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THE ROLE OF EXTERNAL ASSURANCE ON THE QUALITY OF ENVIRONMENTAL DISCLOSURE: EVIDENCE FROM TWO ENVIRONMENTALLY SENSITIVE INDUSTRIES

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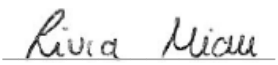

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Introduction

Growing and widespread interest in sustainability issues has increased the tendency of companies to engage in disclosure related to their environmental and social impact. The number of corporate sustainability reports published each year is constantly increasing and, in parallel, it is growing the interest of financial capital provides and of regulators over the practice. However, sustainability reports have been criticised for their lack of completeness and credibility and for their inability to contribute to the goal of sustainable development. In this context, different reporting practices has emerged to enhance the credibility of sustainability reporting, and external assurance is one of these practices. Subjecting disclosure of sustainability information to a process similar to the one deployed when auditing a financial statement could be an effective technique for overcoming the criticisms addressed to sustainability reports, enhancing disclosure quality and the credibility of information reported. From a legitimacy perspective, the adoption of voluntary assurance may strengthen and legitimize company's behaviour and its right to operate. However, the practice of external assurance is not exempt from criticism. Mainly criticisms flourished in the academic literature refer to the absence of stakeholder participation during the assurance process, the lack of independence of the assurance provider, the lack of specific regulation and the existence of a financial interest in performing the engagement. Therefore, there is an open debate concerning the credibility and usefulness of assurance. Concerns have been raised as to whether adopting assurance practice is simply designed to improve corporate image or whether there is also an association with enhanced disclosure quality. Drawing on Legitimacy Theory, the first scenario would suggest a symbolic approach in adopting assurance practice, while an enhanced disclosure quality could represent a substantive use of the practice. Within this debate, a limited number of studies have focused on the relation between assurance and disclosure quality providing mixed results. Therefore, I believed it could be of relevant interest digging deeper into this topic. My research analyses whether disclosure quality is related with the choice of having external assurance. The aim is to investigate whether companies that decide to assure their sustainability report show also a higher commitment toward accountability disclosing more and better information. Moreover, this study also examines whether differences in the quality of disclosure can be reconciled with the choice of different types of assurance provider.

I decided to focus the analysis on companies belonging to two environmentally sensitive industries (Power & Heat and Oil & Gas) and to limit the scope of my analysis to the environmental dimension of sustainability reporting. Companies have been selected from the

European Emission Trading Scheme (EU ETS) Company Database. I believed that, in the actual context of high concerns for climate changes and emission reduction, framing an analysis of environmental disclosure on emission intensive companies could be interesting and meaningful.

I decided to limit the research to European companies as I believed investigating sustainability reporting related practice in Europe is particularly timely, considering that European companies will be bound form the financial year 2017 onward by the directive regarding disclosure of non-financial information which also include sustainability disclosure.

The disclosure quality has been assessed using a multidimensional framework which includes *quantity*, *type of information* and *managerial orientation*. These three dimensions have been used moving from the insight that quantity is not a sound proxy for quality.

The work is organized in four chapter. The following two chapters provide a literature review: the former focuses on Sustainability Reporting, the latter focuses on the practice of Assurance and ends with the identification of a research gap and the definition of the research questions. Chapter three is devoted to research methods for conducting the empirical analysis and chapter four presents and discusses the results obtained.

1. Sustainability Reporting

Sustainability Reporting is defined as "*an organization's practice of reporting publicly on its economic, environmental, and/or social impacts, and hence its contributions – positive or negative – towards the goal of sustainable development*". (GRI Standard, 2016, p.3)

Sustainability reporting answers to the growing demand of information that goes beyond financial data. According to the Federation of European Accountants "*users of financial reports are looking for more information about the value creation process of an undertaking as well as information as to how it interacts with the world around it*." (FEE, 2016, p.5). This information is aimed at presenting the sustainability of the business model of a company and how it is able to meet stakeholder expectations.

The most common labels used for that kind of disclosure includes Sustainability Reporting (SR), Corporate Social Responsibility (CSR) Reporting and ESG (environmental, social, governmental) Reporting. Typically, it involves disclosure of economic, social and environmental performance. The subdivision of sustainability information into these three categories derives from the concept of Triple Bottom Line defined by Elkington in 1994. The insight of Elkington was to sort corporate performance into economic, social and environmental, thus adding to the traditional bottom line representing profit also an account for people and planet. In this work, I have decided to narrow the scope of attention to the environmental dimension. Accordingly, the theoretical part of the thesis will provide, where possible, more reference to environmental dimension of disclosure.

