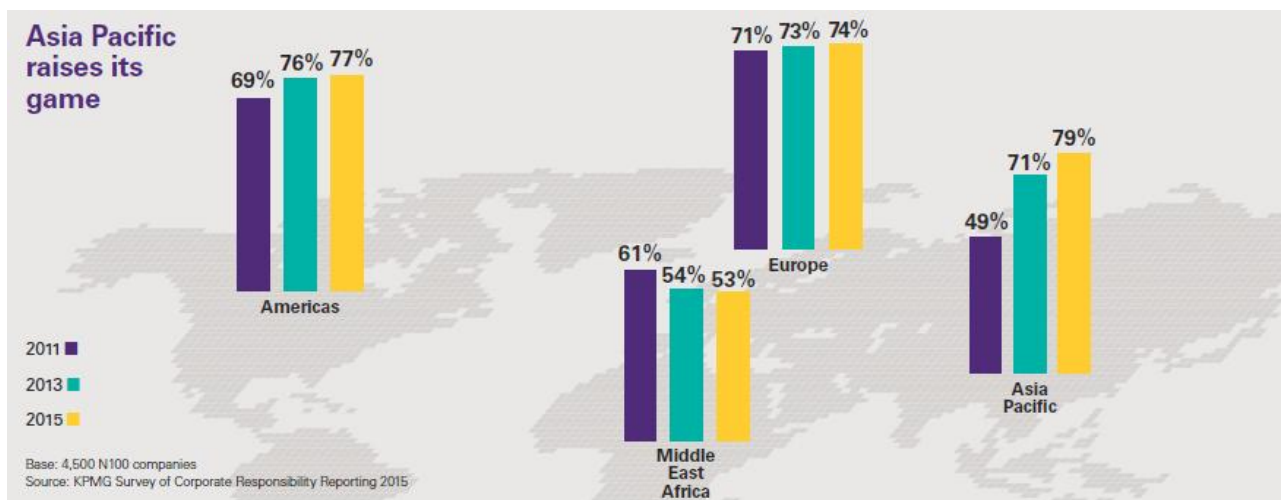


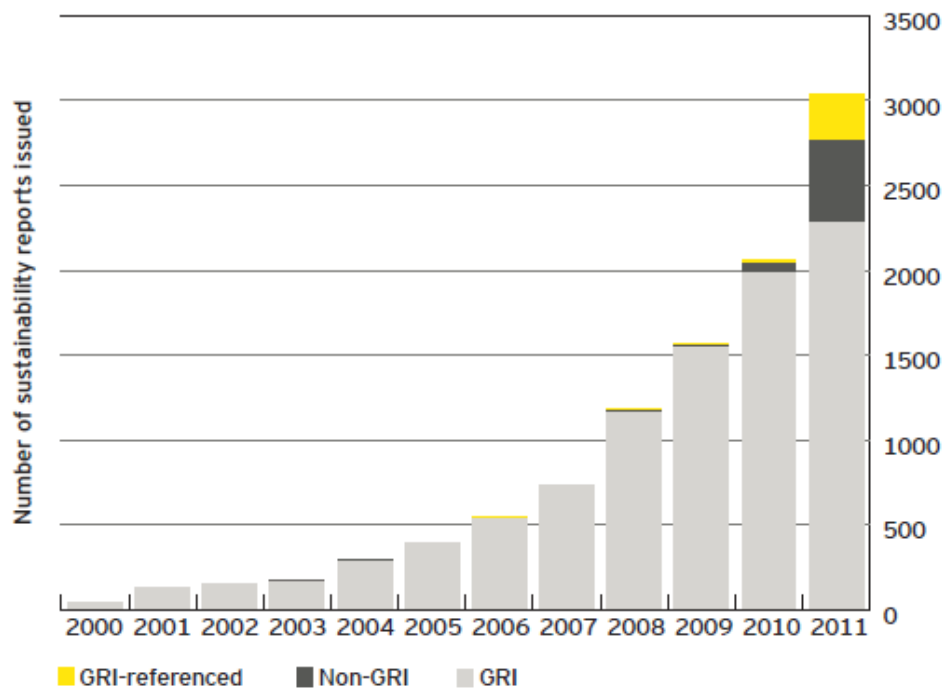
FIGURE 3. CR reporting rate, by region.
 Source: KPMG Survey of Corporate Responsibility Reporting 2015.
 Base: 4,500 N100 companies.



As firms worldwide have embraced sustainability reporting, the most widely adopted framework has been the one created by the Global Reporting Initiative (GRI). GRI was founded in 1997 with the aim of developing globally applicable guidelines for reporting of corporations, governments and NGOs. GRI's sustainability reporting Framework, first published in 2000 and now in its fourth version (G4), provides a robust guidance for disclosure on sustainability performance. The working groups that draft it are composed of corporate representatives, NGOs, labor groups and society at large. By continually revising its standards through a broadly consultative global process to meet evolving environments, the GRI has created the first global framework for comprehensive sustainability disclosure and has established itself as a leader in reporting standards.⁴⁴ A study on sustainability reporting published by the joint effort of The Boston College Center for Corporate Citizenship and Ernst & Young LLP in 2013 reports data from GRI Sustainability Database, on the growing trend of GRI sustainability reporting. As Figure 4 shows, in particular, the trend of GRI standards use for sustainability reporting has been increasing since 2000, with an average growth of more than 30% every year between 2007 and 2011. Moreover, the before cited study by KPMG maintains that, in 2015, 60% of all N100 and 74% of the G250 use the GRI framework for their sustainability reports.

FIGURE 4. Growth of sustainability GRI reporting, 2000–2011.

Source: EY & Boston College Center for Corporate Citizenship, *Value of Sustainability Reporting*.



⁴⁴ Ernst & Young LLP & Boston College Center for Corporate Citizenship. (2013). *Value of sustainability reporting*. In:

http://modulas.kauri.be/Uploads/Documents/doc_2260_thevalueofsustainabilityrepsummary.pdf

The GRI framework contains three main elements: sustainability reporting Guidelines, Protocols and Sector Supplements. The Guidelines are broadly relevant to all organizations regardless of size, sector or location and identify the indicators and the standard disclosures that companies should report. Consistently with the concept of TBL, they are divided in three categories of indicators: economic, environmental and social. Protocols explain each indicator of the Guidelines and the compilation methodologies, while Sector Disclosures address the gaps caused by the one-fits-all approach of the Guidelines, by complementing them with sector specific sustainability issues.

The just cited widespread implementation of environmental reporting has been widely analyzed in its rationales. In the literature, external pressure for environmental impact transparency and data reliability is defined as the principal driver for corporate implementation of sustainability reporting. Such pressures arise from the most diverse audiences: from the environmental groups, the media and the scientific community, to the companies' stakeholders like investors, clients and suppliers.⁴⁵ On the basis of this, several studies describe the legitimacy theory as an explanatory concept for environmental reporting, posing that social disclosure is motivated by the corporate need to legitimize activities. But besides the situation in which corporate activities are effectively oriented to sustainability, environmental reporting could also be used to divert attention from adverse environmental situations.⁴⁶ Consistently, several works adopt a legitimacy theory approach to explain the companies' use of external reporting as a tool to reduce exposure to the social and political environment as opposed to a means for signaling a proactive strategy towards green objectives, otherwise unobservable.⁴⁷

Whatever the managerial reasons to implement environmental reporting, several are its benefits for organizations identified in the accounting literature. Firstly, an enhanced corporate image and trust of all company stakeholders is underlined. Given that customers, shareholders, suppliers and communities call for more transparency, in fact, environmental reporting is undoubtedly seen as a step forward in organizational sustainability commitment, that can improve the trust and loyalty of those outside the corporation. On the basis of this, companies that fail to disclose their environmental and social impact can face serious business consequences. In fact, on the one hand, not reporting does not mean to hide potentially bad

⁴⁵ Lamberton, G. (2005). Sustainability Accounting – A Brief History and Conceptual Framework. *Accounting Forum*, 29, 7-26

⁴⁶ Wilmshurst, T. D, Frost, G. R. (2000) Corporate environmental reporting: A test of legitimacy theory. *Accounting, Auditing & Accountability Journal*, 13 (1), 10 – 26.

⁴⁷ Cho, H. C., Freedman, M. & Patten, D. M. (2012). Corporate disclosure of environmental capital expenditures: A test of alternative theories. *Accounting, Auditing, & Accountability Journal*, 25(3), 486-507.

environmental data for companies. Subpar environmental performance has become hard to hide at present, because of the attention given by the media and the society to sustainability commitment and because of the influent opinions of many environmentalists groups, which can seriously threaten companies' reputation. On the other hand, without reporting, companies can miss the opportunity to attract new customers by positively shaping their image. Beyond these benefits of greater accountability and thus enhanced corporate image, reporting can also help the internal strategy formulation. The necessary data collection, in fact, requires a careful tracking of the environmental impact, which can help organization to manage climate change challenges.⁴⁸ Finally, but not less importantly, many studies underline how environmental reporting boosts company valuation and thus promotes its access to finance, since it reduces investors' uncertainty.⁴⁹ Corporate transparency and communication with stakeholders, together with the possibility to clearly evaluate environmental risks, in fact, have been identified as one of the most relevant aspects investors monitor in their decisional process.

1.2. Strategic Issue Management: How Cognitive Categorizations Affect Organizational Decision Making

Strategic issue management literature is not a newly developed research field – the first studies date back to the seventies – but it analyzes a topical matter for organizational theories. That is, how strategic issues are interpreted by the people held responsible within corporations and how, in turns, these interpretations result in organizational responses and activities.

The very starting point of this stream of literature is said to be the two assumptions underlying organizational research: on the one hand, that the short- and long-term performance of firms is partly determined by the actions they implement in response to their external environments; on the other hand, that these organizational actions are partly dependent on the behaviors of individuals in the organization, especially the top-level decision makers.⁵⁰ Moving from these considerations, strategic issue management researchers study how individuals' cognitive representation of the external context is developed and its link with subsequent organizational actions. To do so, the dominant approach is to integrate an interpretive view of organizational decision making with cognitive categorization theory. Hence, before analyzing the resulting

⁴⁸ Porter, M. E. et al. (2007). Climate Business | Business Climate. *Harvard Business Review*, 1-17.

⁴⁹ Cheng, B., Ioannou, I. & Serafeim, G. (2014). Corporate Social Responsibility and Access to Finance. *Strategic Management Journal*, 35 (1), 1-23.

⁵⁰ Child, J. (1972). Organizational structure, environment and performance: The role of strategic choice. *Sociology*, 6 (1), 1-22.

model, it is worth presenting briefly the categorization theory, that is the starting point of strategic issue management theory.

1.2.1. The Starting Point of Strategic Issue Management: Categorization Theory

Categorization theory falls under the umbrella of cognitive theories, that identify schema as tools used by individuals to understand and simplify their world. In the specific case, schema, that describe how data are stored in memory and used to codify different situations, are represented by categories. In particular, categorization theory describes the development and use of categories by individuals to organize their natural and social worlds. This theory was initially developed by Rosh (1975) as an explanation of the cognitive process at the basis of the concept formation for natural objects.⁵¹ Following this initial direction, most research on this theory has focused on the categorization processes implemented by individuals to understand and interact with the natural world. Some attention has also been paid to the categorization of social objects, situations and events.⁵² The ambiguity intrinsic to social phenomena makes their categorization more complex but also more powerful, since the labeling and simplification of elements is said to have the greatest effect when applied to ambiguous stimuli, like the social ones.⁵³ Whatever the application field of categorization theory, its critical assertion is, as just underlined, that people develop cognitive categories on the basis of their observations of objects' features and use such categories to organize their world. Hence, the category is the basic element of this theory and it is defined as composed by elements that are similar but not identical. In particular, they share some common attributes, but are also differentiated by dissimilarities. Given this, a prototypical category member is defined as an element characterized by the common features shared by all the other category members. Such features of the prototypical member that, by definition, differentiate categories, are said to have high cue validity by Rosh (1975).

Advocates of the categorization theory claim that the individuals' use of categories to interpret situations has a double rationale, respectively addressing the personal and societal spheres. In fact, on the one hand, categories are developed by individuals to reduce the complexity of phenomena they have to deal with, by organizing elements into meaningful groups; on the other hand they are useful in day-to-day interactions among individuals,

⁵¹ Rosch, E. (1975). Cognitive reference points. *Cognitive Psychology*. 1, 532-547.

⁵² Tversky, B., & Hemenway, K. (1983). Categories of environmental scenes. *Cognitive Psychology*. 15, 121-149.

⁵³ Rommetveit, R. (1968). *Words, meanings and messages*. Academic Press, New York.

because the information summarized by a category label are shared by community members.⁵⁴ A step forward in the development of categorization theory has been the analysis of the consequences of cognitive categories' creation, that are represented by effects on individual behaviors. In particular, once categories are created, three cognitive phenomena are likely to happen. Firstly, memory for category-consistent information is stronger than memory for category-inconsistent information. Whether this happens because inconsistent information is unnoticed or simply forgotten, the result is that, once an object is categorized, its cognitive representation developed over time is inaccurate and simplified. In fact, it is built by considering only the information that confirm the already defined categorization of the object.⁵⁵ The second and the third effects can be described as a unique error consequent to cognitive representation. More precisely, in both the situations in which new information about an element is either incomplete or ambiguous, it is likely that this gap or ambiguity will be filled with information consistent with the already defined category. In other words, people are led to infer the presence of attributes typically associated with category members, when the available information is incomplete or ambiguous.

These assertions are of high importance for behavioral studies, since they acknowledge the power of categorization to lead individuals adjusting and distorting both new (ambiguous or incomplete) and old information, so that the initial categorization of a given object is likely to be inaccurately confirmed over times. Although social psychology is the most developed and, at a first sight, suitable application field of categorization theory, it widely helped also organizational scientists' understanding of leadership.⁵⁶ Following this cross-fertilization between cognitive psychology and organizational theory literature, Dutton and Jackson (1987) posit that "a natural extension" of categorization theory is "applying it to the study of how [organizational] decision makers label, interpret, and respond to strategic issues"⁵⁷. In the following section, the model developed in their work, that embodies the representative theory for strategic issue management, is presented.

⁵⁴ Cantor, N., & Mischel, W. (1977). Traits as prototypes: Effects on recognition memory. *Journal of Personality and Social Psychology*, 35, 38-48.

⁵⁵ Alba, J. W., & Hasher, L. (1983). Is memory schematic? *Psychological Bulletin*, 93, 203-231.

⁵⁶ Phillips, J. S. & Lord, R. G. (1982). Schematic information processing perceptions of leadership in problem solving groups. *Journal of Applied Psychology*, 67, 486-492

⁵⁷ Dutton, E. J. & Jackson, S. E. (1987). Categorizing Strategic Issues: Links to Organizational Action. *Academy of Management*, 12 (1), p. 79.

1.2.2. Linking Cognitive Categorization to Organizational Decision Making: Strategic Issue Management

Strategic issue management, as already underlined, conceptualizes on the relationship between the categorization of strategic issues by decision makers and the organizational action implemented. The model is developed through applying categorization theory to corporate strategic issues and through integrating this with an interpretive view of decision making. The resultant is a three-steps model explaining the process going from the identification of strategic issues to the implementation of organizational actions.

The first phase of this theory has strategic issues as its central element, since it deals with their identification and subsequent categorization. Strategic issues are defined as events, developments and trends that affect an organization as a whole and that arise either from changes inside the firm or from external matters. However, not all these events represent strategic issues, but only the ones that are perceived by the organization's members as having potential consequences on the achieving of organizational objectives.⁵⁸ This element of subjective perception is integrated in strategic issues' definition because they do not appear in objective, prepackaged form; rather, they are a continuous stream of ill-defined events, among which only some are identified and selected as strategic by decision makers. In this selection process, personal information capacity limits, together with individual and organizational filters, play an important role. Individual filters may be represented by past experiences, such as functional training, while organizational ones are embodied by corporate strategy, structure and systems. Once an issue has penetrated such filters, it is categorized. Here, the application of categorization theory to organizational strategic issue is implemented, by restricting the definition of the subject of the theory – from a general individual to the organization's decision maker – and of the object of the theory – from a natural or a social element to the strategic issue –. The cognitive categorization of strategic issues, as already underlined in the case of a general object, has the double aim of helping the decision maker to store information more efficiently and of aiding communication with other organizational members. The extant literature on strategic management has identified two typical categories with which strategic issues are associated and labeled: threat and opportunity. These labels capture top managers' beliefs about the potential effects of strategic events and trends and set in motion processes that lead the organization towards a specific direction.⁵⁹ Three are the dimensions along which the research has theoretically and empirically defined threat and opportunity: positive-

⁵⁸ Egelhoff, W. G. (1982). Strategy and structure in multinational corporations: An information processing approach. *Administrative Science Quarterly*, 27 (3), 435-458.

⁵⁹ Dutton, J. E., Fahey, L., & Narayanan, (1983). Toward understanding strategic issue diagnosis. *Strategic Management Journal*, 4 (4), 307-323.

negative, gain-loss, controllable-uncontrollable. Specifically, the opportunity category implies a positive situation, in which gain is likely and which the organization is able to handle and control. On the contrary, threat is defined as a negative situation, that is likely to cause loss and that is uncontrollable by the organization. According to the categorization theory, these three attributes are said to have high cue validity for the categories of threat and opportunity. Once strategic issues are identified and categorized, the second phase of the process begins, which consists in the acquisition and interpretation of information relative to the strategic issue in analysis. This is the turning point of the model, that helps to explain why issue categorization is supposed to eventually affect organizational responses. Drawing directly from the categorization theory, in fact, the model posits that the information analysis, which chronologically follows the labeling of the strategic issue, is affected by the categorization itself, in the already explained ways. Specifically, once a phenomenon has been categorized, a confirmatory bias reinforces such original labeling, by affecting the processing of both old and new information. In the former case, consistently with categorization theory, old information congruent with the category will be better remembered than old, incongruent information. Also in the latter case, new category-consistent information is more likely to be identified and processed with respect to new category-inconsistent information. Moreover, this bias influences also the assumptions made by decision makers about unavailable or ambiguous information, leading such assumption to be consistent with the way the issue has been already categorized. Hence, once labeled, the issue's perceptions are unlikely to change, because they push the interpretation of all (new and old, available and unavailable) information to confirm the initial categorization. Moreover, given that, as already said, categorization also affects the social dimension, communication within organizational members will be biased. Consistently, issue-relevant information, that are underlined during daily conversations, will be more likely the ones that confirm the category than the ones that disconfirm it.

This biased acquisition and processing of information explains the third step of the model, that underlines how the eventual organizational actions are affected by the initial identification and, mostly, categorization of the strategic issues. The categories of threat and opportunity, in fact, are found to be relevant and consequential for decision processes.⁶⁰ Which direction this influence takes is hypothesized by several researchers, but there are no univocal answers. Nutt (1984) argues that organizational actions are influenced in terms of processes implemented to respond to the strategic issues. Specifically, categorizing an issue as

⁶⁰ Mintzberg, H., Raisinghini, D., & Theoret, A. (1976). The structure of unstructured decision processes. *Administrative Science Quarterly*, 21, 246-275.

an opportunity is found to result in a more open search for solutions than does categorizing it as a threat. This open search is defined along several dimensions, such as a high inclusion of subordinates in the search process, the innovativeness and the multiplicity of the solutions implemented.⁶¹ Other authors, instead, identify the target and the magnitude of organizational actions to be affected by issues categorizations.⁶²

To conclude, it is important to underline an interesting element of the strategic issue management theory: the focus on strategic issues as starting point of all the process until the organizational actions' implementation. This distinguishes this model from the traditional decision-making view for interpreting patterns of organizational actions. Typically, in fact, researchers define a decision and then trace backward from that point. In so doing, they look at decisions as creators of patterns in organizational actions and use such end point of the process as the initial reference, to find who and what were involved in the decisional process. On the contrary, by identifying the strategic issues as a starting point, this model more deeply captures the rationales of organizational actions.⁶³

Moreover, the importance of this stream of literature can be found in the introduction of a personal element in the analysis of the organizational actions. Besides the just cited focus on strategic issue, in fact, the perception of such strategic issue as an opportunity or a threat by the decision maker is even more important, because it is not possible to objectively define a strategic issue as an opportunity or a threat; rather, managerial interpretation is necessary and, as such, it is a key element. This helps to explain why similar firms operating in similar external contexts respond to the same strategic issue in different ways: even when exposed to identical stimuli, top managers in different organizations develop diverse interpretations of the same strategic issue that, as a consequence, lead to different organizational answers.⁶⁴ However, most existing studies of issue interpretation have focused on how top managers of various organizations perceive different strategic issues. When, instead, the content of the strategic issue is the same, what it is hypothesized to shape managerial perception are the internal characteristics of the organization. Anyway, research that goes beyond the differences in the strategic issues' contents to examine the effect of the organizational context on managerial interpretation is still needed. This relationship between firms' context and strategic issue interpretation, in fact, has been predominantly theoretical, while "if researchers hope to understand and improve strategic decision processes, our understanding of what

⁶¹ Nutt, P. C. (1984). Types of organizational decision processes. *Administrative Science Quarterly*, 29, 414-450.

⁶² Bowman, E. H. (1982). Risk seeking by troubled firms. *Sloan Management Review*, 23(4), 33-42.

⁶³ Dutton, J. E. & Dukerich, J. M. (1991). Keeping an eye on the mirror: Image and identity in organizational adaptation. *Academy of Management Review*, 34 (3), 517-554.

⁶⁴ Meyer, A. D. (1982). Adapting to environmental jolts. *Administrative Science Quarterly*, 27, 515-536.

causes the same stimuli to be interpreted differently in different organizations should be a high-priority research question”.⁶⁵

⁶⁵ Thomas, J. B., Reuben, R. (1990). Interpreting Strategic Issues: Effects of Strategy and the Information-Processing Structure of Top Managements Team. *Academy of Management Journal*, 33 (2), p. 287.

CHAPTER 2

The Effects of Environmental Accounting and Managerial Interpretation on Corporate Environmental Strategy: Research Hypothesis Setting

Several studies within corporate environmental strategy literature show that companies within a common industry context tend to adopt similar strategies in response to the institutional forces they experience. However, another wide range of researches show an interesting variability among the environmental strategies of companies that belong to the same industry and to similar social and regulatory contexts. This testifies, according to the authors, that operating in analogous external settings is not determinant to define a certain environmental strategy.⁶⁶ Rather, it has been argued that the importance of organizational and managerial factors in shaping organizational environmental strategy should be considered. In fact, on the one hand, organizational context defines “the range of organizational reality” and limits “the repertoire of possible options”⁶⁷, thus affecting managerial choices. On the other hand, in the environmental management dimension, “there is a large role for individual interpretation and innovation”⁶⁸, which can heavily affect organizational choices. Thus, organizational and managerial forces are supposed to be the elements allowing for differences in environmental strategies among similar firms. Consistently, it has been generally found that organizational and managerial perspectives on the environmental matters are widely divergent, even among firms that use similar technologies, face comparable competitive environments, operate under commensurate levels of public scrutiny and are subject to a common regulatory regime. However, according to several authors, the extant literature has made little progress toward providing insights into how these elements may be associated with firms’ environmental strategies choices. Only theoretically, and with no further specifications, it has been assessed that they may represent the principal cause of such variability, the mediating factors between similar external contexts and different environmental strategies.⁶⁹

⁶⁶ Stead, W. & Stead, J. (1995). An empirical investigation of sustainability strategy implementation in industrial organizations'. *Research in Corporate Social Performance and Policy*, 1, 43-66.

⁶⁷ Hoffman, A. J. (1997). *From Heresy to Dogma: An Institutional History of Corporate Environmentalism*. New Lexington Press, San Francisco, p. 148.

⁶⁸ Jennings, P. D. & Zandbergen. P. A. (1995). Ecologically sustainable Organizations: An Institutional Approach. *Academy of Management Review*, 20, p. 1041.

⁶⁹ Sharma, S., Pablo, A. & Vredenhurg, H. (1999). Corporate environmental responsiveness strategies: The importance of issue interpretation and organizational context. *Journal of Applied Behavioral Science*, 35, 87-108.

The lack of attention to behavioral and individual dimensions is, as already underlined in the previous chapter, a great gap also in the more specific EMA literature. Although the behavioral variable has been defined of high importance for understanding the volatile execution of EMA, in fact, little attention has been paid on how managers individually interpret and consequentially use environmental accounting information to make green decisions. Similarly, it has not been analyzed how these managerial interpretations can, in turns, be shaped by a specific design and use of green management accounting and control systems. The first building element of our research hypothesis is build on these considerations and acknowledges that analyzing the individual managerial interpretations of the environmental accounting information on the one hand, and how these interpretations are influenced by the internal management accounting systems themselves on the other hand, would help to gain a greater knowledge of EMA tools' effectiveness and of their potential impact on managerial decisions.

If EMA literature lacks in the focus on the behavioral sphere, despite acknowledging its importance, a diametrically opposed position is embodied by strategic issue management literature. In fact, it provides a great knowledge on how managers develop and categorize perceptions of strategic issues and on how such interpretations eventually affect managerial decisions, as already explained in the previous chapter. This stream of research, however, has not analyzed the hypothesis in which the strategic issues deal with the environmental variable. Moreover, also in this case, the importance of the internal organizational context as an element that may shape the managerial perception of issues and thus the eventual managers' decisions has been only theoretically supposed. Instead, as already underlined in the previous chapter, research that goes beyond the differences in the strategic issues' contents to examine the effect of the organizational context on managerial interpretation is highly needed, because it would give a great contribution on understanding how managerial decisional process is developed.

All this given, the research framework that is now going to be presented draws from both the research streams of environmental accounting and strategic issue management, implementing a cross-fertilization between accounting and managerial literature while trying to address their gaps. On the one hand, environmental accounting offers a guidance on the managerial and control tools that can be used to address the environmental matter, while lacking in the individual and behavioral elements analysis, that can potentially explain EMA's volatile execution. On the other hand, strategic issue management literature offers a valuable knowledge on the cognitive interpretation of a strategic issue by a decision maker and on how this personal interpretation eventually affects organizational actions, but it has not been

applied to environmental strategic issues and it does not analyze how the internal organizational context affects managerial interpretation itself.

Studies implementing this integration between environmental accounting and strategic issue management theories are not common in the academic research field. However, one representative example can be found in the work of Sharma, published in 2000 and analyzing the relationship between organizational context, managerial interpretation of environmental issue and corporate environmental strategy.⁷⁰ In particular, building on hypotheses developed from the exploratory case studies of 7 Canadian oil and gas companies described in Sharma, Pablo, and Vredenburg (1999), it widens the sample to 99 firms of the Canadian oil and gas industry and empirically assess whether the managerial framing of environmental issues as opportunities rather than as threats affects the environmental strategy of firms and whether their organizational context, upstream, influences such managerial interpretation.

The organizational context supposed to affect the managerial perception of the environmental matter consists of three elements: issue legitimation, discretionary slack and employee incentive system. Issue legitimation measures how embedded is the concern for the environment in corporate identity and thus, how legitimated are organizational actors to adopt an environmental conscious behavior. Discretionary slack represents the amount of time and resources available to managers for developing innovative solutions to deal with the relationship between business and the natural environment. The third element, instead, evaluates the incorporation of green performance criteria in employee evaluation and rewarding systems. Consistently with strategic issue management literature, the managerial interpretation of environmental issue is expressed as opportunity perception or threat perception. Finally, environmental strategy is defined in eight categories of possible environmental activities implemented by companies to reduce their impact on the natural context. In order to measure the level of corporate green responsiveness, these activities are classified in a scale from conformance to voluntariness. Conformance implies that they are implemented only under external pressures and to comply with regulation and standards; a voluntary environmental strategy, instead, has strategic, organizational and ethical choices as rationales. With these definitions of the main variables of the model, Sharma sets four hypothesis to test, on the one hand, whether a more environmental conscious organizational context leads the manager to perceive environmental issues as opportunities rather than as threats; on the other hand, whether this framing of environmental issues as opportunities

⁷⁰ Sharma, S. (2000). Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy. *Academy of Management Journal*, 43 (4), 681-697.

rather than as threats is positively correlated to the implementation of a voluntary environmental strategy rather than a conformance environmental strategy, and vice versa.

Through the analysis of data from a questionnaire survey, the latter hypothesis is confirmed. As for the relationship between organizational context and managerial perception, instead, managerial interpretations of environmental issues as opportunities are found to be significantly influenced by both the degree of legitimation of environmental issues and the discretionary slack available to managers. The inclusion of environmental criteria in employee evaluation and rewarding systems, instead, was not confirmed to affect managerial environmental interpretation.

Sharma's study highlights the importance of the human dimension in the creative problem solving and innovation necessary for voluntary environmental strategies. Also, it provides an important contribution to understand how the integration of environmental commitment within the organizational context positively affects the development of green accountability strategies, through shaping managerial perception of environmental issues.

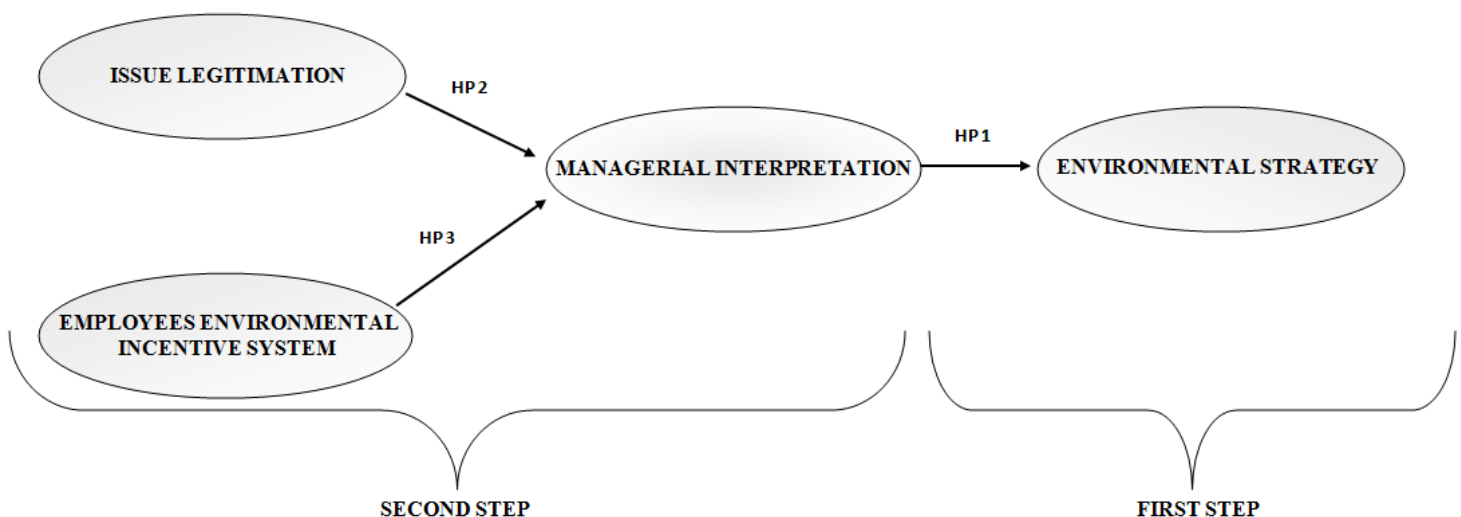
Hence, being this work a great example of how to test the interaction between strategic issue management and the environmental variable, it is taken as a reference in the development of our research hypothesis. However, apart from environmental employees incentive system, Sharma does not analyze the level of effectiveness of environmental accounting tools in shaping green strategies decisions. Rather, the focus is on a general commitment for the environment within the organizational context, without evaluating specific accounting and control tools that make this commitment concrete and objectively measurable.

This limitation in Sharma's work testifies the lack in the literature of a study integrating environmental accounting and strategic issue management research. By aiming at overcoming this gap, the present work sheds some light on the effectiveness of some environmental accounting tools in influencing the definition of corporate environmental strategy. In analyzing this relationship, the individual element is taken into consideration, thus addressing environmental accounting literature's lack of individual analysis while testing the strategic issue management literature applied to the environmental matter. To perform this, we shift the focus from Sharma's general organizational context to precise environmental accounting and control systems as determinants of managerial perception of environmental issues. This will also lead us, as it will be explained later, to more objectively define Sharma's issue legitimation, measure used also in our research hypothesis. Similarly, the measures of environmental strategy and managerial perception are defined differently, to increase, respectively, their objectivity and their capacity to capture more complex and less defined situation of individual interpretation.

All this given, we propose a modified research framework that is developed in two steps, as shown in Figure 5. In particular, this work operationally defines and tries to empirically evaluate the influence of several, specifically designed environmental accounting systems – namely, environmental employees incentive system on the one hand, and six other environmental accounting tools enclosed in issue legitimation on the other hand – on the individual managerial interpretation of the environmental issues and how this categorization, in turns, eventually affects corporate environmental strategy. Hence, this work evaluates whether environmental accounting tools indirectly affect the defining and implementation of a responsive corporate environmental strategy and whether, in this relationship, the individual perceptions of managers represent the intermediate, decisive element. Consistently, “understanding the requisite conditions for [corporate] environmental responsiveness is not only an important area of inquiry but also a complex and encompassing endeavor that can fruitfully draw upon multiple research paradigms to enhance development of more explanatory frameworks of corporate environmental responsiveness”.⁷¹

For this purpose, we proceed backwards, testing firstly the impact of managerial interpretation on corporate environmental strategy (first step: hypothesis 1) and then the impact of, respectively, issue legitimation and employees environmental incentive system on the managerial interpretation of environmental issues (second step: hypothesis 2, 3).

FIGURE 5. Theoretical Research Framework.
 Source: Modified from Sharma, (2000). P.682.



⁷¹ Sharma, S. (2000). Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy. *Academy of Management Journal*, 43 (4), p.88.

2.1. Determinants of Environmental Strategy

Before analyzing the factors supposed to affect the development of corporate environmental strategy, it is worth defining the concept of environmental strategy itself. This is rather challenging and a personal choice of perspective is needed. Indeed, in the research literature, the concept of environmental strategy is defined as multidimensional in nature and has not a univocal representation; rather, each study autonomously classifies firm's attitudes in managing the environmental variable. Although the interest in companies' environmental activities has been increasing over the past twenty years, in fact, the accounting profession has been slow in the effort to define, measure and control this broad corporate domain. Thus, measures of environmental strategy have proliferated in the absence of clear, generally accepted guidelines to categorize it and to define what constitutes good and bad environmental performance.⁷² Despite this lack of a unique and prescriptive definition, it is possible to assess that a widespread way of presenting environmental strategy is either through process measure or outcome measures. Accordingly, process measures of environmental strategy are represented by all those organizational systems and stakeholder relations with the final aim of making firms able to effectively manage the environmental variable. In particular, organizational systems are embodied by structural and programmatic characteristics of the company, including written policies, standards definition and adoption, internal accounting and control mechanisms, employees training and incentives.⁷³ Stakeholder relations, instead, refer to the interaction between the company and its various external constituencies, including its shareholders, the local community, government, customers, suppliers, and industry. These interactions are represented by activities such as corporate philanthropy, community outreach, formal relations with social activists and the government and, above all, corporate willingness to communicate with such external actors through disclosure of environmental performance information.

On the other hand, adopting an outcome-related perspective to analyze environmental strategy implies a more concrete focus on all corporate activities implemented both for regulatory compliance and to reduce firms' impact on the environment. Hence, while process measures refer to the organizational and structural characteristics of a company, outcome measures focus on the physical dimension of corporate activity, represented by modifications in the production or transportation process, aiming at reducing the negative environmental

⁷² Ilinitch, A. Y., Soderstrom & N. S., Thomas, T. E. (1998). Measuring Corporate Environmental Performance. *Journal of Accounting and Public Policy*, 17, 383-408.

⁷³ Wells, R.P., Hochman, M.N., Hochman, S.D. & O'Connell, P.A. (1994). *Measuring environmental success. Understanding Total Quality Environmental Management*. Executive Enterprise Publications, New York.

externalities generated in the conduction of business. Consistently with Sharma, here an outcome-related perspective is adopted and thus environmental strategy becomes a synonymous of physical environmental initiatives and activities. So, these terms will be used interchangeably from now on. What has been just defined as the process measures of environmental strategy, thus the internal environmental accounting and control systems and the external disclosure to stakeholders, instead, are enclosed in the two elements of issue legitimation and employees environmental incentive system, as it will be later explained. While this choice of perspective draws on Sharma's work, the specific classification of environmental initiatives to evaluate the level of corporate green responsiveness is different and has the Carbon Disclosure Project (CDP) as main reference. Specifically, Sharma, as already underlined, adopts a continuum of conformance to voluntariness to categorize firms' environmental initiatives. However, as several authors posit, defining whether an environmental initiative has been undertaken only for regulatory compliance or because of deeper economic and ethical reasons could lead to a high level of uncertainty and ambiguity in results, especially if corporate information are self-reported.⁷⁴ Consistently, this work opts for a more objective classification and categorizes environmental strategy along two attributes dimensions, identified as its intensity and its scope. Environmental strategy's intensity is represented by the number of environmental initiatives undertaken by the company, while its scope is the number of typologies of environmental initiatives implemented. To define the possible typologies of environmental activities, the ones identified by the CDP have been taken into consideration, these are: "Energy Efficiency", "Carbon Efficiency", "Transportation", "Product Design", "Behavioral Change" and "Others".⁷⁵

All this given, we assume that a more environmental responsive firm will be characterized by a high intensity, wide scope environmental strategy with respect to a less environmental responsive firm, implementing more environmental initiatives and covering more environmental types of activities identified by the CDP.

⁷⁴ Shrivastava, P. (1992). Corporate self-greenewal: Strategic responses to environmentalism. *Business Strategy and the Environment*, 1(3), 9-21.

⁷⁵ CDP Investor Survey

2.1.1. Managerial Perception of the Environmental Issue

Drawing on the strategic issue management theory and applying it to the environmental issue, we are now going to define the first hypothesis of this work. As it has been explained in the first chapter, the strategic issue management literature posits that managerial categorization of strategic issues shapes eventual organizational actions, through a three-steps process from the identification of strategic issues to the implementation of organizational actions. The basis of this model is the cognitive categorization theory, of which strategic issue management represents an extension and evolution. While categorization theory has been mostly applied to understand how individual categorize natural and social objects to simplify their world, in fact, strategic issue management introduce this theory in the organizational setting. Hence, the subject of the theory becomes the manager of the company, instead of a general individual, while the object of the theory is represented by an organizational strategic issue, no more by a natural or a social element. Drawing on Sharma's work, here the theory is further extended and innovated by taking the environmental matter as the strategic issue. According to the strategic issue management theory, strategic issues are defined as events, developments and trends that affect an organization and that are perceived by company's members as having potential consequences on corporate strategy and objectives. Environmental matters can, by nature, be included in this definition and thus identified as corporate strategic issues. On the one hand, in fact, the growing stakeholders' concern for green commitment is making increasingly essential for firms to deal with the environmental variable, that has thus become one of the critical factors potentially affecting organizational goals. On the other hand, the importance of the individual element of organizational members' perception in the identification of strategic issues, underlined in their just cited definition, is preserved when focusing on environmental matters. In fact, the great deal of unpredictability in defining and managing the environmental variable makes even more realistic that strategic issues, as previously defined, do not appear in prepackaged form, but they are a continuous stream of ill-defined events, among which only some are identified and selected as strategic by decision makers. Acknowledging that the definition of strategic issue can be applied to environmental issues means allowing for strategic issue management theory to be applied on environmental strategic issues. Thus, we can assume that, once environmental matters are identified, they are categorized by the decision maker, that label them as opportunities or threats. However, the present work slightly modifies and deepens the threat-opportunity categorization identified as relevant by the strategic issue management theory and used by Sharma. Such changes maintain the central attribute dimensions along which the concept of opportunity is distinguished from the threat one: positive-negative, gain-loss, controllable-uncontrollable.

However, here the threat label is substituted with risk, since this is the term used in the CDP survey, which is the main source for our data analysis, as it will be underlined in the next chapter. This change in label is legitimated by the fact that the meaning attached to the categories remains the same. Specifically, the opportunity category implies a positive situation, in which gain is likely and which the organization is able to handle and control. Risk, exactly like threat, is a negative situation, that is likely to cause loss and that is uncontrollable by the organization. Moreover, in the decision making literature, examples can be found in which other labels are used to express the concepts of threat and opportunity, testifying that the category names are not prescriptive, when the three attribute dimensions remain explicative to distinguish between the two categories. For example, Fredrickson (1985) manipulated the labeling of an issue as a problem or an opportunity.⁷⁶ McCrae substitutes the opportunity denomination with challenge, preserving its positive meaning of high gain likelihood and controllability.⁷⁷ The second change in the definition of threat and opportunity situations with respect to the theory is a deepening in their specification, made necessary by the high degree of ambiguity faced by managers in allocating the environmental variable to a strictly defined category. Given the complexity characterizing the environmental matters, in fact, their understanding and labeling is highly challenging for managers. This difficulty is increased by the fact that considering the environmental variable as critic as the economic one is nontraditional in business world. Consistently, although green attention has grown over the past twenty years, its real integration in decisional processes is a quite new challenge for the majority of corporations. As a consequence, environmental strategic issues do not easily fit well-used categorization schemes. Rather, an innovative way of analyzing situations is necessary for managers: to really involve green commitment in firms' decisions, a long-term focus beyond financial goals is requested, from the very first stage of environmental issues categorization. Because of these factors and since green commitment is generally seen as counter posed to short term business goals, it is likely that people hold responsible within the firm will not be able to specify a clear identification of the environmental issue either with the opportunity or the risk category. Instead, it will more likely evoke both an opportunity and a risk perception at the same time.⁷⁸ This theoretical concept, supported by the literature, will be validated by the analysis of our data in the

⁷⁶ Fredrickson, J. W. (1986). The strategic decision process and organizational structure. *Academy of Management Review*, 11 (2), 280-297.

⁷⁷ McCrae, R. M. (1984). Determinants of coping responses: Loss, threat and challenge. *Journal of Personality and Social Psychology*, 46, 919-928.

⁷⁸ Throop, G. M., Starik, M. & Rands, G. P. (1993). Sustainable strategy in a greening world: Integrating the natural environment into strategic management. In Shrivastava, P & Lamb, R (Eds.), *Advances in strategic management*, 9, 63-92. JAI Press, Greenwich, CT/London.

following chapter, where we will underline how the majority of managers perceive both risks and opportunities related to the environmental variable. As a consequence, this would make managerial interpretation an ambiguous determinant in eventual firm's decisions, thus making our research potentially problematic.

On the basis of this, we propose a modified operationalization of risk and opportunity categories, declined on two levels of specification. The first level preserves the traditional basic distinction between risk and opportunity, as it has been explained until now and without considering the just cited potential bias. In order to overcome this ambiguity, then, an additional and more complex level of definition is specified, which allows for the possibility that the managerial interpretation of the environmental issue is both opportunity and risk. Specifically, we shift the focus on two deeper dimensions of risk and opportunity perception: the perceived likelihood of realization and the perceived impact of the realized risk or opportunity. Hence, what makes managerial perception optimistic rather than pessimistic, is no more the identification of the environmental issue with an opportunity rather than a risk, but the fact that the opportunity is perceived as more likely and of a higher impact compared to the risk. This shift in focus represents an overcoming of both strategic issue management theory and Sharma's model, that can lead to a more realistic analysis of how managerial perception affects environmental actions.

Drawing directly from strategic issue management theory, we assume that, once an issue is categorized in the just explained levels of detail, a confirmatory bias reinforces such original labeling, by affecting the acquisition and interpretation of both old and new information. Moreover, the labeling is made even stronger by the fact that, from a personal interpretation, it becomes shared by more organizational members. The simplification made possible by identifying the environmental issue in optimistic or pessimistic terms, in fact, aids managers to transmit their selective interpretations to others in the organization through social processes and formal interactions. As a result, these categorization "become embedded in organizational systems [and] generate predictable actions".⁷⁹ In fact, as previously underlined, strategic issue management theory posits that categories of threat (risk) and opportunity are relevant in shaping the decisional processes and the eventual organizational actions. On the basis of this, we are able to suppose that managerial interpretation of the environmental matter affects firm's choice of environmental strategy. However, which direction this influence takes is not univocally defined in the strategic issue management literature. An interesting position is the already cited one of Nutt (1984). He argues that categorizing an issue as an opportunity is

⁷⁹ Dutton, E. J. & Jackson, S. E. (1987). Categorizing Strategic Issues: Links to Organizational Action. *Academy of Management*, 12 (1), p. 85.

found to result in a more open search for solutions than does categorizing it as crisis or threat.⁸⁰ This vision offers us the possibility to complete the reasoning by identifying this more open search of solutions with a higher intensity and wider scope environmental strategy. All this given, the first hypothesis of the work is set. It is divided in two elements, corresponding to the two levels of definition of managerial perception.

Hypothesis 1.

- Managerial perception of environmental issues as risks is negatively correlated to the intensity and the scope of environmental strategy.
Conversely, managerial perception of environmental issues as opportunities is positively correlated to the intensity and the scope of environmental strategy.
- The risk-opportunity likelihood ratio and the risk-opportunity impact ratio are negatively correlated to the intensity and the scope of environmental strategy.

2.2. Determinants of Managerial Perception of the Environmental Issue

As previously underlined, in strategic issue management literature, organizational context is identified as determinant in shaping managerial perception, although this has been only theoretically supposed. Consistently, Dutton and Jackson (1987) posit: “The meaning of a strategic issue is not inherent in the environmental events or developments. Instead, the organization’s internal environment (structure or systems) has a major effect on the meanings that evolve”.⁸¹ Hence, given that organizational actions are shaped by strategic issues interpretation, the fact that such interpretation is, in turns, influenced by internal organizational context, would underline an indirect relationship between organizational context and corporate strategy and would help to explain why firms operating in similar external contexts and exposed to identical strategic issues react differently. In other words, organizational systems play an important role in shaping perceptions of issues, influencing how managers construct their own versions of reality, thus driving strategy making and consequent organizational actions.

Shifting this concept on environmental matter and consistently with Sharma, several tools belonging to the organizational and structural characteristics of a company and used to manage the environmental variable are presented, in order to test whether they can be defined

⁸⁰ Nutt, P. C. (1984). Types of organizational decision processes. *Administrative Science Quarterly*, 29, 414-450.

⁸¹ Dutton, E. J. & Jackson, S. E. (1987). Categorizing Strategic Issues: Links to Organizational Action. *Academy of Management*, 12 (1), p. 77.

as determinants of environmental managerial interpretation and, indirectly, of environmental strategy. They are enclosed in the two elements of issue legitimation and employees environmental incentive system.

2.2.1. Issue Legitimation

This construct is drawn from Sharma's work, where it is defined as the degree to which environmental commitment is legitimated among organizational members, mostly decision makers. According to Sharma, Environmental issue legitimation is directly correlated to the extent to which environmental commitment is part of the corporate identity. Consistently, when concern for sustainable development becomes an integral component of corporate identity, environmental issues become "harder to disown".⁸² This not only channels resources for action on these issues, but also provides "important political ammunition for justifying and legitimating further issue commitment".⁸³

If the concept of issue legitimation is based on Sharma's work, its definition and operationalization represents an overcoming of what we identify as limitations of such reference study. In order to assess the degree of issue legitimation, in fact, Sharma asks the managers of the analyzed corporations to state whether they see their company as an environmental leader in the industry and whether reducing the environmental impact of operations is central to corporate identity. This self-reported method of assessing the organizational level of issue legitimation is, by nature, scantily objective. In order to define whether environmental commitment is embedded in corporate identity and thus to assess the level of issue legitimation within organization, we adopt a different measure, that also allows us to test the effectiveness of several environmental accounting tools. In fact, we define issue legitimation as composed by six environmental management, accounting and control systems: environmental strategic planning; board-level responsibility for the environmental matter; environmental target setting; environmental risk management; environmental external disclosure; ISO 14000 standard setting. We assume that the higher is the number of the systems implemented, the higher is the level of issue legitimation within the firm. The rationale at the basis of this assumption can be found in the traditional management accounting literature. The last four elements can be included in the range of environmental

⁸² Weick, K. E. (1988). Enacted sensemaking in crisis situations. *Journal of Management Studies*, 24, p. 310.