Sustainability reporting has become the standard for large companies. The most recent KPMG Survey (2015) shows that 92 per cent of the Global Fortune 250 (the first half of Fortune's Global List) report on their CSR activities. These reports attract the attention of investors, regulators and customers and are becoming more and more relevant as driver for investment decision (EY, 2017). According to GRI, in the future reporting content and format will have to be more and more tailored to the need of encouraging investors to make sustainable investment decisions (GRI, 2015). The interest of governments in the topic is clearly reflected in the emerging regulatory requirements aimed at disciplining Sustainability Reporting practice.

Being under the lens of financial capital provides and of regulators, the topic of Sustainability Reporting seems to be of increasing interest in the worldwide scenario. However, this growing interest is accompanied by criticisms. Doubts have been raised as to whether such disclosure

do not improve social and environmental impacts but rather serves to protect the organization from external pressure (Cho and Patten, 2007). Sustainable reports have been criticised for their lack of completeness and credibility (Adams and Evans, 2004) and for their inability to contribute to the sustaining of the Earth's ecology (Milne and Gray, 2012). Not only they have been addressed the criticisms of incompleteness and ineffectiveness, but also of serving as a "corporate veil" that provides a new face to the outside world, while protecting the organization from external view (Hopwood, 2009). In this context, external assurance can be framed as a practice that have been deployed to enhance the credibility of sustainability reporting.

In this chapter I will give a theoretical introduction of the practice of sustainability reporting. In the first paragraph, I will present the evolutionary trend in the practice, considering both regulatory context and voluntary diffusion of the practice. In the second paragraph, I will introduce the major reference existing as reporting guidelines, which I believe is essential in order to set the basis for analysing sustainability reports. In the last paragraph, I will present theories that have been tied to CSR, with a focus on Legitimacy Theory, which seems to be the most suitable when dealing with the topic of external assurance.

1.1 Historical evolution of the phenomenon

According to Elkington, since 1960, three waves of public pressure have contributed in shaping the environmental agenda (Elkington, 2004). The first wave started to raise awareness of the fact that environmental impact needs to be limited. Accordingly, companies started to provide information on their social and environmental activities (Fika, 2012). A second "green wave" began in 1987 when, for the first time, the concept of sustainable development was defined in the publication "Our Common Future" by the United Nations World Commission on Environment and Development (WCED). In this context, sustainable development was defined as a "*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*" (WECD, 1987). Since then the concept started to attract public attention. A third wave emerged in the 90s with the beginning of Globalization. In those years, interest toward environmental reporting started to keep pace. It is in this period that the already mentioned concept of Triple Bottom Line emerged, giving rise to the practice of reporting that integrate the social and environmental dimension with the economic one, based on the three pillars of sustainability. Moreover, the practice of publishing a stand-alone report dedicated to sustainability issues become mainstream (Fika, 2012). In 2001 the European

Commission, acknowledging that the debate on the role of business in achieving sustainable development was starting to gain importance on the global stage, published a Green Paper aimed at promoting a European framework for Corporate Social Responsibilities. The Green Paper defined CRS as "*A concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholder on a voluntary basis*" (European Commission, 2001, p.8)

In the last decades, a growing number of firms become active in publishing sustainability reports. The graph below shows the percentage of companies reporting on CSR information among the first 250 companies ranked in Fortune list.