⁸³ Dutton, J. E. & Dukerich, J. M. (1991). Keeping an eye on the mirror: Image and identity in organizational adaptation. *Academy of Management Review*, 34, p. 549.

accounting systems, since they all are formal accounting and control tools aiming at collecting, measuring and controlling firms' environmental information, to make them available for both internal managerial processes and external disclosure. The first element of green strategy setting, instead, can be defined as tightly linked to the implementation of these environmental control and accountability mechanisms. In fact, management accounting literature identifies management accounting and control systems as central to strategy-making, as they help shaping the process of strategy definition and support its implementation.⁸⁴ This tight link between strategy setting and accounting mechanisms leads also to understand and justify their inclusion in the definition of issue legitimation. Specifically, as Simons maintains, the intimate role of formal accounting and control systems is also to provide input into the formation or modification of the strategy, besides influencing strategic and operational processes by guiding the behaviors of organizational members.⁸⁵ Consistently, the vision for which accounting and control systems are only consequent to strategy setting and exclusively serve to steer individuals' actions toward well-defined and fixed strategic objectives, captures only a small part of the organizational picture. Hence, this conception of accounting and control mechanisms as passive and not constitutive of change has been criticized by a number of authors besides Simons, who acknowledge the active role of such systems that, besides implementing strategy, can be determinant in strategy-making itself.⁸⁶ On the basis of this we can assess that, by nature, accounting and control systems, once efficiently set in motion, have the ultimate and indirect role of influencing a corporate identity, since they shape the organizational processes from strategy definition until its implementation, by motivating and guiding the actions of individuals within the firm. Shifting this concept to environmental matters, we are able to assume that the implementation of the specifically defined environmental accounting tools define the level of environmental issue legitimation within the firm, since they make environmental commitment embedded in the accounting and control organizational system and thus in environmental strategy, which is, in turns, part of corporate identity, as we explain in the following.

⁸⁴ Langfield-Smith, K. (1997). Management control systems and strategy: a critical review. *Accounting, Organizations and Society*, 22 (2), 207–232.

⁸⁵ Simons, R. (2000). *Performance Measurement and Control Systems for Implementing Strategy: Text and Cases*. Prentice Hall, Englewood Cliffs, NJ.

⁸⁶ Merchant, K.A & Van der Stede, W.A. (2011). *Management control systems: performance measurement, evaluation and incentives*. 3rd ed., Prentice Hall, Harlow, UK.

2.2.1.1. Environmental Strategic Planning

As already explained, issue legitimation construct comprises what can be defined the process sphere of an environmental strategy, as complementary to the outcome one, which is included, instead, in the construct presented before (environmental strategy). Specifically, process factors of environmental strategy are all those structural and programmatic mechanisms of the company, including written policies setting, standards definition, internal accounting and control mechanisms, that are implemented to manage the environmental variable and to pursue the strategic objectives that have been defined within the process of strategy setting. With environmental strategic planning, we indicate such process. Environmental strategic planning refers to the programming meaning of an environmental strategy, represented by the definition of which issues the company is willing to address and of how this will happen in terms of management, accounting and control systems.

As it has just been underlined, the rationale of including environmental accounting and control system in environmental issue legitimation is represented by their important function in shaping the environmental strategy setting and thus corporate identity (although they are more traditionally identified as only passively shaped by environmental strategy). In fact, the relationship between environmental strategy setting and corporate identity is almost self-explicative and represents the rationale of identifying the former as part of environmental issue legitimation. Consistently, regardless the focus on the environmental variable, research on corporate identity management has widely theorized on the tight link between corporate strategy and identity. For example, Stuart found corporate identity to be an expression of corporate personality, based on corporate strategy.⁸⁷ This view is aligned with that of Abbratt, who postulated that corporate strategy captures and serves as a vehicle to express the most intimate corporate identity.⁸⁸ On the same line of thoughts, Marwick and Fill, introducing the organizational culture as an important means through which organizational strategy eventually impacts on organizational identity, posits: “as strategic content will frequently precede changes in the culture of an organization, then we believe that strategic management is (...) a significant component (...) for the purposes of understanding, developing and managing corporate identity”.⁸⁹ By applying this concept to environmental strategy, we identify a strong rationale for the inclusion of environmental strategic setting in issue legitimation: the process of identifying environmental objectives and of setting plans and

⁸⁷ Stuart, H. (1998a). Exploring the corporate identity/corporate image interface: an empirical study of accounting firms, *Journal of Communication Management*, 2 (4), 357-371.

⁸⁸ Abratt, R. (1989). A new approach to the corporate image management process, *Journal of Marketing Management*, 5 (1), 63-76.

⁸⁹ Marwick, N. & Fill, C. (1997). Towards a framework for managing corporate identity, *European Journal of Marketing*, 31 No (5/6), p. 400.

procedures to reach them, makes environmental commitment tightly embedded in corporate identity, thus increasing the legitimation for environmental commitment within organizational members.

Once identified the rationale of including environmental strategic planning in environmental issue legitimation, it is worth analyzing more deeply its definition. We have already underlined that setting an environmental strategy is about choosing whether the company should be sustainable, what resources are available to achieve sustainability and how it should be pursued, in terms of mission statements, plans, standards definition, internal accounting and control mechanisms. What distinguishes a performing environmental strategy that really shapes organizational culture towards environmental commitment from a partially developed environmental strategy is the level at which it is implemented. With level, several studies on environmental strategy mean not only the amount of researches destined to manage the environmental impact of the company, but also the degree of intimate commitment of corporate executives to sustainable development. This element, in fact, is not sufficient but necessary for defining a real performing and proactive environmental strategy. Epstein identifies three levels at which organizations can carry out an environmental strategy, with a growing degree of commitment from the first to the third.⁹⁰ The first level of environmental strategy implementation has the mere aim of meeting regulatory standards and avoiding liability costs, rather than developing innovative strategies to increase competitiveness and reduce environmental impacts. At this level, firms generally publish a corporate environmental policy statement and establish systems to plan for and deal with the environmental variable. However, their aim is to simply offset the potential negative consequences of a bad environmental management, in terms of costs and reputational crisis. At the second level of environmental strategic planning, organizations move from a commitment to comply with legal requirements to a realization that they can gain a competitive advantage through an improved environmental performance, because of the multiplicity of economic and financial benefits driven by green strategies, analyzed in the first chapter. This awareness leads companies to perceive sustainability commitment as not opposed but complementary to business goals. However, environmental dimension is still confined to a corporate domain that is secondary in importance compared to the economic one. The real economic and environmental integration is achieved at the third level of environmental strategy setting. Green and economic performances become here two components of the whole corporate strategy, which firms perceive no longer as counter posed.

⁹⁰ Epstein, M. J. (2008). *Making sustainability work: Best practices in managing and measuring corporate social, environmental and economic impacts*. Greenleaf Publishing, Sheffield (UK).

Rather, they contribute together to the same profitability objectives, in a triple-bottom-line view, thus fostering social, environmental and financial performances at the same time. Accordingly, environmental issues become part of day-to-day decision-making. Sustainability commitment becomes pervasive of corporate policies and systems and it is integrated in managerial decisions at all levels. In this case, environmental strategic planning is a real issue legitimation builder. Thus, we refer to this level of definition.

2.2.1.2. Board-Level Environmental Accountability

As previously underlined, environmental accountability mapping process can be included in the range of accounting and control mechanisms implemented by firms to manage the environmental variable. As such, we assume that it helps shaping corporate strategy and thus corporate identity toward sustainability commitment and, consequently, that it increases environmental issue legitimation. However, besides this rationale for its inclusion in environmental issue legitimation, that holds also for all the other green accounting and control systems that compose this construct, in the case of environmental accountability we need to make a further specification. In fact, we consider the case in which not only environmental responsibilities have been efficiently defined and assigned, but the highest level of direct environmental accountability is the board level. This reinforces the assumption that environmental accountability contributes to make issue legitimation higher. Consistently, several researchers have postulated that setting the board, or part of it, as the highest direct responsible of corporate environmental performance, institutionalizes company's commitment to green performance. In so doing, in fact, top management conveys a strongly engaged company's environmental position not only to external stakeholders but also to employees. According to Noël, the board of directors enacts the strategic core of an organization by emphasizing activities that are crucial to the survival and growth of the firm. By setting itself accountable for environmental objectives, it indicates the strategic importance of environmental sustainability, that starts to be perceived as a corporate core value by the individuals within the organization.⁹¹ This, in turns, stimulates internal credibility and inspires employees at all levels to promote progress toward improved environmental performance. In fact, board's personal commitment leads managers and employees to perceive sustainability no longer set against their short-term financial objectives and thus to feel legitimated to take decisions, according to their discretionary slack, toward environmental sustainability. On the

⁹¹ Noël, A. (1989). Strategic cores and magnificent obsessions: Discovering strategy formation through daily activities of CEO's. *Strategic Management Journal* [special issue], 10, 33-49.

basis of this, it is possible to assume that setting the board accountable for green performance boosts environmental issue legitimation within the firm.

Besides being an important source of issue legitimation, board commitment to environmental sustainability, testified by its formal accountability, is found to be an essential ingredient for effective environmental performance. In fact, vision and leadership from the top of an organization have long been accepted as essential ingredients for progress in sustainability. Consistently, “research has clearly shown that sustainability strategies are typically top-down”⁹² and that identifying, measuring and reporting environmental impact cannot be effective until the board of directors is committed to improve sustainability management. Only in this case, in fact, environmental issues are integrated into corporate strategic decisions and long-term sustainability objectives can have a “seat at the table” at the same level of short-term financial goals.⁹³

2.2.1.3. Environmental Target Setting

A key part of developing and implementing a performing environmental strategy is the setting of green goals and formalized targets. After having identified the issues firms are willing to address, in fact, the explicit definition of targets helps focusing the attention on areas of concern and priority. This process represents the other side of the accountability mapping, since it identifies the goals for which specific individuals or organizational units will be held accountable. As such, environmental target setting falls under the umbrella of environmental accountability and control systems assumed to increase issue legitimation.

The process of target setting is not straightforward and deciding on environmental targets is a different sort of challenge to setting financial ones, for several reasons. Firstly, businesses have far less experience in environmental matter. Moreover, too often sustainability goals tend to be set by a part of the company with limited resources and authority to achieve them. In this, the necessity for target setting to go together with a committed environmental accountability mapping is clearly manifested. Finally, choosing what to measure and how to fix an auspicious level of the analyzed environmental impact is rather complex. For the purpose of this study, we focus on emission reduction targets, since those are the ones considered as fundamental by the Carbon Disclosure Project. Three are the types of classification of emission targets identified by practitioner literature. According to what they

⁹² Epstein, M. J. (2008). *Making sustainability work: Best practices in managing and measuring corporate social, environmental and economic impacts*. Greenleaf Publishing, Sheffield (UK), p. 60.

⁹³ Paine, L. S. (2014). Sustainability in the Boardroom: Lessons from Nike's Playbook. *Harvard Business Review* 92 (7/8), 87–94.

measure, we distinguish among three types of target: measuring Scope 1 emissions, measuring Scope 2 emissions, measuring Scope 3 emissions. From a timeframe point of view, targets are distinguished among short, medium and long term. Finally, as for how they are structured, we differentiate absolute targets from intensity targets. The first classification is directly related to emissions' categorization. Scope 1 class includes all direct emissions that occur from sources owned or controlled by the company (e.g. gas for heating). Emissions classified as Scope 2, instead, are the indirect ones caused by consumption of purchased electricity, heat or steam. Scope 2 emissions are defined as indirect because they do not physically occur at firm's facility, but at the facility where electricity is generated. However, they still can be controlled by the organization, as Scope 1. On the contrary, Scope 3 emissions are the indirect ones that happen as a consequence of the activities of the company, but occur from sources not owned or controlled by the company. In other words, Scope 3 emissions are the ones associated with activities of firm's supply chain (e.g. emissions caused by purchased goods and services; transportation and distribution). As Scope 1 and Scope 2 emissions are directly controlled by the organization, relative target setting is a natural area to focus on initially. Accordingly, it is more likely that firms will build a business case around investing on emission reduction that can lead to subsequent savings in electricity or gas consumption. However, a further committed environmental strategy should acknowledge that firm's environmental impact stretches beyond its own operations, into its supply chain. Interestingly, an increasing number of firms is setting sustainability requirements to its own suppliers, by setting Scope 3 emission targets.

When developing a targets plan, several time horizons should be taken into consideration, since each of the related target has pros and cons and is determinant to make environmental strategy effective. Medium and, mostly, long term goals are crucial to define corporate sustainability vision and future business model. They have stronger reputational benefits than short term targets, since they demonstrate commitment to sustainable evolution. Also, they drive innovation, because they allow a low reliance on current technology to pursue them. Short term targets are equally necessary, since they act as stepping stones that make sustainability an issue for the present and help making long term goals achievable. Moreover, progress against these targets can be measured much more easily, and the individuals responsible for setting them may still be in the same role when the target end date is reached and have to deal with potential actual consequences of missing them.

According to how targets can be structured, we distinguish between absolute and intensity targets. Absolute targets are represented by the reduction in emissions that have to be reached. Intensity targets, instead, express this reduction as normalized to a business metric (revenue or

quantity produced). Each of them can be set either as a numeric target or as a percentage change from previous or benchmarked performance. The choice of which approach is more useful is quite ambiguous. On the one hand, absolute targets are easier to understand in terms of their actual positive impact on the environment, so they may be more suitable for engaging with certain stakeholders, such as consumers. On the other hand, intensity targets are more indicative of company's ability to develop environmental efficiencies into the business. In fact, they measure how firm can reduce its environmental impact, while still increasing economic performance. However, the drawback of intensity targets is that absolute emissions can increase and targets can still be achieved, if the business metric grows accordingly. All this given, the best way of setting targets is to balance the two typologies, so that pros of both can be exploited, and cons offset. In fact, if "only stating an absolute target may make some shareholders nervous of the ability of the organization to grow, intensity metrics may open up an organization to accusations of greenwash".⁹⁴

An effective target plan should be comprehensive of all the different target typologies and make a balanced use of each of them. Moreover, literature offers some other general advices on how targets should be set. Firstly, accuracy is needed: targets must be precise in what is being measured, the geographical and organizational boundaries and the timescale in which the outcome is sought. It must be possible to measure the data related to the target, thus the baseline and any conversion factors need to be clearly specified. Targets must be stretching and ambitious, since this is instrumental in driving collaboration and innovation, building future business value and future-proofing organizations against risks related to climate change and sustainability. Finally, it is necessary for goals to be appropriate and relevant not only to the business and its sector, but also to firm's stakeholders. Accordingly, a number of theoretical frameworks in environmental management control systems literature posit that target setting should be interlinked with the identification of relevant stakeholders groups. While firms generally view social responsibility from their own perspectives, environmental goals should be set in conjunction with and to reflect the needs of relevant stakeholders groups, following a consultative and fruitful approach.⁹⁵

Structured as such, environmental targets can lead to important benefits for organizations, underlined and empirically tested in several reports of the Carbon Disclosure Project. First of all, setting transparent and robust goals adds credibility to firm's sustainability claims, improving its reputation and public image. Besides the relatively rapid benefits to corporate

⁹⁴ Carbon Trust. (2011). *Raising The Bar - Building sustainable business value through environmental targets*, p. 8. In: <https://www.carbontrust.com..>

⁹⁵ Durden, C. (2008). Towards a socially responsible management control system. *Accounting, Auditing & Accountability Journal*, 21 (5), 671 – 694.

reputation, setting stretching environmental goals can be used as a catalyst to generate longer term returns. In fact, on the one hand, it helps reducing costs by a more efficient use of energy, resources, operations and distribution and by eliminating potential future liability costs. On the other hand, especially longer term targets will help to create innovation leading to new product and market opportunities.⁹⁶

2.2.1.4. Environmental Risk Management

Environmental risk management, another issue legitimation builder, is the organized and systematic accounting process used by risk managers to identify, quantify and prioritize environmental risks to develop a mitigation and remediation plan. Chronologically speaking, literature identifies three different stages of environmental risk management development. Until the 1960s there was little concern with environmental risk by businesses, governments and societies. Organizational environmental risks and costs were almost totally externalized, on the basis of a distorted conception that viewed natural systems as infinitely capable of absorbing the pollutants and wastes of industrial economies. In this first stage, there was no financial incentive for environmental risk management systems to exist. Gradually, public opinion started to realize that environmental risks do indeed exist and businesses increasingly focused their attention on the necessity to implement risk management systems. However, at its first level of development, environmental risk management had the only aim of compliance with various regulations and it was perceived by companies as inefficient and unreasonably expensive. Accordingly, environmental regulations were seen in negative light as adding only costs and no benefits to a business. More recently, a newer approach to environmental risk management is developing. Under this approach, firms perceive this practice as an integral part of overall business and strategic management and implement it on a voluntary base. In fact, its benefits in terms of creating competitive advantage, improving corporate image, reducing costs and increasing bottom line have been widely theorized and tested by the research and acknowledged also by an increasing number of companies.⁹⁷

When talking about environmental risk management, the hazards that are mostly taken into consideration in environmental studies are the ones related to climate change, on which also this work focuses. Scientific data clearly show that global average temperature has increased by about 1.4°F (0.8°C) since 1880. Carbon dioxide emissions (CO₂), the greenhouse gas

⁹⁶ Carbon Disclosure Project. (2014). Why companies need emissions reduction targets - the key to a low-carbon economy. CDP website.

⁹⁷ Hawken, P., Lovins, A. & Lovins L. H. (1999). *Natural Capitalism*. Little, Brown and Company, Boston, MA.

(GHG) mostly associated with global warming, are at their highest level in the last 650 years: 402.56 parts per million on a volume basis (ppmv).⁹⁸ Overwhelming evidence demonstrates that these concentration levels are largely human induced, and it is here that corporations' activity comes into play and the necessity of environmental risk management is manifested. Three are the climate change-related risks that firms need to deal with: business risks, represented by customers and NGO boycotts, reputational risks and regulatory risks. In order to manage them, Anderson (2002) underlines how traditional risk management process can be effectively applied on environmental dimension.⁹⁹ Accordingly, he identifies five practices of environmental risk management to be implemented jointly. Risk assessment is the first one. Its aim is to identify and evaluate the potential losses caused by adverse environmental effects. In so doing, environmental risk managers' analysis should go beyond firm's boundaries and look upstream and downstream in the supply chain. That is, suppliers networks, manufacturing processes and distribution channels must be examined to assess potential environmental risks. The preventive action of risk assessment characterizes also the second environmental risk management practice: damage control. It includes avoidance, loss prevention and loss reduction, and is particularly important and cost-effective in the environmental area because once harmful substance gets into the air or waterways, it becomes extremely difficult, costly and often impossible to remove. Diametrically opposed to the preventive character of the first two practices, are both crisis management and claims management, that are implemented with the aim of mitigating the adverse consequences of already happened environmental hazards. Crisis management is a critical component of an organization's risk management program, since it develops a plan to deal with environmental disasters. Claims management, instead, is related to situations of environmental claims. Unlike traditional contract claims, environmental losses do not always offer defined areas of liability, thus resolving them can require a great amount of resources and expertise.¹⁰⁰ Finally, product design and assessment is included in environmental risk management practices. Product liability, in fact, is seen as one of the largest loss exposures. Product quality control programs are, thus, a key component of environmental risk management systems and, when combined with eco-labeling, a strong marketing control can be created.

Benefits of implementing an effective environmental risk management process should not be undervalued by companies. In fact, environmental risk costs will be increasingly internalized

⁹⁸ Nasa website. <http://climate.nasa.gov/>

⁹⁹ Anderson, D. R. (2002). Environmental risk management: a critical part of corporate strategy. The Geneva Papers on Risk and Insurance, 27 (2), 152-180.

¹⁰⁰ Hobbs, R. E. (1996). Don't be caught off guard: new options in managing environmental incidents. *Risk Management*, August

to business, due to the broadening of risk into reputational, business and regulatory areas as well as to a likely increased number of litigations, caused by the growing prominence of environmental and interests groups. Consequently, those companies that develop environmental risk management systems not only will mitigate these costs, but will also have a competitive edge over those firms that do not. Sharfman and Fernando shows also another fundamental advantage of environmental risk management implementation. Analyzing a sample of 267 firms from the S&P 500, they show an important negative relation between environmental risk management and firms' cost of capital. Specifically, they posit that an effective environmental risk management signals the financial markets that the firm represents a low-risk investment and thus improves the market's risk perception of the firm. Consistently, There is evidence in the literature that investors and analysts take account of improvements in environmental risk factors when making investment decisions and recommendations.¹⁰¹ This improved perception, in turn, cause the financial market to be willing to accept lower risk premiums on equity, or allow the firm to acquire higher levels of leverage, all of which can result in a lowered cost of capital overall.¹⁰² The authors underline how several studies show that a lowered cost of capital can, in turns, increase firm's economic performance.¹⁰³ These findings provide an alternative perspective on the environmental–economic performance relationship, which has been dominated by the view that improvements in economic performance stem only from better resource utilization. Instead, firms also benefit from an improved environmental risk management.

2.2.1.5. Environmental Disclosure

Like for environmental accountability, the parameter of environmental disclosure is not considered in this work regardless any specification. In fact, only two are the cases in which we assume environmental reporting to increase the level of issue legitimation within the firm: if it is voluntary and/or in the case of integrated reporting. Hence, the assumption that environmental accounting tools shape corporate strategy and thus corporate identity toward climate change commitment, thus increasing environmental issue legitimation, is here slightly modified. In fact, although environmental reporting is a constitutive part of a firm's

¹⁰¹ Mackey, A., Mackey, T. B. & Barney, J. B. (2007). Corporate Social Responsibility and Firm Performance: Investor Preferences and Corporate Strategies, *Academy Management Review*, 32 (3), 817– 835.

¹⁰² Sharfman, M. P. & Fernando, C. S. (2008). Environmental risk management and the cost of capital, *Strategic Management Journal*, 29 (6), 569–592.

¹⁰³ Scott J.T. & Pascoe, G. (1984). Capital Costs and Profitability, *International Journal of Industrial Organization*, 2 (3), 217-234.

environmental accounting system, assuming its consequential role in increasing issue legitimation is not as straightforward as for all the other accounting and control mechanisms analyzed. Indeed, the choice of reporting information on company's performance in managing climate change and GHG emissions could be simply mandatory, rather than driven by a real effort to direct corporate strategy and culture toward sustainable development. In the former case, assuming environmental reporting without any distinction to increase environmental issue legitimation may lead to biased results. By considering only voluntary and integrated reporting we can at least partially overcome this problem, because, as it will be underlined in the following, in both these situations it is more reasonable to assume that environmental disclosure is a component of a real internal commitment to environmental strategy and, accordingly, an issue legitimation builder. As for voluntary green information disclosures, such assumption is clearly explicable and supported by the literature. If a company autonomously chooses to publish its efforts and results about the management of climate change and GHG emissions, environmental reporting is found to be a tool aiming at signaling a proactive and otherwise unobservable green strategy, rather than at simply reducing exposure to liabilities and social pressure.¹⁰⁴ On the basis of this, the assumption that voluntary environmental reporting testifies a higher level of issue legitimation holds. In the present work, in order to distinguish between voluntary and mandatory environmental reporting, we use organizational self-reported information from the related question in the CDP survey, as it will be explained in the next chapter. However, although regulation on environmental disclosure is quite fragmentary, it is possible to underline some contexts in which climate change reporting is clearly mandatory. Specifically, GHG emissions disclosure is regulated in both Europe and USA. As for the former, industrial installations and aircraft operators covered by the EU Emission Trading System (EU ETS) are required to have an approved monitoring plan, according to which they have to monitor and report their GHG emissions during the year. Also, the data in the annual emissions report for a given year must be verified by an accredited verifier by 31 March of the following year.¹⁰⁵ In USA, The

¹⁰⁴ Cho, H. C. & Patten, D. M. (2007). The role of environmental performance as tools of legitimacy: a research note. *Accounting, Organizations and Society*, 32(7/8), 639-647.

¹⁰⁵ Launched in 2005, the EU ETS combats climate change and operates in the 28 EU countries and in the three EEA-EFTA (European Economic Area - European Free Trade Association) states of Iceland, Lichtenstein and Norway. It limits GHG emissions from more than 11,000 heavy energy-using installations in power generation and manufacturing industry and from aircraft operators performing aviation activities in the EU and EFTA states. This program works on the 'cap and trade' principle: a limit is set on the total amount of certain GHG (Carbon dioxide -CO₂-; Nitrous oxide -N₂O-; Perfluorocarbons -PFCs -) that can be emitted by the installations in the system. The limit is reduced over time with the aim of decreasing GHG concentration levels in the air. Specifically, the 2020 goal is to lower emissions by 21% of 2005 level. The 'trade' element of the principle is embodied by the rule that, within the cap, companies buy emission allowances which they can trade with one another as needed. Auctioning is the

Environmental Protection Agency (EPA) issued in 2009 the Greenhouse Gas Mandatory Reporting Rule, which became effective in the same year. It requires fossil fuel and industrial gas suppliers, direct GHG emitters, and manufacturers of heavy-duty and off-road vehicles and engines to report their GHG emissions to the EPA, beginning with carbon emissions for 2010. In contexts not covered by these regulations, environmental and, specifically, GHG emission information disclosure is implemented by organizations on a voluntary base.

The benefits of publishing green performance results, regardless whether or not it is mandatory, have been widely underlined by the research and presented in the previous chapter. A lower number of studies, instead, analyze the advantages of voluntary disclosure. In a research published in 2014, Matsumura et al. use hand-collected carbon emissions data from 2006 to 2008 that were voluntarily disclosed to the Carbon Disclosure Project by S&P 500 firms, to examine the effects on firm value of carbon emissions and of the act of voluntarily disclosing carbon emissions. The results indicate that the markets penalize all firms for their carbon emissions, but a further penalty is imposed on firms that do not disclose emissions information. Specifically, it is found that the median firm value is about \$2.3 billion higher for firms that disclose their carbon emissions compared to firms that choose to not disclose them. Thus, it is possible to posit that capital markets, when assessing firms' valuations, consider not only the level of carbon emissions (in a negative way), but also the act of voluntary disclosure of this information (in a positive way).¹⁰⁶ Consistently with this results, several studies underline how firms making truthful voluntary carbon emission disclosures deliver transparent nonfinancial information to investors that informs them of future costs that may be imposed upon the firm due to its carbon emissions. If firms do not disclose carbon emissions, then investors will likely treat this non-disclosure as an adverse signal and penalize non-disclosing firms.¹⁰⁷ Moreover, investors are likely to undertake costly information searches regarding the non-disclosers' emissions, thus increasing their own costs and, ultimately, decreasing firms' valuation.¹⁰⁸ Besides benefits on firm-stakeholders relations and on firms' value, voluntary environmental disclosure are also found to reduce potential

default method of allocating allowances, since it is the most transparent and puts into practice the principle that the polluter should pay. After each year a company must surrender enough allowances to cover all its emissions, otherwise heavy fines are imposed. The flexibility that trading brings, ensures that emissions are cut where it costs least to do so. Source: European Commission site, Climate Action.

¹⁰⁶ Matsumura, E. M, Prakash, R. & Vera-Munoz, S. C. (2014). Firm-Value Effects of Carbon Emissions and Carbon Disclosures. *The Accounting Review*, 98 (2). 695-724

¹⁰⁷ Milgrom, P. R. (1981). Good news and bad news: Representation theorems and applications. *Bell Journal of Economics* 12 (2), 380–391.

¹⁰⁸ Johnston, J. S. 2005. *Signaling Social Responsibility: on the Law and Economics of Market Incentives for Corporate Environmental Performance*. Scholarship At Penn Law. Working paper 66, University of Pennsylvania Law School.

regulatory intervention.¹⁰⁹

Moving on to the second case in which we assume environmental reporting to increase issue legitimacy's level, it is now worth analyzing integrated reporting. It is defined as a concise communication about how an organization's strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value in the short, medium and long term. Through the implementation of the 'connectivity of information' concept, the sustainability and financial reports are no longer two distinct documents, rather they converge in the unique integrated reporting document, that shows both the financial statement and environmental performance results.¹¹⁰ Consistently, integrated reporting is a reporting that meets the needs of both statutory financial reporting and sustainability reporting, and communicates a clear, concise, integrated story that accounts for all the factors that materially affect an organization's ability to create value over time. Although it has recently received a growing attention from organizations like the GRI and the Sustainability Accounting Standards Board (SASB), that identify integrated reporting as a great innovation and the future development of disclosure practices, it is still at an embryonic stage. One of the first companies to produce an integrated report was the Danish pharmaceutical firm Novo Nordisk, in 2004.¹¹¹ Only in 2013, a formal guidance on integrated reporting was published by the International Integrated Reporting Council (IIRC). Nevertheless, its meaning is still evolving. At present, it is not simple to assess the level of diffusion of this practice, since there is no clear way to measure the number of companies that are issuing integrated reports. In fact, the practice of integrated reporting is a matter of degree. In absence of clear guidelines on implementation, there are companies that are doing more or less integrated reporting and firms that practice it to a certain extent, while not describing their reports as integrated. The only certain information is that, since 2011, all South African companies listed on the Johannesburg Stock Exchange have been required to issue an integrated report or explain why they weren't doing so. On the basis of this, it is possible to assess that more research is needed to develop a deeper knowledge on integrated reporting and to set more standardized procedures to foster its adoption. Despite this, advantages of integrated reporting have been already widely underlined within the accounting literature. Firstly, it solves much of the critics that have been addressed to sustainability reporting. In spite of sustainability reporting's important role in capturing sources of value creation ignored by financial

¹⁰⁹ Blacconiere, W. G., and D. M. Patten. (1994). Environmental disclosures, regulatory costs, and changes in firm value. *Journal of Accounting and Economics* 18 (3), 355–377.

¹¹⁰ Integrated Reporting <IR> website: <http://integratedreporting.org/>

¹¹¹ Eccles, R. G & Krzus, M. P. (2010). *One Report: Integrated Reporting for a Sustainable Strategy*. John Wiley & Sons, Inc. Hoboken, New Jersey.

reporting, in fact, sustainability disclosure is criticized for lacking in credibility, timeliness and relevance. The data that are included in a sustainability report are frequently not audited and, even when they are, the report receives negative assurance rather than the more investor-useful positive assurance. One of the major reasons for this is that sustainability data lack the rigorous measurement and reporting standards that exist for financial information, although organizations like the GRI are working to change that. Moreover, sustainability reports tend to be published with a lag of several months compared to financial reports, making the information included in them less valuable. Finally, and perhaps most importantly, by focusing only on sustainability data, without referring to business metrics, sustainability reports make it difficult for investors to understand how environmental and social performance relates to financial performance and thus, whether and how sustainability issues affect the value creation process in an organization. All these critics are addressed and solved by integrated reporting, when the integration between financial and environmental information is effectively performed. On the basis of these considerations, integrated reporting is said to be the best way to communicate externally when environmental issues have been made core to the company's strategy and operations.¹¹² It is on this concept that we base our assumption on the relation between integrated reporting and issue legitimation: integrated reporting, signaling a real environmental commitment embedded in corporate strategy, can be said to be a constitutive part of environmental issue legitimation. Besides communicating a strong commitment to sustainability, integrated reporting provides important information to all company stakeholders, including investors, employees, customers, suppliers and regulators. In fact, by giving an holistic view of a firm's performance, it provides useful insights about all the resources are devoted to value creation. Benefits of integrated reporting are also related to the internal dimension of companies. One of its impact, in fact, is to stimulate the so-called integrated thinking, that helps a company to understand the links between sustainability and business strategy and thus to take better or, at least, more informed decisions.¹¹³

¹¹² Eccles, R. G. & Serafeim, G. (2014). *Corporate and Integrated Reporting: A Functional Perspective*. Working Paper 14-094, Harvard Business School.

¹¹³ International Integrated Reporting Council (IIRC). (2013). *The International <IR> Framework*. In: International Integrated Reporting Council (IIRC). (2013). *The International <IR> Framework*. In: <http://integratedreporting.org/>.

2.2.1.6 ISO 14000

The ISO 14000 Standards were issued by the International Organization of Standards (ISO) in 1996. They provide practical tools for companies and organizations of all kinds looking to manage their environmental responsibilities. Specifically, they are a “series of management-system standards, covering such areas as process documentation, training, lifecycle assessment procedures and management reporting, and accountability for environmental performance”.¹¹⁴ The ISO 14000 series is composed of two groups of standards. The first one is in turns composed by ISO 14001 and ISO 14004 and provides principles for the setting and implementation of environmental management systems (EMS). The second group, represented by ISO 14010, ISO 14011 and ISO 14012, provides guidelines for environmental auditing and the analysis and characterization of the environmental attributes of products. Among them, the most famous and internationally recognized is ISO 14001, that provides guidance on the establishment and maintenance of EMS. Specifically, it helps companies develop EMS and monitor the implementation performance towards environmental goals. It stresses continual improvement through the “plan-do-check-act” mechanism which, through a continuous checking of the implemented actions previously planned, allows for a virtuous cycle of corrective actions.

ISO 14000 standards are designed to help organizations, regardless of their size and business type, to formalize a management process, and to evaluate the effectiveness of their activities, operations, products and services in the improvement of environmental performance. The adoption of these standards is merely voluntary, and companies wishing to obtain certification must establish internally consistent and defined processes for each of the areas covered by the respective standards. However, it is not necessary for firms to meet any prescribed levels of environmental performance, since ISO 14000 are standards of process, not of performance. Certification is renewed on annual basis, and requires the company to verify via third-party or internal audit that it is following its own established procedures. Actually, certification does not verify that these procedures are best practice or even reasonable. It only verify that the company is doing what it claims. For the areas they cover, we can assess that ISO 14000 standards partly embodies environmental accounting and control systems (environmental management accounting systems and environmental reporting) and partly goes beyond these systems, covering areas such as auditing and product labeling. However, the rationale for which we have included environmental accounting and control systems in issue legitimation, holds and is even reinforced in the case of ISO 14000. If applied, in fact, these systems

¹¹⁴ Kleindorfer, P. R. (1997). Market-Based Environmental Audits and Environmental Risks: Implementing ISO 14000. *The Geneva Papers on Risk and Insurance*, 22 (83), 194-210.

eventually shape corporate strategy and identity towards environmental sustainability, since they are pervasive of organizational management systems. Moreover, these systems are said to bring environmental management into the strategic decision making process, and to require top management commitment to environmental management. On the basis of all these considerations we are able to assume that ISO 14000 systems, shaping environmental strategy and pushing top management commitment towards the environment, are issue legitimation builders.

The literature has identified several important advantages of ISO 14000 standards setting. Firstly, they provide companies with a specific strategic framework, characterized by a standardized language and a set of tools to implement performing EMS. These can help managers in putting some order in an extremely ambiguous field: environmental management. The two advantages of improved stakeholders relations and corporate reputation can be underlined also in this case, like for all the analyzed environmental accounting tools. Providing external audiences with a certified commitment for the environment, in fact, is undoubtedly a means to improve the company's reputation and to satisfy investors' and stakeholders' demands for corporate accountability. Also, by setting ISO 14000 standards, the company can decrease the costs of processes. In fact, by integrating environmental commitment in operational processes, cost efficiency can be achieved.

The key role of environmental issue legitimation, as it has been defined, is drawn from strategic issue management literature and from Sharma's work. Specifically, in several works belonging to strategic issue management literature, the perceptions managers have of their corporate identity have been shown to influence their interpretation of strategic issues as threats or opportunity.¹¹⁵ On the basis of this, we can assume that issue legitimation, caused by corporate identity itself, affects managerial interpretation of strategic issues. Sharma further specifies this influence, stating that "if environmental issue carry positive associations in the corporate identity [that is, if corporate identity embodies environmental commitment and thus, if there is environmental issue legitimation within the firm] these issues create positive emotional associations in managerial interpretations and stimulate opportunity-seeking behavior rather than threat aversion."¹¹⁶

On the basis of these reasonings, we set our second hypothesis.

¹¹⁵ Gioia, D. A. & Thomas, J. B. (1996). Identity, image and issue interpretation: Sensemaking during strategic change in academia. *Administrative Science Quarterly*, 41 (3), 370-403.

¹¹⁶ Sharma, S. (2000). Managerial Interpretations and Organizational Context as Predictors of Corporate Choice of Environmental Strategy. *Academy of Management Journal*, 43 (4), p. 684.

Hypothesis 2.

The level of issue legitimation within the company is negatively correlated to the managerial perception of the environmental issues as a risks.

Conversely, The level of issue legitimation within the company is positively correlated to the managerial perception of the environmental issues as an opportunities.

In the second level of managerial perception specification, the degree of issue legitimation is negatively correlated to the risk-opportunity likelihood ratio and to the risk-opportunity impact ratio.

2.2.2. Environmental Employees Incentive System

The second accounting and control mechanism that we assume to be correlated with the managerial perception of the environmental issues is the employees rewarding system declined in environmental terms. According to several authors, the traditional accounting system often provides a disincentive for employees to report potential hazards or violations of corporate environmental goals or practices. In fact, while punishment techniques, often implemented to hold employees responsible, can avoid certain negative behaviors, their drawback is a self-protective attitude by employees. Research has shown that positive rewards, instead, are generally more effective motivators than negative counterparts, especially for the environmental variable.¹¹⁷ An incentive system that reflects corporate commitment for environmental results and that is developed within a wider environmental performance measurement system has been found to be critical to implement sustainability. Indeed, it allows employees to perceive the environmental variable as not opposed to their short term financial objectives, but equally important. This, in turns, promotes a culture of collaboration and efforts towards sustainability, where the interests of corporation, senior managers and employees are aligned and pushed to pursue environmental results.¹¹⁸ Rewards can be of several forms. Besides financial rewards, non-monetary types of incentives are rather widespread. Examples of them are award and recognition programs, gift certificates, favored parking. Several works underline how non-monetary rewards can motivate employees better than monetary ones, when the environmental aspect comes into play. According to the monetary crowding-out motivation theory, monetary rewards discredit the pro-social intrinsic meaning of environmental commitment in employees' minds, thus creating an opposite effect compared to the expected one. On the contrary, non-monetary rewards reinforce the intrinsic

¹¹⁷ Lawler, E. (1973). *Motivation in Work Organizations*. Brooks/Cole Publishing, Monterey, CA.

¹¹⁸ Laabs, J.J. (1992). The greening of HR. *Personnel Journal*, August, 60-71.

moral value of a committed behavior by employees, so that they are more motivated to implement environmental sustainability during their day-to-day activities.¹¹⁹ Regardless of the types of rewards used, they should be developed in relation with well-structured environmental performance appraisal systems.

In this work, we define the employees environmental reward system on two levels, to test its correlation with the managerial perception of environmental issues. The first level of definition is directly drawn from Sharma's work, and it is related with the mere presence of an environmental incentive system in the firm. The second one refers to its organizational structure, defined as its level of pervasiveness within the company. As for the first level of analysis, we hypothesize, basing on Sharma's work, that the presence of an environmental incentive system is correlated with an optimistic managerial perception of the environmental issue rather than a pessimistic one. The rationales at the basis of this assumption are two. Firstly, environmental rewarding system is an environmental accountability and control tool that, like all the others previously analyzed, by nature, shapes corporate strategy and identity towards environmental commitment. Hence, actually, also environmental incentive system could be considered an issue legitimation builder. The first rationale of assuming a positive impact of environmental rewarding system on managerial perception, thus, is the one already explained for issue legitimation itself. However, environmental rewarding system has also another intrinsic power in shaping managerial perception of the environmental issue. This is why we have chosen, in line with Sharma's work, to present this system separately from all the other accounting and control tools enclosed in issue legitimation. The ambiguity inherent in a manager's decisions related to the environmental matters results in low task programmability and, more importantly, in a high outcome uncertainty, mostly for short-term results. As a consequence, for sustainability to be really pursued, managers should implement risk-taking behaviors, looking beyond their short-term financial goals. However, these behaviors can be sharply reduced or even impeded if managers' performance appraisal and consequent incentives assignment are solely based on financial results. The central role of a well structured environmental rewarding system is to help solving this detriment. In fact, balancing the long-term, environmental performance and rewarding criteria with economic criteria in employee performance evaluation reduces the possibility that they will associate risk-taking, environmental committed actions with the risk of loss. Rather, it encourages managers to view environmental issues as opportunities for gain.

As for the second level of definition of environmental employees incentive system, we

¹¹⁹ Bragg, T. (2000). How to effectively reward and inspire your team. *Occupational Hazards*, October, 131-134.

hypothesize that a good organizational structure of such system, represented by a high level of pervasiveness in the organization, is correlated with an optimistic rather than a pessimistic managerial perception of the environmental variable. This assumption is drawn from the balanced scorecard literature. Specifically, for the balanced scorecard to effectively perform its function of measuring organizational strategic goals on the basis of both financial and non-financial perspectives, it should be cascaded down to different organizational levels. According to Kaplan and Norton, once the corporate balanced scorecard has been developed by defining the different set of indicators belonging to each of the strategic performance dimensions, several additional balanced scorecards should be created, related to different organizational levels. Successfully cascaded balanced scorecards provide clear linkages between the strategies and performance metrics at the various levels in the organization and represent a solid guidance to employees throughout the organization as to how they can contribute to overall corporate performance.¹²⁰ Shifting this concept to the environmental incentive system, strictly linked and consequential to the performance appraisal one, we assume that a performing system of incentives to employees should be highly pervasive at all the organizational levels, from top management to business units and support functions, so that fruitful synergies of efforts throughout the organization are created. With a strong incentive system developed as such, managers can rely on more motivated employees even at the lowest levels of the organization to pursue their objectives. Hence, managerial risk-taking efforts toward environmental sustainability are further encouraged, and managers will likely perceive the environmental variable as an opportunity for gain. On the basis of this, we assume that a highly pervasive environmental rewarding system is correlated with the managerial perception of the environmental issue as an opportunity rather than as a risk.

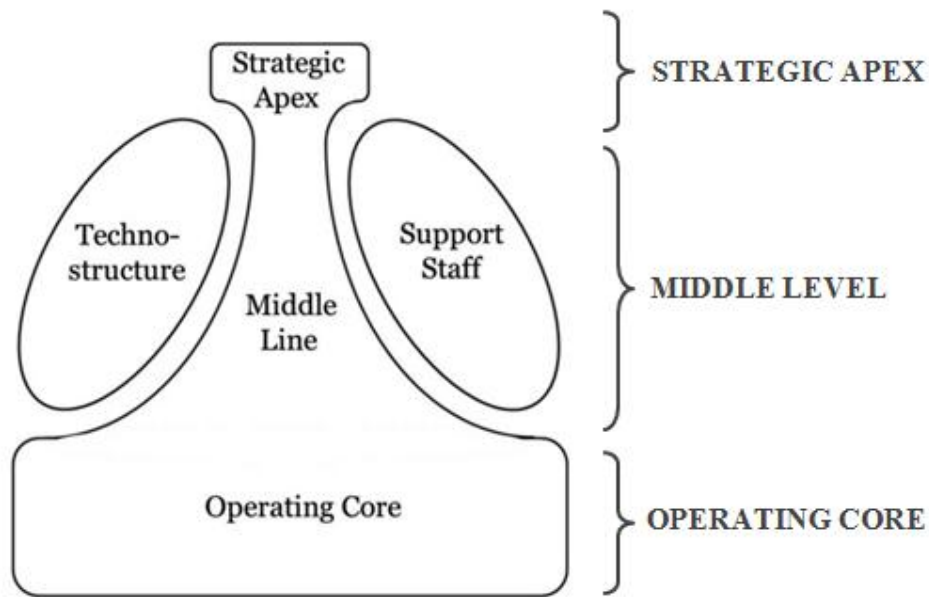
In order to operationalize the degree of environmental rewarding system's pervasiveness, we refer to the hierarchical categorization of the organizational structure identified by Mintzberg (1979).¹²¹ As figure 6 shows, five are the basic part of an organization identified by the author. The small strategic apex represents the top-level of an organization. It encloses those people charged with overall responsibility for the organization, such as the chief executive officer (CEO), the board of directors and any other top-level managers whose concerns are global. The strategic apex is joined to the operating core by the chain of middle-line managers with formal authority. This chain runs from the senior managers just below the strategic apex to the first-line supervisors, who have direct authority over the operators. In general, the middle-line manager performs all the managerial roles of the chief executive, but in the

¹²⁰ Kaplan, R. S. & Norton, D. P. (2006). *Alignment: Using the Balanced Scorecard to Create Corporate Synergies*. Harvard Business School Press.

¹²¹ Mintzberg, H. (1979). *The structuring of organizations*. Prentice-Hall.

context of managing his own unit. At the lowest level of the organizational structure, the operating core is depicted. It encloses those members who perform the basic work related directly to the realization of products and services. Basically, Mintzberg identifies four functions they perform: securing the inputs for production; transforming the inputs into outputs; distributing the outputs; providing direct support to the input, transformation, and output functions. The three just described parts of the organization are shown in one uninterrupted line to indicate that they are typically connected through a single line of formal authority. The technostructure and support staff, instead, are shown off to either side to indicate that they are separate from this main line of authority, and influence the operating core only indirectly. Mintzberg defines the technostructure as enclosing the analysts, those who serve the organization by affecting the work of others. They are removed from the operating work flow because they may design it, plan it, change it, or train the people who do it, but they do not do it themselves. Examples of analysts are controllers, accountants and recruiters. The support staff, instead, represents number of specialized units that provide support to the organization outside the operating flow. Most often they are lumped together with the technostructure and labeled as the “staff” that provides advice to management. Although this organizational structure is rather simplified, it defines three clear levels of corporate hierarchy, as the right side of Figure 6 shows. At the highest level, there is the strategic apex. At the intermediate level, Mintzberg defines the technostructure, the middle line managers and the support staff as jointly representing the middle level. At the lowest level we find the operating core.

FIGURE 6. the five basic parts of organizations.
Source: Mintzberg, (1979). P. 21.



For the purpose of this work, we identify an environmental rewarding system to have the highest degree of pervasiveness, if it reaches the lowest level of the organization: the operating core. At the opposite site, if it is designed only for top management to be rewarded under the attainment of targets, its level of pervasiveness is minimum. The intermediate level of pervasiveness is found in an environmental rewarding system designed to reach the strategic apex and the middle level.

All this given, we set our last hypothesis. It is divided in two elements, corresponding to the two levels of definition of environmental employees rewarding system.

Hypothesis 3.

- The presence of an environmental employees incentive system implemented in the firm is negatively correlated to the managerial perception of the environmental issues as a risks. Conversely, the presence of an environmental employees incentive system implemented in the firm is positively correlated to the managerial perception of the environmental issues as an opportunities.

In the second level of managerial perception specification, The presence of an environmental employees incentive system is negatively correlated to the risk-opportunity likelihood ratio and to the risk-opportunity impact ratio.

- The degree of pervasiveness of the environmental employees incentive system implemented in the firm is negatively correlated to the managerial perception of the environmental issues as a risks.

Conversely, the degree of pervasiveness of the environmental employees incentive system implemented in the firm is positively correlated to the managerial perception of the environmental issues as an opportunities.

In the second level of managerial perception specification, the degree of pervasiveness of the environmental employees incentive system is negatively correlated to the risk-opportunity likelihood ratio and to the risk-opportunity impact ratio.

CHAPTER 3

Research Sample and Measurement of Constructs

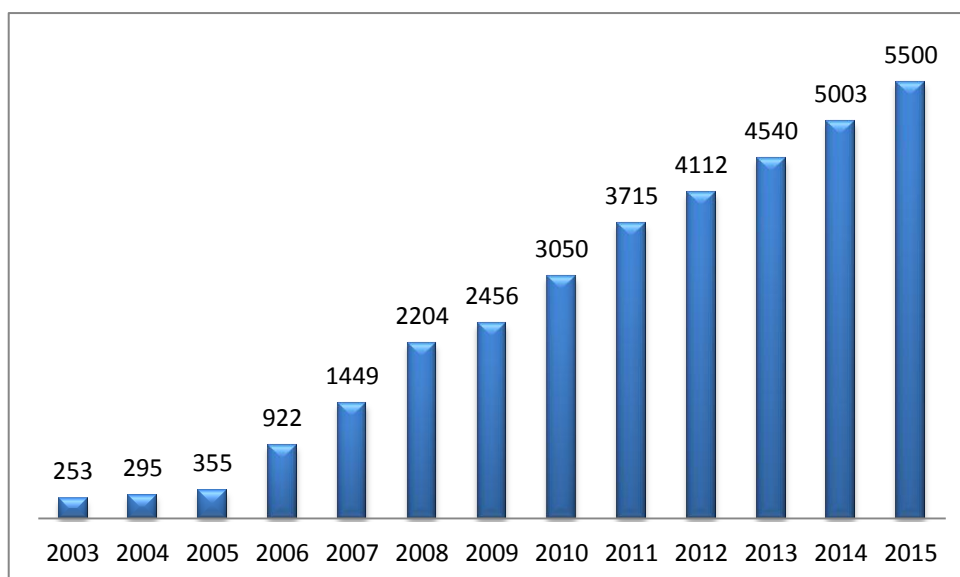
3.1. Sample

The primary source of information in our sample development is the investor survey of the Carbon Disclosure Project (CDP). CDP is an international, independent, not-for-profit organization with the aim of integrating environmental protection in business, thus helping the implementation of a low-carbon global economy. In particular, three are its environmental macro-areas of interest: climate change, water scarcity and deforestation risks. This study concentrates on the first one. Since 2002, CDP has been requesting standardized information on carbon emission and climate change from some of the world's largest listed companies through annual questionnaires, and collecting the relative data on behalf of institutional investor signatories. Those actors represent the signatory base of CDP, which has grown enormously over the year: in 2015, the project was backed by more than 822 institutional investors representing an excess of US\$ 95 trillion in assets.¹²² Through this work of data gathering, CDP gives its signatories the possibility to dispose of year-on-year, global source information that represent a strategic tool to assess firms' environmental risks and opportunities, and thus support them in long-term investment decisions that move towards a low carbon and more sustainable economy. On the other hand, reporting companies themselves can benefit from the measurement and disclosure of climate change information. In fact, this process leads to an increased awareness of their own environmental impact, that make them able to assess and thus manage the related risks. Moreover, transparency to shareholders, clients and the public audience is increased, and opportunities for revenue generation through more sustainable products and services are highlighted.

As Figure 7 shows, the total number of companies responding to CDP's surveys has sharply increased over the years. Today, CDP manages the world's largest database of corporate self reported environment-related information, with 5,500 responding companies in 2015, accounting for 55% of the market capitalization of listed companies globally.

¹²² CDP website: <https://www.cdp.net>

FIGURE 7. Number of firms disclosing climate-change, water, forests information to CDP–time dynamics.
Source: CDP website.



The importance of CDP as a relevant and reliable source of environmental information has grown over the years and today it is widely acknowledged by both practitioners and academic researchers. Since April 2010, CDP ratings have been made publicly available on Google Finance. Moreover, since 2013, CDP climate change questions have been used in the annual corporate sustainability ranking process of RobecoSAM, the company that, together with S&P Dow Jones Indices, publishes the globally recognized Dow Jones Sustainability Indices (DJSI). Also, in several empirical studies of management and accounting, CDP data are used to give evidence of the analyzed phenomena. (Matsumura et al. 2014; Eccles et al. 2014).

For the purpose of this study, as previously underlined, the Climate Change investor survey information are analyzed. In particular, this questionnaire is composed of three modules: Management, Risks & Opportunities, Emissions. Our model's variables are selected from the first section, that reports aspects on management and accounting green practices, and from the second section, dealing with environmental risks and opportunities corporate perception. The period under observation is 2011-2013, because of two reasons: some investigated information are not available in the previous periods, and there is full consistency over time among the analyzed types of questions proposed in the CDP survey.

On the basis of this, we initially identify a panel of 4896 firm-year observations corresponding to 1632 unique firms that, in the period 2011 – 2013, responded to at least some of the CDP climate change survey questions. In order to be able to find and report also financial information of the firms under observation, we then eliminate the not-listed companies, and we combine the remaining data with corporate financial information from Thomson Reuters' Datastream. Then, we match the remaining observations with ASSET4

database, an environmental, social and governance (ESG) source of information, powered by Thomson Reuters. Through a standardized process of data searching and screening, it provides information on firms' sustainability governance structures and climate change policies, available in public disclosures such as company websites, annual reports, newspapers, NGO reports. Finally, we drop observations from countries with less than 5 distinct firms per country, to reduce potential measurement bias linked to country misrepresentation.

After subtracting observations with missing data, our final sample consists of a panel set containing 1296 firm-year observations, corresponding to 740 unique firms. The number of responding firms, although at a very low rate, has decreased over the years, from 467 in 2011 to 449 in 2012, to 380 in 2013. This data does not confute the just underlined growing trend of companies joining the CDP survey. In fact, in order to perform this study, we need to drop from our sample also those firms that join the CDP survey, but do not answer to all those questions that we analyze in this investigation. Specifically, even in the case in which one firm participates to the survey from 2011 to 2013 but, as an example, in 2013 does not answer to one of the questions representing the principal variables of our model, we need to drop that firm from our 2013 sample. Hence, the sample analyzed should not be considered representative of the trend of CDP survey's responding firms.

As displayed in Panel A of Table 1, the sample presents a considerable variation in size, especially if we consider the total assets, with a value ranging from \$ 290 million to \$ 2,800 billion (mean = \$ 100 billion, median = \$ 15 billion). Also the other two measures reveal some variation in size among the companies analyzed, with revenues ranging from \$ 110 million to \$ 480 billion (mean = \$ 24 billion, median = \$ 9,700 million) and employees from 12 to 650,000 (mean = 57,349.3, median = 25,467.5).

TABLE 1. Sample main characteristics.
Panel A – Size

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max
Total Assets (\$/million)	1296	100,000	330,000	290	5,600	15,000	44,000	2,800,000
Revenues (\$/million)	1296	24,000	39,000	110	3,800	9,700	24,000	480,000
Employees (#)	1296	57,349.3	84,546.36	12	9,084	25,467.5	67,927	650,000

Moreover, the sample analyzed shows a diverse distribution in terms of both countries and industries, that remains almost the same across the three years analyzed. As Panel B of Table 1 shows, the sample firms are distributed in 24 countries, with the highest concentration in the United States (346 firms in three years), followed by Great Britain (197 firms in three years) and Japan (168 firms in three years). As Figure 8 more clearly shows, these three countries jointly cover almost 55% of the sample, while in each of the remaining countries less than 6% of the sample is located. In Panel C of Table 1, instead, the industry sample distribution is represented. The companies operate in 19 GICS Industry Groups, with the highest concentration in Industrial Goods and Services (229 firms in three years), and with some convergence in Technology (118 firms in three years) and Utilities (100 firms in three years), jointly covering 34% of the sample. As figure 9 graphically shows, the remaining industries cover less than 6.5% of the sample each.

TABLE 1. Sample main characteristics.
Panel B – Country distribution

Country distribution	Freq.	Percent	Cum.
Austria	5	0.39	0.39
Australia	40	3.09	3.47
Belgium	7	0.54	4.01
Brazil	17	1.31	5.32
Canada	38	2.93	8.26
Denmark	17	1.31	9.57
Finland	27	2.08	11.65
France	69	5.32	16.98
Germany	55	4.24	21.22
Great Britain	197	15.2	36.42
Hong Kong	13	1.00	37.42
India	21	1.62	39.04
Italy	30	2.31	41.36
Japan	168	12.96	54.32
The Netherlands	30	2.31	56.64
Norway	10	0.77	57.41
Portugal	7	0.54	57.95
South Africa	70	5.4	63.35
Spain	34	2.62	65.97
Sweden	30	2.31	68.29
Switzerland	34	2.62	70.91
Taiwan	25	1.93	72.84
Turkey	6	0.46	73.30
U.S.	346	26.7	100
Total	1,296	100	

FIGURE 8. Sample country distribution – graphical representation

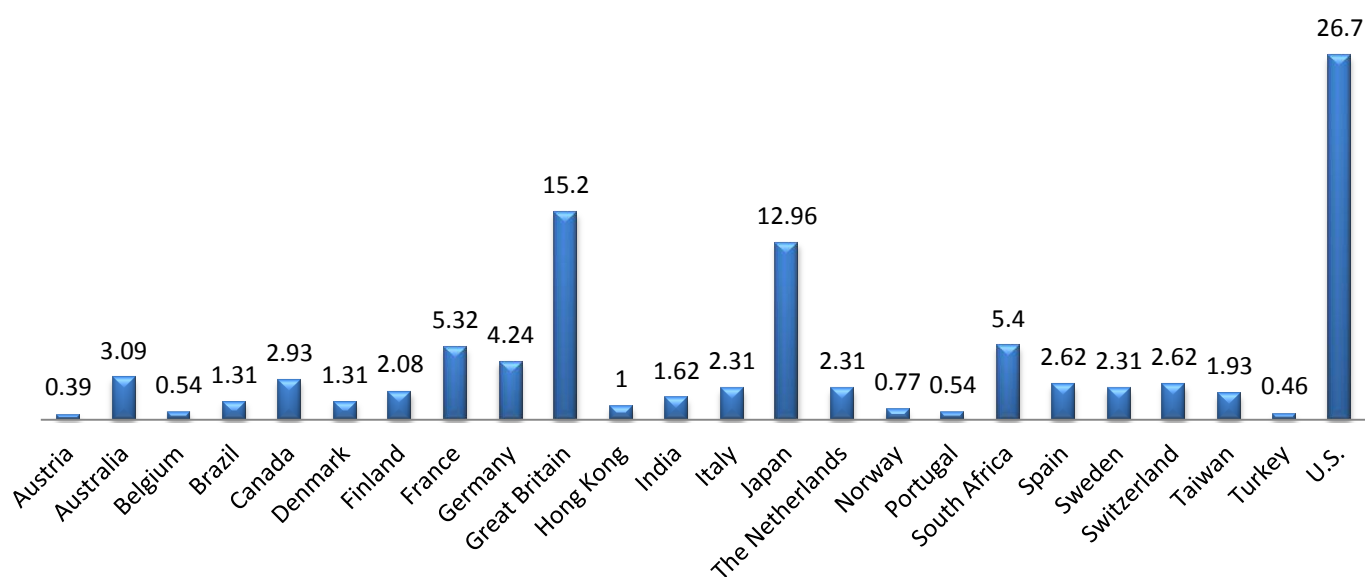
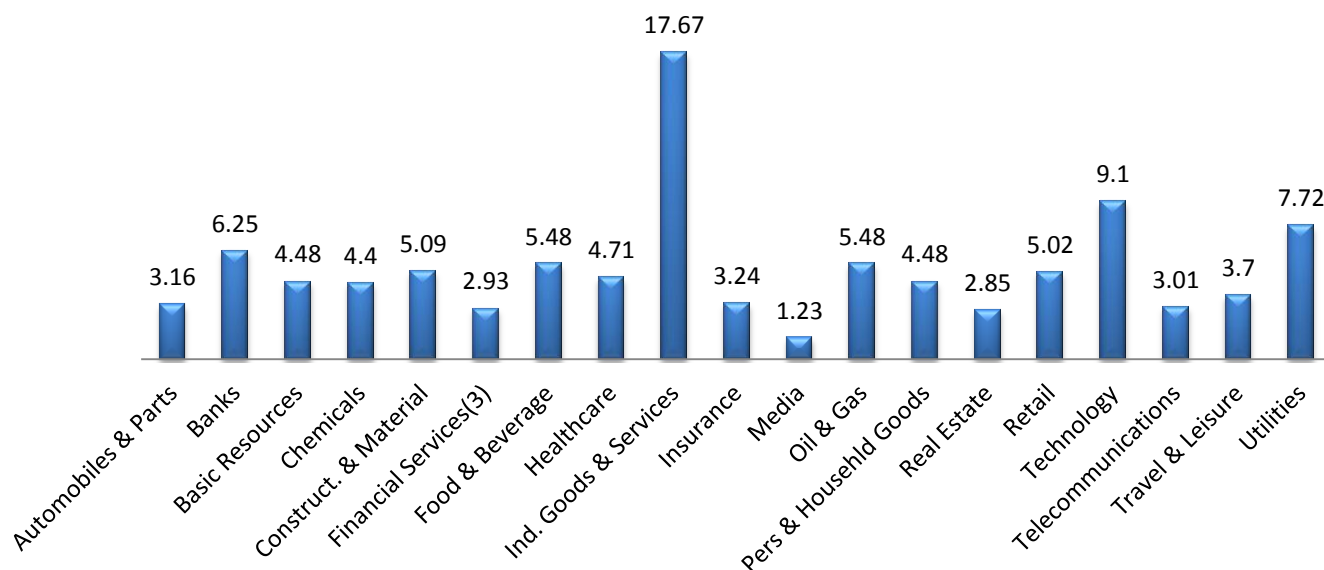


TABLE 1. Sample main characteristics.
Panel C – Industry distribution

Industry distribution	Freq.	Percent	Cum.
Automobiles & Parts	41	3.16	3.16
Banks	81	6.25	9.41
Basic Resources	58	4.48	13.89
Chemicals	57	4.40	18.29
Construct. & Material	66	5.09	23.38
Financial Services	38	2.93	26.31
Food & Beverage	71	5.48	31.79
Healthcare	61	4.71	36.50
Ind. Goods & Services	229	17.67	54.17
Insurance	42	3.24	57.41
Media	16	1.23	58.64
Oil & Gas	71	5.48	64.12
Pers & Househld Goods	58	4.48	68.60
Real Estate	37	2.85	71.45
Retail	65	5.02	76.47
Technology	118	9.10	85.57
Telecommunications	39	3.01	88.58
Travel & Leisure	18	3.70	92.28
Utilities	100	7.72	100.00
Total	1,296	100.00	

FIGURE 9. Sample industry distribution – graphical representation



3.2. Measurement of Constructs

In the following, the operationalization of the theoretical constructs identified in the previous chapter is presented. Moreover, an analysis of variables' descriptive statistics is reported.

3.2.1. Dependent Variables

3.2.1.1. Environmental Strategy: Environmental Initiatives Implementation

The Environmental Initiatives undertaken by the sample firms represent the main dependent variable of the work. In the CDP survey, they are defined as all the emission reduction initiatives that were active (in planning and/or implementation phases) within the reporting year. The survey questions investigate on the presence of environmental activities at different levels, since each firm is asked to state whether and how many environmental initiatives have been undertaken, and which kind they are. On the basis of this, some variables have been extracted from the data survey analysis. In particular, a binary outcome variable, denoted "emisinit", indicates whether environmental initiatives are implemented, scoring 1 each year the firm reports to have undertaken environmental initiatives, 0 otherwise. Similarly, six dummy variables have been created for each of the environment-oriented kinds of initiative

considered in the CDP survey: Energy Efficiency (denoted “ee”), Carbon Efficiency (denoted “ce”), Transportation (denoted “tr”), Product Design (denoted “pd”), Behavioral Change (denoted “bc”), and Others (denoted “ot”). Finally, the number of initiatives, denoted “ninit”, is available. For the purpose of this work, two variables are needed. In fact, as it has been underlined in the previous chapter, environmental strategy is defined along two dimensions: its intensity, represented by the number of environmental activities implemented, and its scope, indicating how many activity types are undertaken. The former variable is already available from CDP survey (ninit), we only compute its natural logarithm, and code it “intensity”. This log measure will be included in our analysis instead of the raw variable extracted from the CDP survey, to improve our results by reducing the variance in the number of initiatives implemented. As for the latter variable, instead, a measure of the scope of environmental strategy, denoted “scope”, has been computed by summing up the just cited dummy variables representing the activity types. Hence, scope variable will score an integer number between 0 and 6 included, and the higher its level, the wider the scope of the environmental strategy implemented by the firm.

In the following, the sample is analyzed with a growing degree of detail. Firstly, the trend of green initiatives implementation (“emisinit”) is identified. Then, the variables later used to test our hypothesis, thus the attribute dimensions of environmental strategy, are analyzed: how many (“intensity”) and how many types (“scope”) of activities are mostly undertaken. Panel A of Table 2 shows the trend of green initiatives implementations among the sample firms, in all the three years analyzed (in the upper section of the table) and in each year separately (in the lower part of the table). Given that the variable analyzed is a dummy scoring 1 if environmental initiatives are implemented and 0 otherwise, its mean exactly represents the percentage of firm undertaking environment-oriented activities. Hence, we can assess that an impressive rate, 99% of the sample, declare to implement environmental initiatives during all the years considered. This data remain stable in each of the three years analyzed, with a peak in 2013, where the whole sample of 389 respondents state to implement environmental activities.

TABLE 2. Environment-oriented Initiatives.
Panel A - Corporate implementation of environmental activities

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max	
	1296	0.99	0.10	0	1	1	1	1	
Environmental Initiatives (emisinit)	Year	N	Mean	S.D.	Min	P25	Mdn	P75	Max
	2011	476	0.99	0.11	0	1	1	1	1
	2012	449	0.98	0.13	0	1	1	1	1
	2013	389	1.00	0.00	0	1	1	1	1

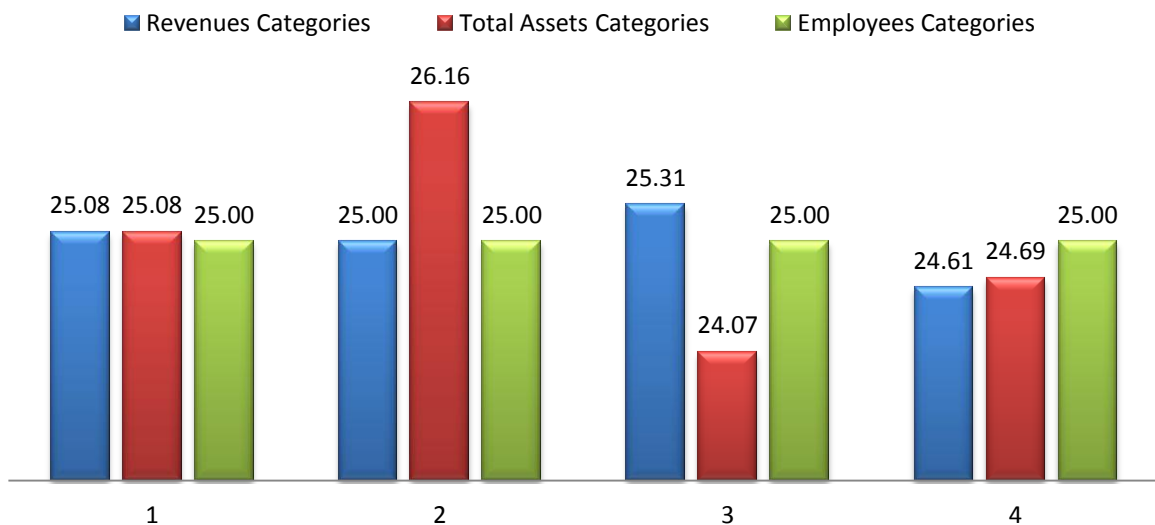
The high percentage of initiatives implementation holds when the sample is analyzed by industry and by country: more than 90 % and in some cases all the firms of a given industry or country have green initiatives active during the reporting years. Thus, it is possible to conclude that almost all the sample firms, with no great distinctions between industries or countries, implement green initiatives.

In order to check also for the potential differences in environmental decisions caused by size diversity among the companies analyzed, three more variables are computed. They are categorical variables denoted “revcat”, “tasscat”, “emplcat” and they respectively divide revenues, total assets and employees in four categories corresponding to quartiles, thus scoring 1, 2, 3 or 4 according to which quartile the observation belongs to. Consequently, it is possible to consider these three variables as indicators of firm’s size, since they are directly proportional to it, if we assume that revenues, total assets and the number of employees are proxy for firm’s size. In fact, the four categories created are: (Min, P25], (P25, P50], (P50, P75], (P75, Max) respectively of revenues, total assets and employees. Table 3 shows the meaning of each category of such variables and the number of companies falling inside each category. This number is then graphically shown in Figure 10, where it is reported in percentage of the total 1296 firm-year observations. As it is clearly represented, for all the three variables (depicted in different colors), the companies are equally distributed in each of the four size categories. Consistently, each of such categories encloses between 24% and 26% of the total 1296 firm-year observations.

TABLE 3. Size Categories Variables

Variable	Score	Meaning (\$/000)	N. of companies
Revenues Categories (revcat)	1	Revenues are between 110,000 and 3,800,000	325
	2	Revenues are between 3,900,000 and 9,700,000	324
	3	Revenues are between 9,800,000 and 24,000,000	328
	4	Revenues are between 25,000,000 and 480,000,000	319
Total Assets Categories (tasscat)	1	Total Assets are between 290,000 and 5,600,000	325
	2	Total Assets are between 5,700,000 and 15,000,000	339
	3	Total Assets are between 16,000,000 and 44,000,000	312
	4	Total Assets are between 45,000,000 and 2,800,000,000	320
Employees Categories (emplcat)	1	Employees between 12 and 9,084	324
	2	Employees between 9,097 and 25,467	324
	3	Employees between 25,484 and 67,927	324
	4	Employees between 67,933 and 650,000	324

FIGURE 10. Size categories variables – percentage of companies included in each category of the three variables



Also when the sample is analyzed by size, the number of companies implementing green activities remains very high, between 84% and 99% of the sample in each quartile of the three variables, with the concentration growing, despite almost imperceptibly (between +0.01 and +0.08 basis points), from the first to the fourth quartile of each variable, leading to suppose a positive correlation between firms' size and the implementation of green activities.

Passing to a higher level of detail, the first dependent variable of our model is analyzed: the number of environmental initiatives undertaken by firms (intensity), representing the intensity of the environmental strategy. The first line of Panel B in Table 2 shows that this variable ranges between 0 to 83. In particular, a deeper analysis (not tab.) shows that the peak of more than 80 activities is reached by only one firm. It operates in Oil and Gas industry, is located in Spain, and implements 83 environmental initiatives only in 2011. On the contrary, the sample mean of 5.85 and 50 percentile of 4 suggest that the average firm implements only between 5 and 6 initiatives, with the majority of companies declaring to have undertaken between 0 and 4 green activities. These rather low results hold in all the years analyzed (not tab.), and are quite stable in every industry, with a sample mean between 4 and 6 in almost all the industries (not tab.). Instead, when we divide the sample on the basis of the country where the firms are located (not tab.), we find three exceptions from the total sample mean. Specifically, Spain, Turkey and Austria, respectively show a sample mean of 11.68, 15.67 and 17.20. Apart from these exceptions, all the other sub-samples, one for each of the country where the firms are located, present an average number of implemented environmental initiatives similar to the total sample mean, between 4 and 6.

With regards to the types of environmental initiatives implemented, the middle section of Panel B in Table 2 shows that an impressive rate of the sample (85%) choose to undertake Energy Efficiency initiatives. More than half of the sample (57%) implement Carbon Efficiency activities. Moreover, it is interesting to notice that the Behavioral Change kind of green initiatives, potentially more complex and time demanding than the others, are implemented by a rather high percentage of firms (34%), that is a bit lower than the one implementing Transportation environmental initiatives (39%) and higher than the rate of the sample choosing Product Design initiatives. Such practice presents the lowest percentage of companies choosing it (14%). Finally, 22% of the sample converge under the general definition of "Other" activities implementation. This trend of adoption remains stable in all the years of analysis (not tab.).

Finally, the last line of Panel B in Table 2 shows the summary statistics of scope variable, indicating the scope of the environmental strategy implemented by the companies. Since this variable, as already explained, has been computed by adding the dummy variables just

analyzed, it obviously scores an integer number between 0 and 6 included, and indicates how many typologies of initiatives have been undertaken by each firm. The sample mean of 2.51 and the median equal to 2 respectively suggest that the average firm implements between 2 and 3 typologies of environmental activities, with the majority of firms undertaking between 0 and 2 (included) types of environmental initiatives.

TABLE 2. Environment-oriented Initiatives.
Panel B – Number and types of environmental initiatives undertaken

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max
Intensity of environmental strategy (intensity)	1296	5.85	5.63	0	3	4	7	83
Type of environmental initiatives:								
Energy Efficiency (ee)	1296	0.85	0.36	0	1	1	1	1
Carbon Efficiency (ce)	1296	0.57	0.50	0	0	1	1	1
Transportation (tr)	1296	0.39	0.49	0	0	0	1	1
Product Design (pd)	1296	0.14	0.35	0	0	0	0	1
Behavioral Change (bc)	1296	0.34	0.48	0	0	0	1	1
Other (ot)	1296	0.22	0.42	0	0	0	0	1
Scope of environmental strategy (scope)	1296	2.51	1.31	0	1	2	3	6

3.2.2. “Intermediate” Variables

3.2.2.1. Managerial Perception of the Environmental Issue

As already underlined in the research hypothesis, managers’ interpretation of environmental issues represents the link between the environmental accounting system and the environmental strategy implemented by the firms. In fact, it works as an independent variable in the first step of the study, representing the supposed determinant of the environmental strategy (Hp 1), and as a dependent variable in the second step of the work, where it is hypothesized to be influenced by the environmental accounting systems (Hp 2, Hp 3). It is to communicate this nature of linkage element, that it is called an “intermediate” variable.

In the CDP survey, firms are asked to state whether they perceive and identify any climate change risks or opportunities that can potentially and substantially change business operation, revenue or expenditure. In particular, three are the main typologies of risks and opportunities cited by the survey question: driven by changes in regulation; driven by changes in physical climate parameters; driven by changes in other climate-related developments. Also, the perceived likelihood of the risk and the opportunity verification, and the estimated impact of both, are reported by the respondent firms in respectively a 1 (no risk/opportunity perceived, or unknown likelihood) to 8 (maximum likelihood) and a 1 (no risk/opportunity perceived, or unknown magnitude) to 6 (maximum magnitude) scale.

Basing on these data, four variables have been computed to test the research hypothesis. As already explained in the previous chapter, in fact, the managerial interpretation of environmental issues is declined on two levels: the definition of the environmental matter as an opportunity or as a risk, and how the risk is likely and of a certain magnitude compared to the opportunity. As for the first level of definition, two dummy variables, denoted “riskcod” and “oppcod”, have been computed. They score 1 if the firms maintain to perceive respectively environmental risks or environmental opportunities, and 0 otherwise. Analyzing panel A of Table 4, in its upper section, it is possible to underline two elements: firstly, almost all the sample firms, respectively 90% and 93%, state to perceive opportunities or risks related to climate change, while only 7% sees no risks or opportunities. Secondly, the situation is almost totally balanced between risk and opportunity perception, since all the sample perceiving environmental risks (90% of the total sample), also perceive environmental opportunities. Vice versa, among that 93% of the total sample perceiving environmental opportunities, 90% identifies also environmental risks, while only the remaining 3% perceives only environmental opportunities, and not environmental risks. In other words, almost all the

companies analyzed (90%) identify both risks and opportunities related to climate change. This holds in every year of analysis, as the lower section of the table shows, with a slightly lower percentage identifying opportunities (92%) in 2013. Also when the sample is divided per industry type and per country (not tab.), the companies that perceive the environmental matter both as a risk and as an opportunity remain the majority in each industry, and the situation remains balanced, with at most 7 basis points of difference between the percentage identifying risks and the one identifying opportunities. Finally, the situation remains stable when the sample is divided by size (not tab.), since the companies identifying risks or opportunities are between 82% and 94% of the sample of each quartile for all the three size variables explained before, with at most 3 basis points of difference between the two groups. In conclusion, it is possible to state that our data confirm the theoretical assumption made in the previous chapter. Specifically, that almost all the companies analyzed perceive the environmental matter both as a risk and as an opportunity, and that this holds when the sample is divided per industry, per country and per size.

TABLE 4. Managerial perception of environmental issues.
Panel A – Risk or opportunity perception

Variable		N	Mean	S.D.	Min	P25	Mdn	P75	Max
Risk (riskcod)		1296	0.90	0.30	0	1	1	1	1
Opportunity (oppcod)		1296	0.93	0.26	0	1	1	1	1
Variable	Year	N	Mean	S.D.	Min	P25	Mdn	P75	Max
Risk (riskcod)	2011	467	0.90	0.31	0	1	1	1	1
Opportunity (oppcod)	2011	467	0.93	0.25	0	1	1	1	1
Risk (riskcod)	2012	449	0.90	0.30	0	1	1	1	1
Opportunity (oppcod)	2012	449	0.93	0.25	0	1	1	1	1
Risk (riskcod)	2013	380	0.90	0.30	0	1	1	1	1
Opportunity (oppcod)	2013	380	0.92	0.27	0	1	1	1	1

In the second level of definition of managerial perception, as already explained in the previous chapter, two deeper and more complex dimensions of the environmental issue identification are analyzed: the perceived likelihood and the perceived impact of risks and opportunities realization. This shift in focus not only characterizes managers' environmental perception in a deeper way, but it is also useful for the purpose of the study. In fact, given that almost all the sample firms actually perceive the environmental matter both as a risk and as an opportunity, it is almost necessary to find another dimension of analysis to distinguish between optimistic and pessimistic managerial interpretation of the environmental matter. Since, in the hypothesis settled in the previous chapter, this dimension of managerial perception is expressed as the likelihood and magnitude of the risk compared to the opportunity, two other variables, coded "ro_l" and "ro_i", have been computed through the ratio of, respectively, risk likelihood ("r_l") and opportunity likelihood ("o_l"), and risk impact ("r_i") and opportunity impact ("o_i"), reported in CDP survey.

Panel B of Table 4 reports the summary statistics of these measures, with the variables later used in the model, namely risk-opportunity likelihood ratio (ro_l) and risk-opportunity impact ratio (ro_i) in bold.

As it has been underlined before, risk and opportunity likelihood is reported in a 1 to 8 scale. Like for risk and opportunity identification, the difference between risk and opportunity likelihood perception among sample firms is quite low. In fact, respectively the average firm and the majority of the sample perceive the verification of both environmental risks and opportunities as around 5 points likely, and less than 6 points likely. A similar situation can be found in risk and opportunity impact perception, reported in a 1 to 6 scale: the average firm defines the magnitude of both risk and opportunity as around 3.5 points, with the majority of the sample setting a value lower than 3.7 for both the impacts of risk and opportunity. As a consequence, the ratios between risk and opportunity likelihood and risk and opportunity impact will be almost 1 for the majority of the sample. Consistently, as panel B of table 4 shows, they both are between 0.1 and 1 included for the majority of the sample, and around 1 for the average firm. Higher heterogeneity seems to be concentrated in the last quartile of each variable, where observations between 1.26 and 7 (for the likelihood ratio), and 1.15 and 6 (for the impact ratio) can be found.

TABLE 4. Managerial perception of environmental issues.
Panel B – Perceived likelihood and impact of risk and opportunity

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max
Perceived risk likelihood (r_l)	1296	4.99	1.79	1	4.26	5.51	6.22	8
Perceived opportunity likelihood (o_l)	1296	4.94	1.68	1	4.33	5.00	6.22	8
Risk/opportunity likelihood ratio (ro_l)	1296	1.08	0.51	0.13	0.87	1	1.25	7
Perceived risk impact (r_i)	1296	3.34	1.34	1	2.33	3.44	4.33	6
Perceived opportunity impact (o_i)	1296	3.44	1.30	1	2.50	3.60	4.44	6
Risk/opportunit` impact ratio (ro_i)	1296	1.03	0.44	0.17	0.81	1	1.14	6

3.2.3. Independent Variables

As discussed in the research hypothesis, two constructs are assumed to influence the managerial perception of environmental issue and, through it, the environmental strategy implemented by the firm. These constructs are issue legitimation and employees incentive system.

3.2.3.1. Issue Legitimation

As already explained in the previous chapter, issue legitimation represents the degree to which organizational members feel justified and legitimated to commit for the environment in their day-to day decisions within the company. In order to develop and measure the construct of issue legitimation, we use six dummy variables that, as underlined before, we theoretically prove to be the builders of the environmental commitment legitimation of individuals in a company. These variables are: environmental strategic planning; board-level environmental accountability; environmental target setting; environmental risk management; environmental reporting; ISO 14000 standards setting. The first five variables have been coded from the CDP survey, while information on ISO 14000 have been taken from ASSET4 database.

Environmental strategic planning, denoted “env.st.pl.”, is directly derived from the following question of the CDP survey: “is climate change integrated into your business strategy?”.

This dummy variable, thus, scores 1 each year the firm states that the environmental issue is considered a critical variable in the process of strategy setting and implementation, 0 otherwise. Since the question underlines the integration between environmental and business strategies, we assume that it refers to what it has been theoretically defined in the previous chapter as the third level of environmental strategy implementation. Thus, we refer to a situation in which environmental commitment is highly pervasive of every managerial decision and where green performance is conceived as determinant as the economic one for organizational profitability.

The board-level environmental accountability variable, denoted “b.ability”, has been computed through an adjustment of the CDP data. In the survey, in fact, firms are asked to report the highest level of direct responsibility for climate change within the company, choosing among the following pre-defined answers: no individual or committee with overall responsibility for climate change; other manager/officer; senior manager/officer; individual/sub-set of the board or other committee appointed by the board. Basing on our theoretical assumption that the environmental commitment and responsibility of organizational leaders are an essential determinant of the issue legitimation within the company, the dummy variable b.ability has been given a value equal to 1 only if the highest direct responsible of climate change is part of the company board, and 0 in all the other cases.

The third component of environmental issue legitimation is environmental target setting. In the CDP survey, companies are asked to report whether they have an emission reduction target active in the reporting year, by specifying its type (absolute target; intensity target; both). For the purpose of this study, however, there is no utility in distinguishing among the target typologies since, as assumed in the previous chapter, target setting is itself an important component of issue legitimation. Thus, the variable “target” is computed as a dummy variable scoring 1 if firms state to have an emission reduction target, 0 otherwise.

The dummy variable “riskmgmt”, representing the presence of a risk management procedure regarding climate change risks and opportunities, is computed with the same reasoning. In fact, the CDP survey distinguishes between the presence of a specific climate change risk management process and the situation in which, instead, it is integrated into a multi-disciplinary, company-wide risk management process. However, we only need to create a variable accounting for the presence of such risk management process, having assumed it as one determinant of issue legitimation. All this given, riskmgmt has been computed as a dummy variable scoring 1 if the company has a risk management procedure (both specific and not) to handle with climate change unpredictable implications, 0 otherwise.

The last variable derived from the CDP survey is external disclosure, related to the presence of environmental reporting. Also here, a codification of CDP data was necessary. The survey, in fact, asks whether company's information about its response to climate change and GHG emission are reported in other places than the survey itself and, if yes, in which document among the following three options: other regulatory filings; mainstream financial reports; voluntary communications. Basing on the theoretical reasoning explained in the previous chapter, we consider only environmental reporting in voluntary communications and in financial reports as issue legitimation builders. Given this, the dummy variable "disclosure" is computed, and it scores 1 only if the company reports environmental information in voluntary communication and/or in mainstream financial reports, besides the CDP survey, and 0 in all the other cases.

Finally, the dummy variable "iso" reports whether the company has implemented an ISO 14000 system, scoring 1 if the answer is affirmative, and 0 if not.

All this given, the issue legitimation variable, coded "legit", is computed by summing up the dummies just described. Thus, as Panel A of Table 5 shows, it will score a discrete value ranging from 0 to 6 included, where 0 indicates that there is no environmental issue legitimation within the company, while a value equal to 6 would mean that the level of issue legitimation is maximum, being the firm characterized by: the integration of the environment within business strategy, the accountability of top management for the environmental variable, an emission target setting, an environmental risk management process, an environmental reporting in voluntary documents and/or in financial reports, an ISO 14000 system.

Panel A of Table 5 reports the summary statistics of issue legitimation (in bold) and all its components. It is possible to note that all the six determinants of issue legitimation are implemented by a great majority of sample firms. In particular, ISO 14000 has the lowest implementation rate (71%). We then find accountability, with 84% of sample firms, over the three years analyzed, declaring to have a board-level direct responsibility for climate change issues, and environmental target setting (87%). Environmental strategic planning, environmental risk management and environmental reporting in voluntary or financial communications and emission target setting are instead found in more than 90% of sample firms, respectively 94%, 95% and 96%.

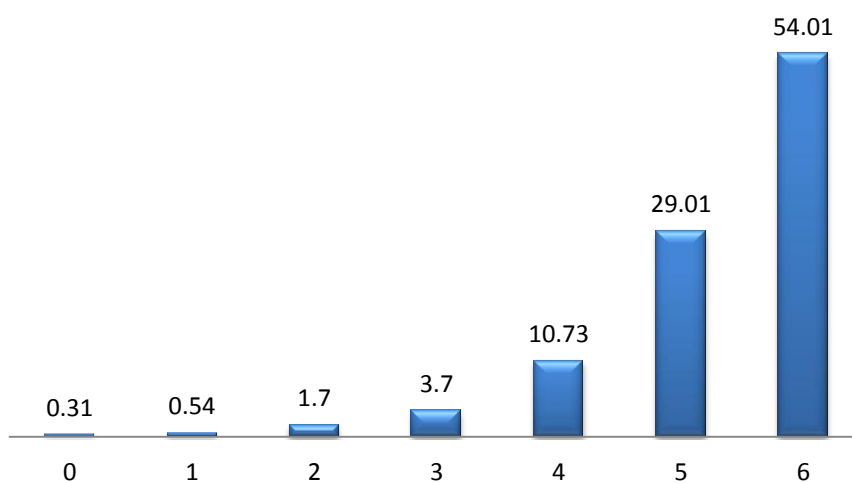
Hence, the degree of issue legitimation, among the total sample of 1296 firm-year observations, is rather high. In fact, on a 0 to 6 scale, the average firm has a score of 5.27 and, as figure 11 clearly shows, the majority of the sample (54.01%) reports a level 6 of issue legitimation. From a deeper analysis (not tab.), we can assess that the sample mean remains

stable in every year of analysis and also when it is analyzed by industry, country and size, with each restricted sample mean scoring at most 1 basis point more or less than the total sample mean (5.27).

TABLE 5. Issue legitimation.
Panel A – Issue legitimation and composing variables.

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max
Environmental strategic planning (env.st.pl)	1296	0.94	0.23	0	1	1	1	1
Board Accountability (b.acbility)	1296	0.84	0.37	0	1	1	1	1
Target setting (target)	1296	0.87	0.34	0	1	1	1	1
Risk management (riskmgmt)	1296	0.95	0.21	0	1	1	1	1
External disclosure (disclosure)	1296	0.96	0.19	0	1	1	1	1
ISO 14000 (iso)	1296	0.71	0.45	0	0	1	1	1
Issue legitimation (Legit)	1296	5.27	1.02	0	5	6	6	6

FIGURE 11. Issue legitimation – Company percentage distribution among the 6 levels of issue legitimation



3.2.3.2. *Environmental Employees Incentive System*

Like the variables representing managerial interpretation and environmental strategy, also employees incentive system is defined on different conceptual levels in order to test its effects on managerial perception, as already explained in the previous chapter. The first level of analysis is simply represented by whether the company has an environmental incentive system, the second one refers to its organizational structure, defined as its level of pervasiveness. The variable representing the first level of definition, coded “grinc”, is directly derived from the CDP survey, in particular from the following survey question: “do you provide incentives for the management of climate change issue, including the attainment of targets?”. It is a dummy variable scoring 1 if the firm’s answer is affirmative, 0 otherwise. As the upper section of panel A in table 6 shows, when the 3 years are jointly analyzed, a very high 93% of the sample states to have an environmental incentive system. More specifically, as the lower section of the table shows, the implementing percentage remains above 80% in all the three years analyzed, reaching 100% of the sample in 2011. When dividing the sample per industry (not tab.), it is possible to note a similar situation, with the majority of companies in each cluster – from 69% in Media to 99% in Utilities - setting an environmental incentive system. A similar situation can be found among the restricted samples of firms divided per countries (not tab.). The lowest percentage of firms implementing an environmental employees incentive system is still the majority: 60%, in Austria. In all the other countries, the percentage ranges from 80% to 99%. Finally, when analyzing the sample by size (not tab.), the “yes” respondents are the majority of each quartile sample of all the three size variable. Moreover, like for environmental initiatives implementation, there seems to be a positive correlation between firm size and the setting of an environmental incentive system, since the implementing firms, expressed in percentage, grow of around 24 basis points from the first to the fourth quartile of each variable.

TABLE 6. Environmental incentive system.
Panel A – Corporate provision of green incentives

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max	
	1296	0.93	0.26	0	1	1	1	1	
Green incentives provision (grinc)	Year	N	Mean	S.D.	Min	P25	Mdn	P75	Max
	2011	467	1	0.00	0	1	1	1	1
	2012	449	0.89	0.31	0	1	1	1	1
	2013	380	0.89	0.31	0	1	1	1	1

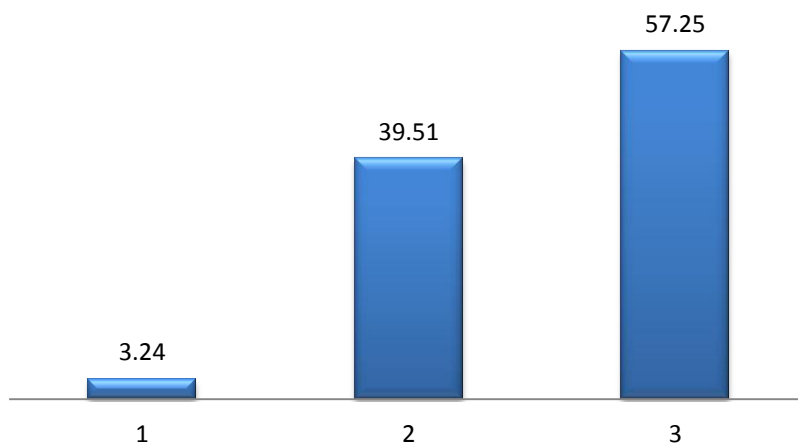
The development of the variable representing the second level of analysis was more complex. In the CDP survey, in fact, firms are asked to report, through an open-ended question, the organizational role entitled to benefit from the incentive systems. Overall, 1458 unique firms report this information for a total of 9781 organizational role-year observations. As a consequence, an extensive work of data analysis clusterization was necessary. To define the variable representing the degree of incentive system pervasiveness, all the organizational roles were firstly classified in the three groups of operating core, middle level and strategic apex identified by Mintzberg¹²³, as already explained in the previous chapter. While some roles were simpler to classify, several others were more ambiguous, and a work of contextualization of Mintzberg's categorization into the firm's organizational reality was necessary. Overall, 150 role typologies were identified as operating core, 496 as middle level and 57 as strategic apex. On the basis of this, and given the theoretical assumption made in the research hypothesis, for which the most pervading environmental incentive system is the one addressed to the lowest organizational levels, the pervasiveness degree variable, denoted "perness", scores 3 if the organizational role reported by the firm belongs to the operating core, 2 if it belongs to the middle level, and 1 if it belongs to the strategic apex. This variable, so defined, is supposed to have a positive correlation with the optimistic managerial perception of environmental issue (Hp.3). Panel B of Table 6 shows the summary statistics of perness, when the three years are jointly analyzed (upper section) and in each of them separately (lower section). In the former case, the average firm has a very high degree of incentive system pervasiveness (2.54 out of 3) and, since both the median and the 75 percentile score 3, it is possible to conclude that the majority of the sample address the incentives until the lowest organizational level: the operating core, thus have the maximum level of pervasiveness. This is clearly depicted in figure 12, which shows that 57% of the total sample has the highest degree of pervasiveness of the environmental incentive system. Like the lower section of table 6 panel B shows, this holds in all the three years analyzed.

¹²³ Mintzberg, H. (1979). *The structuring of organizations*. Prentice-Hall.

TABLE 6. Environmental incentive system.
Panel B – Organizational structure of green incentives

Variable	N	Mean	S.D.	Min	P25	Mdn	P75	Max
	1296	2.54	0.56	1	2	3	3	3
Environmental incentive system pervasiveness (perness)	Year	N	Mean	S.D.	Min	P25	P75	Max
	2011	467	2.51	0.56	1	2	3	3
	2012	449	2.56	0.55	1	2	3	3
	2013	380	2.56	0.57	1	2	3	3

FIGURE 12. Degree of pervasiveness of environmental the incentive system – Company percentage distribution among the 3 levels of pervasiveness



3.2.4. Control Variables

According to the extant research on environmental strategy (Sharma, 2000; Sharma & Vredenhurg, 1999), additional factors may affect corporate decisions on what we have identified as the scope and intensity of environmental strategy. In this work, we check for the potential effects of firm size, firm's growth and investment opportunities, profitability, corporate financial leverage, industry, country and year.

Firm's size is measured by the natural logarithm of the company's number of employees (denoted "lnempl") obtained from Thomson Reuter's Datastream. We include this measure as a control variable on the basis of the extant literature. Indeed, several works have found a significant relationship between company's dimension and the decisions on environmental investments.¹²⁴

Corporate growth and investment opportunities is included to control for market-based improvement expectations potentially correlated with firm's decisions on environmental strategy. Consistently with Lev and Sougiannis (1999), we use the ratio of market value to book value (denoted "mtbv") as a proxy for firm's growth and investment opportunities¹²⁵.

Further, a firm's ROE (return on equity) is included as the ratio of net income to shareholders' equity, to control for corporate profitability. According to several studies, in fact, profitability may affect corporate environmental decisions.¹²⁶

Consistently with Sharma (2000), the debt-equity ratio ("deratio"), computed as the ratio of total liabilities to shareholders' equity, is also considered in the model.

Since prior research has revealed significant differences among industries in how firms respond to green management demand, industry dummies ("ind") based on GICS Parent Sector classification, are included.¹²⁷ Furthermore, we use country dummies ("country") to control for country influences driving firms decisions on environmental strategy. Finally, we include the variable time ("t") as a year dummy to account for unobserved changes in norms and expectations that occurred between 2011 and 2013.

¹²⁴ Bansal, P. & Roth, K. (2000). Why companies go green: A model of ecological responsiveness. *Academy of Management Journal*, 43 (4), 717–736.

¹²⁵ Lev, B. & Sougiannis, T. (1999). Penetrating the book-to-market black box: The R&D effect. *Journal of Business Finance & Accounting* 26 (3-4), 419–449.

¹²⁶ Russo, M.V. & Fouts, P.A. (1997). A Resource-Based Perspective On Corporate Environmental Performance And Profitability. *Academy of management Journal*, 40 (3), 534-559.

¹²⁷ Simnett, R., Vanstraelen, A. & Chua, W. F. (2009). Assurance on sustainability reports: An international comparison. *Accounting Review*, 84 (3), 367–937.

3.2.5. Variables Correlations

Table 8 presents the correlation matrix for the principal variables included in our analysis. Overall, these statistics reveal that organizations implementing a high intensity, wide scope environmental strategy are on average larger compared to companies setting an environmental strategy characterized by a lower intensity and a narrower scope. Such measure of the scope of environmental strategy appears to be positively correlated also to ROE, meaning that a more profitable company is likely to invest in more typologies of environmental activities compared to less profitable firms. Moreover, firms implementing more types and a higher number of environmental initiatives more likely interpret the environmental variable as an opportunity, while they perceive environmental risks as less likely to occur and of a lower impact compared to environmental opportunities. Further, they have a higher issue legitimation, and they are more likely to have an environmental employees incentive system, whose degree of organizational pervasiveness is positively correlated with corporate environmental issue legitimation.

TABLE 8. Table of Correlations

	<u>1.</u>	<u>2.</u>	<u>3.</u>	<u>4.</u>	<u>5.</u>	<u>6.</u>	<u>7.</u>	<u>8.</u>	<u>9.</u>	<u>10.</u>	<u>11.</u>	<u>12.</u>	<u>13.</u>
1. Intensity	1												
2. Scope	0.6872***	1											
3. Riskcod	0.023	0.0041	1										
4. Oppcod	0.0684**	0.0598**	0.6095***	1									
5. Adjro_l	-0.0683**	-0.0509*	0.2803***	-0.2725***	1								
6. Adjro_i	-0.0945***	-0.1057***	0.2391***	-0.2059***	0.6979***	1							
7. Legit	0.1337***	0.1575***	0.2471***	0.2916***	-0.1415***	-0.1431***	1						
8. Grinc	0.0984***	0.0773***	0.1359***	0.171***	0.0189	-0.0084	0.2656***	1					
9. Perness	0.023	-0.0238	0.0174	-0.0017	-0.0572**	-0.0305	0.102***	-0.0262	1				
10. Lnempl	0.1704***	0.1587***	-0.0406*	-0.0146	-0.0849***	-0.1412***	0.2232***	0.1088***	0.0136	1			
11. Mtbv	0.0226	-0.0282	-0.0275	-0.0185	-0.0248	-0.0344	-0.0256	0.008	-0.0235	0.0363	1		
12. Roe	0.0374	0.0522*	0.0059	0.008	-0.0278	-0.026	-0.0062	0.0106	0.0131	-0.0152	0.1683***	1	
13. Deratio	0.0184	-0.0184	-0.0356	-0.0457*	-0.0169	-0.0146	-0.0417*	0.0075	-0.0219	0.0645**	0.8631***	0.0527	1

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

CHAPTER 4

Empirical Tests and Results

To address the research questions previously presented, a statistical analysis is performed through the use of ordinary least squares (OLS) models, to test and estimate all the hypothesized relationships between variables. Specifically, this investigation is implemented using STATA Version 12 and it is developed in two steps, as it has been underlined in the second chapter. Firstly, the hypothesis on managerial perception as a determinant of environmental strategy is tested (Hp.1). In the second step, we analyze the determinants of the managerial perception about the environmental variable, testing the hypothesized effects of environmental issue legitimation (Hp.2) and of environmental employees incentive system (Hp.3) on such variable.

4.1. Determinants of Environmental Strategy

Hp.1 of our research framework, presented in the second chapter, assumes specific relations between managerial perception of environmental issue and corporate environmental strategy. To examine the supposed effects of such managerial perception on, respectively, the intensity and the scope of corporate environmental strategy, we estimate the two following equations:

- Intensity = $\alpha_0 + \alpha_1 \text{Riskcod} + \alpha_2 \text{Oppcod} + \alpha_3 \text{Ro_l} + \alpha_4 \text{Ro_i} + \alpha_5 \text{controls} + \varepsilon$
(1)

- Scope = $\alpha_0 + \alpha_1 \text{Riskcod} + \alpha_2 \text{Oppcod} + \alpha_3 \text{Ro_l} + \alpha_4 \text{Ro_i} + \alpha_5 \text{controls} + \varepsilon$
(2)

Where ε represents the residual, or that portion of the endogenous variable that is not explained by the exogenous regressors. The element controls, instead, stands for the four control variables and the industry, country and year effects included in our model and explained in the previous chapter. For each of the equations, we perform 7 different regression models. In particular, models 1-4 elaborate on the equations to test separately for the impact of, respectively, risk perception, opportunity perception, risk-opportunity likelihood ratio, risk-opportunity impact ratio on the endogenous variable (namely, the natural logarithm of the number of environmental initiatives, for equation (1), and the number of typologies of environmental initiatives, for equation (2)). Model 5-6 tests for the impact of, respectively, the components of the first level of managerial perception specification (risk

perception, opportunity perception) and the components of the second level of managerial perception definition (risk-opportunity likelihood ratio, risk-opportunity impact ratio) on the endogenous variable (namely, Intensity for equation (1), and Scope for equation (2)). Finally, model 7 tests each of the two equations in its complete specification.

Table 7 shows the results of the analysis on equation (1).

TABLE 7. Determinants of corporate choice on the intensity of environmental strategy.

Dependent Variable: Intensity							
Independent Variables	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
<i>First level of managerial perception</i>							
Riskcod	0.0537 (0.0613)				-0.0908 (0.0750)		-0.0182 (0.0939)
Oppcod		0.2274*** (0.0708)			0.2886*** (0.0869)		0.2061* (0.1075)
<i>Second level of managerial perception</i>							
Ro_l			-0.0876** (0.0370)			-0.0076 (0.0511)	0.0216 (0.0582)
Ro_i				-0.1354*** (0.0413)		-0.1295** (0.0572)	-0.1237** (0.0573)
<i>Control Variables</i>							
Lnempl	0.0842*** (0.0141)	0.0829*** (0.0140)	0.0822*** (0.0141)	0.0788*** (0.0141)	0.0833*** (0.0140)	0.0788*** (0.0141)	0.0784*** (0.0142)
Mtbv	0.0010 (0.0019)	0.0007 (0.0019)	0.0010 (0.0019)	0.0010 (0.0019)	0.0007 (0.0019)	0.0010 (0.0019)	0.0007 (0.0019)
Roe	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
Deratio	-0.0005 (0.0012)	-0.0003 (0.0012)	-0.0005 (0.0012)	-0.0005 (0.0012)	-0.0003 (0.0012)	-0.0005 (0.0012)	-0.0003 (0.0012)
Industry Effects	yes	yes	yes	yes	yes	yes	yes
Country Effects	yes	yes	yes	yes	yes	yes	yes
Year Effects	yes	yes	yes	yes	yes	yes	yes
Number Of Obs.	1296	1296	1296	1296	1296	1296	1296
R-squared	0.1527	0.1593	0.1561	0.1596	0.1603	0.1596	0.1642

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standards errors are shown in parentheses. All models include industry effects, country effects, and year effects.

The regression performed on the complete specification of the equation (model 7) and the ones testing separately for the effects of specific regressors (models 1-6) yield coefficients on the hypothesized variables with different levels of significance, but with the same sign (except for Riskcod and Ro_l) and similar magnitude. In order to analyze our results, we concentrate on model 7, since testing the entire specification of the equation means to control for the effects of all the exogenous regressors on the dependent variable. Specifically, in this regression model, R^2 equals to 16.42%, indicating that the independent regressors explain a discrete portion of the variance in a firm's choice on environmental strategy's intensity. Following our hypothesized relationships, we expect the coefficients of equation (1) to have different signs. Specifically, we expect, $\alpha_1, \alpha_3, \alpha_4$ to be negative, and α_2 to be positive.

As table 7 shows, we find that both the managerial perception of the environmental variable as a risk (Riskcod) and the risk-opportunity likelihood ratio (Ro_l) have no effects on the intensity of corporate environmental strategy (Intensity), differently from what it has been hypothesized. On the contrary, the managerial perception of the environmental variable as an opportunity (Oppcod) is positively correlated to the intensity of corporate environmental strategy (Intensity), while risk-opportunity impact ratio (Ro_i) is negatively correlated to such variable, as our hypothesis posits.

Among control variables, only firm's size (Lnempl) appears to be positively correlated with corporate decision to invest in more environmental initiatives, thus setting a high-intensity environmental strategy. This result is in line with prior literature reporting greater implementation of environmental practices by larger companies.¹²⁸

¹²⁸ Patten, D. M. (2002). The relation between environmental performance and environmental disclosure: a research note. *Accounting, Organizations and Society*, 27 (8), 763–773.

Going on in our investigation, Table 8 shows the results of the analysis on equation (2).

TABLE 8 . Determinants of corporate choice on the scope of environmental strategy.

Independent Variables	Dependent Variable: Scope						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
<i>First level of managerial perception</i>							
Riskcod	0.0553 (0.1249)				-0.2073 (0.1529)		-0.1286 (0.1917)
Oppcod		0.3848*** (0.1444)			0.5245*** (0.1774)		0.4341** (0.2196)
<i>First level of managerial perception</i>							
Ro_l			-0.1404** (0.0755)			0.0071 (0.1043)	0.0845 (0.1188)
Ro_i				-0.2332*** (0.0843)		-0.2386** (0.1167)	-0.2246* (0.1169)
<i>Control Variables</i>							
Lnempl	0.1652*** (0.0287)	0.1627*** (0.0286)	0.1617*** (0.0287)	0.1554*** (0.0288)	0.1635*** (0.0286)	0.1554*** (0.0289)	0.1560*** (0.0289)
Mtbv	-0.0033 (0.0039)	-0.0039 (0.0039)	-0.0034 (0.0039)	-0.0035 (0.0039)	-0.0040 (0.0039)	-0.0035 (0.0039)	-0.0040 (0.0039)
Roe	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)
Deratio	0.0003 (0.0025)	0.0007 (0.0025)	0.0003 (0.0025)	0.0003 (0.0025)	0.0008 (0.0025)	0.0003 (0.0025)	0.0007 (0.0025)
Industry Effects	yes	yes	yes	yes	yes	yes	yes
Country Effects	yes	yes	yes	yes	yes	yes	yes
Year Effects	yes	yes	yes	yes	yes	yes	yes
Number Of Obs.	1296	1296	1296	1296	1296	1296	1296
R-squared	0.1292	0.1340	0.1315	0.1344	0.1353	0.1344	0.1381

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Standards errors are shown in parentheses.

All models include industry effects, country effects, and year effects.

Like in the previous analysis, both Riskcod and Ro_l present different signs of the coefficients obtained in the different regression models. Moreover, for all the variables, also the levels of significance of the coefficients changes according to whether equation (2) is tested in its entire specification or in the other regression models. R² ranges between 12.9% and 13.2%, and reaches 13.8% when controlling for all the exogenous regressors (model 7). Hence, also in this case, the model is rather explicative of the variance in the scope of environmental

strategy. Analyzing the results of the hypothesized relationships in model (7), we can assess that the principal regressors included in our model have the same kind of effect on the scope of environmental strategy and on the just analyzed intensity of environmental strategy. Consistently, also in this case, both the managerial perception of the environmental variable as a risk (Riskcod) and the risk-opportunity likelihood ratio (Ro_1) do not affect the scope of corporate environmental strategy (Scope). These data confute our hypothesis, since we expected α_1 and α_3 to be significant and negative. However, like in the previous analysis, the managerial perception of the environmental variable as an opportunity (Oppcod) is positively correlated to the scope of corporate environmental strategy, while risk-opportunity impact ratio (Ro_i) is negatively correlated to such variable, as our assumption posits. With regards to the hypothesized relationships, in fact, we expected α_2 to be significant and positive, and α_4 to be significant and negative. Moreover, considering the magnitude of these regressors, it is possible to maintain that the effect of both Oppcod and Ro_i on the scope of environmental strategy is heavier than their effect on the intensity of environmental strategy.

Consistently with the previous analysis, firm's size (Lnempl) positively affects corporate decision to invest in more typologies environmental initiatives, thus to widen the scope of the environmental strategy implemented. Moreover, here also organizational profitability (Roe) appears to be positively correlated to such decision.

Conclusions on the hypothesized relationships - Hp.1

The definition of the first hypothesis in the second chapter is developed in two elements, corresponding to the two levels of definition of managerial perception. Accordingly, it is worth drawing the conclusions on this hypothesis following the same structure.

- As for the first level of specification of managerial perception, thus the interpreting of the environmental issue as a risk or as an opportunity, Hp.1 is only partially confirmed. In fact, on the one hand, perceiving the environmental issue as a risk does not impact on the intensity and the scope of environmental strategy, while we had hypothesized a negative relationship among these variables. On the other hand, managerial perception of the environmental issue as an opportunity is positively correlated to the intensity and the scope of environmental strategy, like Hp.1 posits. This result is consistent with Sharma (2000), whose tests confirm that opportunity perception of the environmental issue by managers result in a proactive environmental strategy. However, Sharma' tests support also the other side of the hypothesis, thus that risk perception of the environmental issue by managers result in a conformance environmental strategy. Our investigation, instead, does not, as we

have just underlined.

- Also when analyzing the deeper specification of environmental issue's managerial interpretation, thus risk-opportunity likelihood and impact perception, we can assess that Hp.1 is partially confirmed. Consistently, the ratio between risk likelihood and opportunity likelihood has no relations with the intensity and the scope of environmental strategy. This data confutes the hypothesized negative relationship between such variables.

On the contrary, the risk-opportunity impact ratio is negatively correlated to both the attribute dimensions on which we have defined environmental strategy: its intensity and its scope. This result is consistent with Hp.1.

In conclusion, although the first hypothesis is not supported in all its specification, we can interestingly underline the role of managerial perception in influencing corporate decisions on environmental strategy. Specifically, consistently with Nutt (1984), perceiving the environmental matter as an opportunity will result in a more open search for solutions and thus in the implementation of more environmental activities and of more typologies of such environmental activities, than not perceiving the environmental variable as an opportunity. On the contrary, the perceived impact of environmental risks, compared to the perceived impact of environmental opportunities, works against the setting of a responsive environmental strategy. Consistently, the higher the risk-opportunity impact ratio, the lower the intensity and the narrower the scope of environmental strategy.

Hence, the two dimensions of managerial perception found to shape, in opposite directions, corporate environmental strategy, are the identification of the environmental matter as an opportunity and, on the other side, the perceived impact of environmental risks compared to the environmental opportunity one. Instead, identifying the environmental matter with a risk and the perceived likelihood of environmental risks compared to the environmental opportunity one are found to be weaker dimensions of managerial perception, that have no significant impacts on environmental strategy.

4.2. Determinants of Managerial Perception of the Environmental Issue

Once identified the influence of managerial perception in shaping corporate choices on environmental strategy, we proceed backwards in our research framework, and test the hypothesized relations between environmental accounting systems and the managerial perception of environmental issue itself. This second step of the investigation will also allow the identification of potential indirect influences of environmental accounting systems on corporate environmental strategy. In order to test this section of the model in a complete way, we merge Hp.2 and Hp.3 in a unique set of equations. This will allow us to analyze the effects of, respectively, issue legitimation (Hp.2) and environmental employees incentive system (Hp.3) on managerial perception of the environmental matter, while still controlling for all the environmental accounting systems integrated in the model, when the equations are tested in their whole specification. On the basis of this, four equations need to be tested:

- $Riskcod = \alpha_0 + \alpha_1 Legit + \alpha_2 Grinc + \alpha_3 Perness + \alpha_4 controls + \varepsilon$
(3)

- $Oppcod = \alpha_0 + \alpha_1 Legit + \alpha_2 Grinc + \alpha_3 Perness + \alpha_4 controls + \varepsilon$
(4)

- $Ro_1 = \alpha_0 + \alpha_1 Legit + \alpha_2 Grinc + \alpha_3 Perness + \alpha_4 controls + \varepsilon$
(5)

- $Ro_i = \alpha_0 + \alpha_1 Legit + \alpha_2 Grinc + \alpha_3 Perness + \alpha_4 controls + \varepsilon$
(6)

Where ε represents the residual and the element controls stands for the four control variables and the industry, country and year effects included in our model.

Following the structure used in the previous analysis, here 5 regression models are performed for each of the 4 equations. Each regression model is characterized by a different set of the same regressors. Specifically, model 1 tests Hp.2 without controlling for the effects of environmental employees incentive system on managerial perception (whose specification is different depending on the equation). Model 2 and 3 test separately for the impact of, respectively, the presence of an environmental employees incentive system (Grinc) and its level of organizational pervasiveness (Perness) on managerial perception (whose specification is different depending on the equation). Model 4 represents the counterpart of model 1, since it tests Hp.3 without controlling for the effects of issue legitimation on managerial perception (whose specification is different depending on the equation). Finally, in model 5 the equations are tested in their complete specification.

Table 9 shows the results of the analysis on equation (3), where the managerial perception of environmental issues as risks is the endogenous variable.

TABLE 9. Determinants of managerial perception of the environmental variable as a risk.

Dependent Variable: Riskcod					
Independent Variables	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Legit	0.0585*** (0.0094)				0.0517*** (0.0097)
Grinc		0.1527*** (0.0326)		0.1526*** (0.0326)	0.1121*** (0.0332)
Perness			-0.0043 (0.0148)	-0.0012 (0.0147)	-0.0091 (0.0147)
<i>Control Variables</i>					
Lnempl	-0.0010 (0.0068)	0.0084 (0.0065)	0.0119 (0.0066)	0.0086 (0.0065)	-0.0019 (0.0068)
Mtbv	0.0006 (0.0009)	0.0006 (0.0009)	0.0006 (0.0009)	0.0006 (0.0009)	0.0006 (0.0009)
Roe	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)
Deratio	-0.0004 (0.0006)	-0.0005 (0.0006)	-0.0004 (0.0006)	-0.0005 (0.0006)	-0.0005 (0.0006)
Industry effects	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes
Number of obs.	1296	1296	1296	1296	1296
Rsquared	0.1888	0.1781	0.1637	0.1781	0.1967

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Standards errors are shown in parentheses.

All models include industry effects, country effects, and year effects.

There is a high consistency among the results yield by the different regression models in terms of sign, magnitude and level of significance of the variables' coefficients. R^2 is of an acceptable value in all the tests, and it reaches 19.6% in model (5). Hence, this model has a discrete degree of relevance in explaining the variance in the managerial perception of environmental issue as a risk. On the basis of Hp.2, we expect α_1 to be negative. Further, according to Hp.3, also α_2 and α_3 should be negative and significant. Both these assumptions of Hp.2 and Hp.3 are confuted by the analysis of the results. Specifically, the coefficients of issue legitimation (Legit) and of the environmental employees incentive system (Grinc), are

significant and positive, thus they lead to a conclusion that is diametrically opposed to the hypothesized one: the level of environmental issue legitimation within the company and the setting of an environmental rewarding system for employees are positively correlated with the fact that managers perceive the environmental variable as a risk. These results confute, respectively, Hp.2 and the first part of Hp.3, as for their assumptions on the determinants of Riskcod. The latter hypothesis is further rejected, in its second part, from the analysis of Perness. In fact, its coefficient is not significant, while we had hypothesized a significant and negative relation between the degree of pervasiveness of environmental employees rewarding system and managerial perception of the environmental variable as a risk.

Finally, the fact that managers identify the environmental matter with a risk is not correlated to any of the control variables integrated in the model.

The results obtained from the testing of equation (4) are depicted in Table 10.

TABLE 10. Determinants of managerial perception of the environmental variable as an opportunity.

Dependent Variable: Oppcod					
Independent Variables	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Legit	0.0645*** (0.0080)				0.0570*** (0.0083)
Grinc		0.1701*** (0.0279)		0.1699*** (0.0280)	0.1253** (0.0282)
Perness			-0.0056 (0.0128)	-0.0021 (0.0126)	-0.0181 (0.0125)
<i>Control Variables</i>					
Lnempl	-0.0060 (0.0058)	0.0044 (0.0056)	0.0083 (0.0057)	0.0047 (0.0056)	-0.0070 (0.0057)
Mtbv	0.0018** (0.0007)	0.0017** (0.0008)	0.0017** (0.0008)	0.0017** (0.0008)	0.0017** (0.0007)
Roe	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)
Deratio	-0.0012** (0.0005)	-0.0012** (0.0005)	-0.0012** (0.0005)	-0.0012** (0.0005)	-0.0012** (0.0005)
Industry effects	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes
Number of obs.	1296	1296	1296	1296	1296
Rsquared	0.1752	0.1576	0.1326	0.1576	0.1889

***, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standards errors are shown in parentheses. All models include industry effects, country effects, and year effects.**

As before, the different regression models lead to identical sign and almost the same magnitude and significance level for each coefficient of the same variable. When testing equation (4) in its complete specification, R^2 of 18.89% communicates a discrete goodness of the model in identifying the determinants of the managerial perception of the environmental issue as an opportunity. From the analysis of the results, we can assess that Hp.2 is supported, while Hp.3 is only partially confirmed, as for their assumptions on the determinants of Oppcod. Specifically, α_1 is significant and positive, as we expected. This data confirms Hp.2, by showing that the level of issue legitimation within the company (Legit) is positively correlated to the managerial perception of the environmental issues as opportunities. From the analysis of the results relative to Hp.3, instead, two different conclusions arise. As for the first level of definition of environmental employees rewarding system, thus the variable capturing the mere presence of such system (Grinc), Hp.3 is supported, since α_2 shows a positive and significant correlation between Grinc and Oppcod, as we expected. On the contrary, when testing the deeper specification of environmental employees rewarding system, thus its level of pervasiveness (Perness), Hp.3 is rejected, because it is found to have no significant relationships with the perceiving of the environmental variable as an opportunity, while α_3 was expected to be significant and positive.

As for the controls, the perception of the environmental variable as an opportunity is positively correlated with market-based improvement expectations, represented by the market-to-book ratio (Mtbv). This indicates that growth and investment chances linked to market situations make the perceiving of environmental variable as an opportunity more likely. On the contrary, the coefficients relative to the debt-equity ratio (deratio), testify that the more a firm is financially leveraged, the more it is likely that it will not perceive environmental matter as an opportunity. This is rather reasonable. In fact, a firm having a high level of liabilities will more likely prefer to invest in shorter-term, less risky projects than in environmental initiatives, which it will not identify as a business opportunity.

When testing equation (5), we obtain the results shown in Table 11.

TABLE 11. Determinants of managerial perception the environmental risk's likelihood compared to the environmental opportunity's likelihood.

Dependent Variable: Ro_1					
Independent Variables	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Legit	-0.0668*** (0.0163)				-0.0661*** (0.0168)
Grinc		-0.0163 (0.0566)		-0.0220 (0.0566)	0.0298 (0.0578)
Perness			-0.0554** (0.0255)	-0.0559** (0.0255)	-0.0457* (0.0256)
<i>Control Variables</i>					
Lnempl	-0.0134 (0.0118)	-0.0277** (0.0114)	-0.0275** (0.0113)	-0.0270** (0.0113)	-0.0137 (0.0118)
Mtbv	-0.0013 (0.0015)	-0.0012 (0.0015)	-0.0014 (0.0015)	-0.0014 (0.0015)	-0.0014 (0.0015)
Roe	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)
Deratio	0.0007 (0.0010)	0.0007 (0.0010)	0.0008 (0.0010)	0.0007 (0.0010)	0.0007 (0.0010)
Industry effects	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes
Number of obs.	1296	1296	1296	1296	1296
Rsquared	0.1208	0.1090	0.1124	0.1125	0.1233

***, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.**

Standards errors are shown in parentheses.

All models include industry effects, country effects, and year effects.

Once again, we find a rather high consistency among the results of the different regression models, as for the sign, magnitude and significance level of the variables' coefficients. An exception is represented by the control variable measuring the firm size. Specifically, while it seems to negatively affect risk-opportunity likelihood ratio, this does not hold when only Hp.2 is tested (model 1) and also when equation (5) is tested in its entire form (model 7). R^2 is lower than in the other equations' test, but still higher than 10%. On the basis of Hp.2 and Hp.3, as for their specification on the determinants of Ro_1, we expect, respectively, α_1 to be negative and significant, and both α_2 and α_3 to be negative and significant too. The results confirm the expectations on both α_1 and α_3 , leading to conclude that both Legit and Perness are negatively correlated to Ro_1. This means that, as we have hypothesized, the higher the level of issue legitimation and the level of pervasiveness of the environmental incentive

system within the firm, the less the environmental risk will be perceived likely to happen with respect to the environmental opportunity. On the contrary, α_2 is not significant, testifying that the mere development of an environmental employees rewarding system (Grinc) does not have any correlations with Ro₁, and thus confuting this assumption of Hp.3. On the basis of these results, we can assess that Hp.2 is supported, while Hp.3 is validated only in its second part, as for their specification on the determinants of Ro₁.

Finally, larger organizations seem to perceive a lower environmental risk likelihood over the the environmental opportunity likelihood. But this does not hold when equation (5) is entirely tested. In this case, in fact, Ro₁ is not affected by any of the control variables in a significant way.

The results of the regressions performed of the last equation (6) are shown in Table 12.

TABLE 12. Determinants of managerial perception the environmental risk's impact compared to the environmental opportunity's impact.

Dependent Variable: Ro_i					
Independent Variables	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>
Legit	-0.0450*** (0.0143)				-0.0469*** (0.0148)
Grinc		0.0233 (0.0495)		0.0194 0.0495	0.0561 (0.0507)
Perness			-0.0395* (0.0223)	-0.0391* 0.0224	-0.0319* (0.0225)
<i>Control Variables</i>					
Lnempl	-0.0344*** (0.0103)	-0.0448*** (0.0099)	-0.0439*** (0.0099)	-0.0443*** (0.0099)	-0.0349*** (0.0103)
Mtbv	-0.0012 (0.0013)	-0.0011 (0.0013)	-0.0013 (0.0013)	-0.0013 (0.0013)	-0.0013 (0.0013)
Roe	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)	0.0000 (0)
Deratio	0.0005 (0.0009)	0.0005 (0.0009)	0.0006 (0.0009)	0.0006 (0.0009)	0.0005 (0.0009)
Industry effects	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes
Number of obs.	1296	1296	1296	1296	1296
Rsquared	0.1098	0.1029	0.1050	0.1051	0.1123

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standards errors are shown in parentheses. All models include industry effects, country effects, and year effects.

R^2 has the lowest level among all the hypothesis tests performed. However, in model 5, which yields coefficients of the variables with sign, magnitude and significance similar to all the other regression models, is 11.23%. Thus, it is still possible to say that its level is acceptable, also given the fact that we are dealing with a rather new and unexplored field of research, which is also linked to inexact sciences like cognitive psychology. The analysis of the results leads to the same kinds of conclusions already underlined for Ro_l . This allows us to say that the principal regressors of the model affect in the same way both Ro_l and Ro_i , thus the two components of the second definition level of managerial perception. Specifically, the degree of issue legitimation within the firm (Legit) and the level of pervasiveness of the environmental incentive system (Perness) are negatively correlated to the ratio between risk impact and opportunity impact. These results respectively support Hp.2 and the second part of Hp.3, as for their assumptions on the determinants of Ro_i . On the contrary, like in the previous analysis, the first part of Hp.3 is confuted, since the development of an environmental employees rewarding system (Grinc) does not have any impact on Ro_i , while a negative correlation was supposed.

An important difference from the results shown in table 11 is that here the negative relation between firm size and Ro_i is significant also in model (5). Thus, it is possible to maintain that larger organization perceive that environmental risk's impact, compared to environmental opportunity one, is lower.

Conclusions on the hypothesized relationships – Hp.2

Like Hp.1, also Hp.2 can be defined as partially confirmed. On the one hand, the assumptions made about the effect of Legit on the second level of specification of managerial perception (Ro_l ; Ro_i) are entirely supported. In fact, the greater the level of issue legitimation within the firm, the lower both the risk-opportunity likelihood ratio and the risk-opportunity impact ratio, as it has been supposed. On the other hand, the hypothesized impact of Legit on the first level of managerial perception (Riskcod; Oppcod) is only partially supported. Specifically, the assumption on Oppcod is confirmed, since the results show that the greater the level of issue legitimation within the firm, the more likely is that the environmental issue will be perceived as an opportunity. This conclusion, in particular, is consistent with the results from Sharma (2000). However, Hp.2 also supposed a negative relation between legit and the perceiving of environmental issue as a risk, like also the results of Sharma (2000) testify. Instead, this relation is found to be significant and positive, leading to the conclusion that issue legitimation has the same effect on both perceiving the environmental issue as an opportunity and perceiving it as a risk. In other words, Legit is not determinant in the process of

identifying the environmental issue either with the opportunity label or with the risk label. Thus, this specification of Hp.2 is confuted. However, an explanation for this can be found in the extant literature examined in the second chapter, that underlines how the complexity characterizing the environmental matters can lead to an extremely ambiguous labeling for managers, who are likely to perceive them as risks and opportunities at the same time (Throop et al. (1993)). This theoretical concept is recognizable also in the analysis of our data underlined in the previous chapter, since almost all the sample firms declare to identify both a risk and an opportunity in the environmental issue. On the basis of this, we may assess that the role of environmental accounting systems enclosed in issue legitimation is more plausibly the one of leading the managers to an awareness of the complexity of the environmental issue, than the one of making them perceiving such environmental issue as an opportunity rather than as a threat. This prescriptive categorization, in fact, could be an excessive simplification of a highly complex matter that, instead of helping environmental choices, may hinder a completely informed decisional process.

Instead, where the environmental accounting systems positively shape environmental managerial perception and are, thus, determinant in the decisional process, is in the deeper level of definition of managerial interpretation. In this case, as just said, the greater the level of issue legitimation within the firm, the less the risk will be perceived of a high likelihood and of a high impact compared to the opportunity.

Conclusions on the hypothesized relationships – Hp.3

The definition of the third hypothesis, presented in the second chapter, is developed in two elements, corresponding to the two levels of specification of environmental employees rewarding system. Accordingly, it is worth drawing the conclusions on this hypothesis following the same structure.

- As for the first level of definition of environmental employees rewarding system, thus the variable capturing the mere presence of such system (Grinc), it is positively correlated to the opportunity perception of environmental issue, as hypothesized and consistently with Sharma (2000). However, such variable is also positively correlated with Riskcod, while a negative correlation was supposed, which is found also in Sharma (2000). Nevertheless, since environmental employees rewarding system falls into the environmental accounting tools framework, the explanation just shown to justify the same result for Legit, holds also here. As for the relation between Grinc and Ro₁, Ro_i, the hypothesis is entirely confuted, because the presence of an environmental employees rewarding system is not related to

such deeper definition of managerial perception.

- As for the second level of definition of environmental employees incentive system, its level of pervasiveness (Perness) has an effect on the managerial perception that can be defined as complementary to the one of Grinc. In fact, while the latter impacts only on the first meaning of managerial perception, Perness is correlated only with the second level of definition of such variable. Consistently, Perness is not correlated to Riskcod and Oppcod, differently from what Hp.3 posits, and it is negatively correlated to Ro_l and Ro_i. Hence, as we have supposed, the higher the level of pervasiveness of the environmental employees incentive system, the lower will be the perceived likelihood and impact of the environmental risk compared to the ones of the environmental opportunity.

The second step of our research framework has shed some light on which are the factors affecting the managerial perception of the environmental issue, and in which direction. Both Hp.2 and Hp.3 are not supported in all their specifications. However, we are able to underline that environmental accounting and control mechanisms (both the ones enclosed in Legit variable, and the employees rewarding system) have not the role of clearly categorizing the environmental issue either as an opportunity or as a risk. This, to us, is not to be considered a failure of the effectiveness of such systems. Rather, it is more likely that the environmental issue, by nature, cannot be definitely labeled with such a stringent category as risk or opportunity, like also the extant literature posits. Hence, this result could be considered an overcoming of Sharma (2000), where the organizational context is found to shape managerial perception of the environmental issue as an opportunity or a risk. If we shift the focus from the general organizational context to specific environmental accounting mechanisms, instead, we find that their role is to make the manager awareness of the ambiguous nature of the environmental variable, making him perceive both the risks and the opportunities related to it. Moreover, both issue legitimation (thus the environmental accounting systems that this variable represents) and the level of pervasiveness of the environmental employees incentive system (but not the mere presence of the environmental employees incentive system itself), make environmental risk's likelihood and impact perceptions lower than environmental opportunity's likelihood and impact perceptions.

4.3. Indirect Effects of Environmental Accounting Systems on Environmental Strategy

One of the central aims of this research, as it has been underlined in the second chapter, is to evaluate whether environmental accounting tools indirectly affect the defining corporate environmental strategy and whether, in this relationship, the individual perceptions of managers represent the intermediate, decisive element. Hence, on the basis of the results obtained from the two steps of this investigation, we are able to assess that environmental accounting systems do have a positive indirect effect in shaping a responsive corporate environmental strategy. Specifically, by affecting some elements of the managerial perception of the environmental variable, they increase both the intensity and the scope of environmental strategy. Table 13 specifically shows how this process takes place. Legit (and all the accounting systems that this variable encloses) has a positive indirect effect on both the intensity and the scope of environmental strategy. This effect is exerted through both Oppcod and Ro_i, over which Legit has, respectively, a positive and a negative impact. These intermediate variables, as we have already seen, are, in turns, respectively positively (Oppcod) and negatively (Ro_i) correlated to the dimensions of environmental strategy. As a consequence, the impact of Legit on the intensity and the scope of environmental strategy is positive.

Grinc has the same indirect positive effect on the two attribute dimensions of environmental strategy. In this case, however, the intermediate variable is only Oppcod, with which Grinc has a positive, direct relation.

Finally, also the degree of pervasiveness of the environmental employees incentive system (Perness) has a positive indirect impact on the intensity and the scope of environmental strategy. Such effect passes through Perness's negative relation with Ro_i that, in turns, is negatively correlated with Intensity and Scope.

Table 13. Indirect Effects of Environmental Accounting Systems on Environmental Strategy.

Independent Variables	Sign of the direct relation	Intermediate Variables	Sign of the indirect relation	Dependent Variables
Legit	+	Oppcod	+	Intensity
			+	Scope
	-	Ro_i	+	Intensity
			+	Scope
Grinc	+	Oppcod	+	Intensity
			+	Scope
Perness	-	Ro_i	+	Intensity
			+	Scope

4.4. Robustness Check

As a robustness check of our results, we perform the analysis on equation (1) and (2), adding, as control variables, also Legit, Grinc and Perness. This not only allows us to test the robustness of the conclusions drawn on Hp.1, but also to assess whether the relations that we have just identified between environmental accounting systems and environmental strategy are only indirect or also direct. Like for Hp.1 testing, we perform seven different regression models on the modified equations, that have the same logic of regressors' aggregation as the ones performed on equations (1) and (2).

Table 14 and table 15 show, respectively, the results of the modified equation (1) and the results of the modified equation (2).

Table 14. Robustness check - Determinants of corporate choice on the intensity of environmental strategy. Inclusion of Legit, Grinc, Perness as regressors.

Independent Variables	Dependent Variable: Intensity						
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
<i>First level of managerial perception</i>							
Riskcod	0.0077 (0.0619)				-0.1073 (0.0747)		-0.0479 (0.0936)
Oppcod		0.1693** (0.0726)			0.2402*** (0.0877)		0.1721* (0.1082)
<i>Second level of managerial perception</i>							
Ro_l			-0.0767** (0.0369)			0.0023 (0.0508)	0.0320 (0.0580)
Ro_i				-0.1267*** (0.0412)		-0.1285* (0.0569)	-0.1227** (0.0570)
<i>Environmental Accounting Systems</i>							
Legit	0.0724*** (0.0221)	0.0630*** (0.0222)	0.0690** (0.0219)	0.0677*** (0.0219)	0.0638*** (0.0222)	0.0677*** (0.0219)	0.0617*** (0.0223)
Grinc	0.1311* (0.0735)	0.1122* (0.0734)	0.1387* (0.0730)	0.1452** (0.0729)	0.1175* (0.0735)	0.1452** (0.0730)	0.1280* (0.0736)
Perness	0.0622** (0.0320)	0.0649** (0.0320)	0.0597* (0.0320)	0.0589* (0.0319)	0.0653** (0.0320)	0.0589* (0.0319)	0.0625** (0.0320)
<i>Control variables</i>							
Lnempl	0.0655*** (0.0147)	0.0665*** (0.0147)	0.0640*** (0.0147)	0.0608*** (0.0147)	0.0666*** (0.0147)	0.0607*** (0.0147)	0.0624*** (0.0148)
Mtbv	0.0013 (0.0019)	0.0010 (0.0019)	0.0012 (0.0019)	0.0012 (0.0019)	0.0010 (0.0019)	0.0012 (0.0019)	0.0010 (0.0019)
Roe	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)	0.0001 (0.0001)
Deratio	-0.0006 (0.0012)	-0.0004 (0.0012)	-0.0006 (0.0012)	-0.0006 (0.0012)	-0.0004 (0.0012)	-0.0006 (0.0012)	-0.0004 (0.0012)
Industry effects	yes	yes	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes	yes	yes
Number of obs.	1296	1296	1296	1296	1296	1296	1296
Rsquared	0.1678	0.1714	0.1707	0.1741	0.1728	0.1741	0.1741

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively. Standards errors are shown in parentheses.

All models include industry effects, country effects, and year effects.

Table 15. Robustness check - Determinants of corporate choice on the scope of environmental strategy. Inclusion of Legit, Grinc, Perness as regressors.

Dependent Variable: Scope							
Independent Variables	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>
<i>First level of managerial perception</i>							
Riskcod	-0.0364 (0.1262)				-0.2337 (0.1524)		-0.1856 (0.1913)
Oppcod		0.2578* (0.1481)			0.4123** (0.1790)		0.3555* (0.2210)
<i>First level of managerial perception</i>							
Ro_l			-0.1139* (0.0754)			0.0282 (0.1038)	0.1051 (0.1185)
Ro_i				-0.2091** (0.0842)		-0.2308** (0.1161)	-0.2169* (0.1164)
<i>Environmental Accounting Systems</i>							
Legit	0.1928*** (0.0450)	0.1763*** (0.0454)	0.1856*** (0.0448)	0.1828*** (0.0447)	0.1781*** (0.0454)	0.1833*** (0.0447)	0.1756*** (0.0455)
Grinc	0.0736 (0.1499)	0.0388 (0.1499)	0.0788 (0.1490)	0.0907 (0.1489)	0.0503 (0.1500)	0.0905 (0.1490)	0.0643 (0.1503)
Perness	0.0418 (0.0653)	0.0462 (0.0653)	0.0385 (0.0653)	0.0367 (0.0652)	0.0473 (0.0652)	0.0370 (0.0652)	0.0444 (0.0654)
<i>Control Variables</i>							
Lnempl	0.1244*** (0.0300)	0.1259*** (0.0300)	0.1222*** (0.0300)	0.1166*** (0.0301)	0.1262*** (0.0299)	0.1164*** (0.0301)	0.1199*** (0.0302)
Mtbv	-0.0030 (0.0038)	-0.0034 (0.0038)	-0.0031 (0.0038)	-0.0032 (0.0038)	-0.0035 (0.0038)	-0.0032 (0.0038)	-0.0036 (0.0038)
Roe	0.0003** (0.0001)	0.0003** (0.0001)	0.0003** (0.0001)	0.0002** (0.0001)	0.0003** (0.0001)	0.0002** (0.0001)	0.0003** (0.0001)
Deratio	0.0002 (0.0025)	0.0005 (0.0025)	0.0003 (0.0025)	0.0003 (0.0025)	0.0006 (0.0025)	0.0003 (0.0025)	0.0006 (0.0025)
Industry effects	yes	yes	yes	yes	yes	yes	yes
Country effects	yes	yes	yes	yes	yes	yes	yes
Year effects	yes	yes	yes	yes	yes	yes	yes
Number of obs.	1296	1296	1296	1296	1296	1296	1296
Rsquared	0.1442	0.1462	0.1457	0.1484	0.1479	0.1485	0.1503

*, **, *** Indicate significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

Standards errors are shown in parentheses.

All models include industry effects, country effects, and year effects.

The robustness check confirms all the conclusions that we have drawn with regards to Hp.1. Specifically, Riskcod and Ro_l do not impact on the intensity and the scope of environmental strategy. On the other hand, Oppcod and Ro_i are, respectively, positively and negatively correlated to the attribute dimensions of environmental strategy. Also the relations between control variables and environmental strategy previously underlined hold in this test. In fact, the intensity of environmental strategy is found to be positively affected by firm size (Lnempl). The scope of environmental strategy, instead, has a positive relation with both firm size (Lnempl) and firm profitability (Roe).

It is interesting to underline that these results show several direct relations between the environmental accounting systems integrated in the model and corporate environmental strategy. Specifically, issue legitimation, and thus all the accounting systems that it encloses, is significantly and positively correlated with both the scope and the intensity of environmental strategy. This means that the indirect relation between such variables, previously underlined, is, actually, also a direct relation, in which managerial perception of the environmental issue does not perform a determinant role. A different conclusion can be drawn for Grinc, which shows a positive and significant relation with the intensity of environmental strategy, but does not significantly affect its scope. Consequently, while its positive relation with the intensity of environmental strategy is both direct and indirect, its positive effect on the scope of environmental strategy is only indirect. In this case, thus, the intermediate element of managerial perception becomes determinant. Exactly the same can be said for Perness. It positively affects the intensity of environmental strategy both directly and indirectly, while its positive correlation with the scope of environmental strategy is made possible only by the intermediate element of managerial perception. These two results are, to us, of a high importance. Consistently, they acknowledge and empirically test what the extant literature has only theorized: the determinant role of the individual and behavioral analysis to understand the effectiveness of environmental accounting tools. This not only assesses an important gap in environmental accounting literature, but also provides an important insight on how to develop effective environmental accounting tools, so that the individual perception of managers can change on the basis of the information taken by those systems, eventually driving positive environmental results.

CONCLUSIONS

Today, the prominence of the environmental issue in the analysis of social and economic growth is undeniable. Society at large is becoming increasingly concerned with environment preservation, and organizations are widely acknowledging that sustainable development is the only alternative for an effective business. However, the practical implementation of environmental responsive corporate strategies is still volatile. To make a step forward, this study makes explicit the key elements influencing corporate environmental strategy, which is defined on the basis of its intensity and its scope. These attributes are measured, respectively, as the number of green initiatives and the number of typologies of such initiatives the company decides to invest on. In order to identify the determinants of corporate actions for dealing with the environmental matter, we underline the necessity to go beyond the analysis of which environmental issues the company faces, including in the investigation both the personal, cognitive dimension and the internal organizational context. The sample analyzed is a panel data set of 1296 firm-year observations, corresponding to 740 listed firms that, in the period 2011-2013, voluntarily reported their climate-change information to the Carbon Disclosure Project (CDP). Through the use of ordinary least squares (OLS) models, we underline two groups of factors influencing corporate choices on environmental strategy, respectively belonging to the individual and the organizational sphere: the managerial perception of the environmental issue and environmental accounting systems. Moreover, a correlation between those two different domains has been found. This investigation has been developed in two steps. In the first one, we apply the strategic issue management literature's assumptions to the environmental matter, by analyzing whether the managerial perception of the environmental issue affects organizational green actions. In the second step, the effects of environmental accounting systems on managerial perception are analyzed, to understand whether, through such relations, environmental accounting systems are eventually correlated to corporate environmental strategy, and thus to assess their practical effectiveness. The first step of this work leads to several conclusions. Consistently with Sharma (2000) and Nutt (1984), the fact that the environmental variable is perceived as a business opportunity by managers, is positively correlated with both the intensity and the scope of corporate environmental strategy. Instead, the ratio between the perceived impact of the environmental risk and the perceived impact of the environmental opportunity is found to be negatively correlated with such two dimensions of environmental strategy. On the contrary, the other two elements of managerial perception integrated in the model, namely the identification of the

environmental variable with a business risk, and the ratio between the perceived likelihood of environmental risks and the perceived likelihood of environmental opportunities, are found to have no influence on corporate green strategy, differently from our hypothesis. However, empirically acknowledging that at least some kinds of managerial perceptions, declined on the three attribute dimensions of positive-negative, loss-gain, controllable-uncontrollable, affect corporate environmental strategy, is an important contribution to the literature. In fact, it proves that the innovative application of the strategic issue management literature to the environmental domain is a fruitful path to understand the differences among firms' green strategies. As strategic issue management literature posits, these results underline how the individual cognitive dimension and interpretation of strategic issues by managers can shape eventual corporate decisions.

In the second step of our work, the effectiveness of environmental accounting tools is analyzed. They are defined as those techniques aiming at collecting and measuring firms' environmental information, to make them available for both internal managerial processes and external disclosure. Several, specifically developed environmental accounting tools have been integrated in the model, to analyze their relation with corporate green strategy. More specifically, we test for the existence of an indirect relation between those systems and corporate environmental strategy, where the managerial perception of the environmental issue is the intermediate element. In fact, the influence of the environmental accounting systems on managerial perception of the environmental variable has been investigated, to understand whether, through such relation, those systems eventually affect the definition of corporate green strategy. The results of these tests show that both issue legitimation (and thus the environmental accounting systems integrated in such variable) and the presence of an environmental employees rewarding system are positively correlated with both the perceiving of the environmental issue as an opportunity and the perceiving of such issue as a risk by managers. While the former relations are consistent with Sharma (2000) and with our hypothesis, we expected environmental accounting systems to be negatively correlated with the managerial perception of environmental issue as a risk, as also Sharma (2000) posits. However, an explanation for this result can be found in the extant literature. It underlines how the complexity characterizing the environmental matters can lead to an extremely ambiguous labeling for managers, who are likely to perceive them as risks and opportunities at the same time, like Throop et al. (1993) posit. On the basis of this, our results may be considered an overcoming of Sharma (2000), in the revealing that the categories of risk and opportunity, relevant to strategic issue management literature, are too stringent to define such an ambiguous and complex domain like the environmental one. But the real overcoming of

Sharma is the integration, in our model, of two deeper dimensions of managerial perception: the perceived likelihood and impact of environmental opportunities and risks. With them, as it has been hypothesized, issue legitimation and the level of pervasiveness of the environmental employees incentive system (but not the mere presence of the environmental employees incentive system itself), are negatively correlated.

All this given, we can assess that the role of environmental accounting systems is not the one of making managers perceive the environmental issue as an opportunity rather than a threat, like Sharma (2000) maintains. Indeed, they rather have the important informative function of leading managers to the awareness of the complexity of the environmental issue, so that both risks and opportunities that, by nature, are related to it, can be identified. It is in the just cited deeper level of definition of managerial interpretation, instead, that environmental accounting systems optimistically shape environmental managerial perception. In fact, the higher the degree of issue legitimation and the degree of pervasiveness of the environmental employees incentive system within the firm, the less the environmental risk will be perceived likely and severe compared to the environmental opportunity.

Through the analysis of the results obtained in the two steps of our work, we have underlined several indirect relations between environmental accounting systems and corporate green strategy, where the intermediate element is represented by the cognitive perception of the environmental issue by managers. Specifically, all the analyzed elements of issue legitimation, the presence of an environmental employees incentive system and its level of pervasiveness, are positively and indirectly correlated to the intensity and the scope of environmental strategy, through different elements of managerial perception. In the final part of this work, we also check for potential direct correlations between environmental accounting systems and corporate green strategy. This tests highlight that issue legitimation (and thus all the accounting systems that it encloses) is positively correlated with environmental strategy not only indirectly through managerial perception, but also directly. On the contrary, the setting of an environmental employees rewarding system and its level of pervasiveness are positively and directly correlated only with the intensity of environmental strategy. Their positive relation with the scope of environmental strategy, instead, is only indirect. In other words, the mediating element of managerial perception is necessary and determinant in shaping the influence of such environmental accounting system on the scope of environmental strategy.

These results give an important contribution to the extant research in environmental accounting. On the one hand, in fact, they show that specifically-designed environmental accounting tools improve environmental performance, proving that “effective managerial

[accounting] systems drive environmental results".¹²⁹ On the other hand, they testify the rather unexplored significance of personal dimension. In fact, although the importance of individual and behavioral elements has been underlined as a possible area of enquiry to understand the poor effectiveness of EMA tools, (Burrit (2004)), its empirical investigation has not been developed by the extant literature. This research proves that perceptual and cognitive elements are the key linkage between some environmental accounting tools and environmental strategy. In so doing, not only we assess a gap in the environmental accounting literature, but also we provide important insights on how to develop effective environmental accounting tools, so that the individual perception of managers can change on the basis of the information taken by those systems, eventually driving positive environmental results.

It should be noted that this investigation is subjected to some limitations. For instance, the sample analyzed may be biased towards environment-committed companies. Thus, our findings may be, to some extent, specific of those companies that are already able or, at least, interested in reducing their impact on the environment. This is due to the fact that the data analyzed are the ones voluntarily disclosed by companies to CDP survey, and companies joining this project are undoubtedly committed to sustainable development. However, it is also undeniable that the number of companies disclosing to CDP has sharply grown over the years. From a niche project for very green companies, CDP has become the world's largest database of corporate self reported environment-related information, with 5,500 responding companies in 2015, accounting for 55% of the market capitalization of listed companies globally. On the basis of this, we are able to maintain that the great diffusion of such project alleviates this concern of sample bias.

Another limitation of this work that we need to acknowledge is the very high degree of ambiguity that any study dealing with the environmental variable needs to face. Specifically, as already underlined, environmental strategy and performance imply a great complexity in measurement and classification, since their assessment can be reliable only in the long-term, and the common business metrics are not able to capture these organizational dimensions. Consistently, measures of environmental strategy have proliferated in the extant literature, without clear, generally accepted guidelines to categorize it and to define what constitutes good and bad environmental performance. However, we partially overcome this ambiguity by choosing a rather objective and physical measure of environmental strategy, though potentially not exhaustive. On the basis of this, future research could concentrate on the

¹²⁹ Wells, R.P., Hochman, M.N., Hochman, S.D., O'Connell, P.A., 1994. Measuring environmental success. *Understanding Total Quality Environmental Management*, Executive Enterprise Publications, New York, p. 150.

development of a comprehensive framework capturing the multidimensional nature of environmental strategy, to measure and categorize it.

Finally, it is worth underlining how this investigation is to be considered explorative of a new field of research. What makes it innovative, is not its mere dealing with the environmental variable. The interest on this subject, in fact, has already been growing for some years. However, most of the studies have concentrated on the economic and financial benefits of integrating the environmental variable into business. How to effectively realize this integration, by modifying the internal accounting and control system, instead, is a rather unexplored field of research. In this lies the first important contribution of this work. The second highly innovative element, is the allowing for individual, behavioral and cognitive elements to be determinant for the effectiveness of environmental accounting systems. In fact, the extant literature has only theoretically acknowledged the importance of the individual sphere to understand the volatile effectiveness of environmental accounting tools. This study provides a solid evidence in this sense, and paves the way to further research. This high novelty of the field, and the integration in the model of variables belonging to inexact sciences like cognitive psychology, makes our results not entirely explicative of the relations that have been analyzed – this explains why a rather low R^2 in our tests has been still considered a good result -. However, this investigation gives an important contribution to the literature, by showing how, on the one hand, effectively environmental accounting systems do drive environmental results and, on the other hand, how innovative dimensions, different from the ones traditionally integrated in business models and afferent to the behavioral sphere, need to be accounted for when analyzing such a complex domain like the environmental one.

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