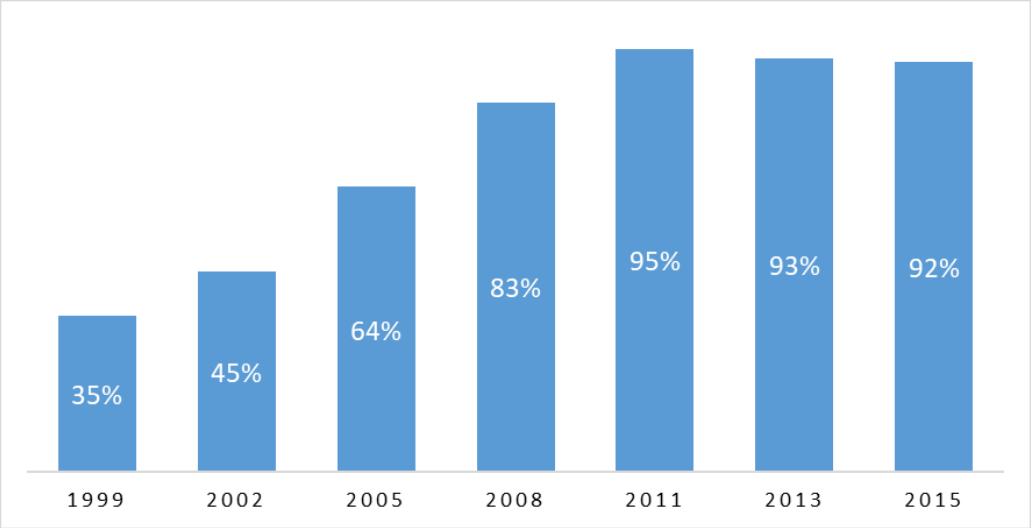

Figure 1: Fortune Global 250 companies reporting on CRS

Source: personal elaboration from KPMG International Survey of Corporate Responsibility Reporting (2015; 2013; 2011; 2005; 2002)

The Federation of European Accountants highlights the fact that sustainability reporting started to be considered a major issue after the financial crisis, "*as awareness was arising of the negative impact businesses can have on society and the environment."* (FEE 2016, p.5). At that point that was an emerging need to rebuild investors' and consumes' trust in markets through better information regarding both risk management and sustainability. Consequently, European Institutions have been active in promoting CRS reporting for the benefit of the society, but also as a mean to improve the competitiveness and innovation of European businesses (FEE, 2016). This increasing attention toward CSR reporting culminated in the European Directive on Non-Financial Information (NFI Directive). If the first approach to CRS, as defined by the Green

Paper in 2001, was addressing it as a voluntary practice, now the topic is not anymore merely voluntary, as reporting on CSR information is not an option in certain cases. Recently, sustainability reporting has started to be a matter under the lens of governments and stock exchanges around the world. According to the most recent survey of KPMG, "*The main driver for CR reporting continues to be legislative: there is a growing trend of regulations requiring companies to publish non-financial information*." (KPMG 2015, p.30). The first European countries to adopt regulations have been France, UK and Scandinavian Countries. In France, social environmental reporting is mandatory for listed companies since 2001. In 2010 with the Law Grenelle II the range of companies subjected to mandatory reporting has been broadened also to non-listed companies reaching certain thresholds (500 employees and 100 million of net turnover or total assets). Moreover, external assurance by a third independent party is required to guarantee the presence of all information required, and to explain the company's reasons in case of not reporting on some information. In United Kingdom, Company Act, since 2013, requires large companies to disclose principal risk and uncertainties and KPI in relation to environmental and employees matters. In 2007, the Swedish government required state-owned companies to present an independently assured sustainability report in accordance with the GRI guidelines. In Denmark, since 2008, large companies, are required to supplement their annual management's review with a report on social responsibility.

A recent attempt of the European Commission in regulating the issues has been made with the Directive regarding disclosure of non-financial and diversity information. The directive requires large companies to disclose certain information on the way they operate and manage social and environmental challenges. It is interesting, on my opinion, to notice how the theme of CSR has shifted from a topic addressed only by Soft Law with the Green Paper of 2001, to a topic doomed to enter in the national law of each member states. Italy has transposed the directive into national law in 2016, and it has to be applied from the financial year 2017. Companies are required to include non-financial statements in their annual reports from 2018 onwards. This rule applies to large public-interest companies with more than 500 employees. This covers approximately 6,000 large companies and groups across the EU. According to the European Commission "*This helps investors, consumers, policy makers and other stakeholders to evaluate the non-financial performance of large companies and encourages these companies to develop a responsible approach to business*". (European Commission, 2014) The statutory auditor is in charge of verifying the presence of the required information. Additionally, Member States may require the assurance of non-financial information by and independent assurance provider. (FEE, 2016, p. 9). Topics to be covered within non-financial information are environmental protection, social responsibility and treatment of employees, respect for human

rights, anti-corruption and bribery, diversity on company boards. Significant freedom is granted in term of how to report, although Article 2 of the Directive refers to non-binding guidelines on methodology for reporting non-financial information. These guidelines will be further discussed in the next paragraph.

1.2 Reporting frameworks

In this paragraph, I will present the main frameworks to which an organization can refer when reporting on CSR information. The frameworks discussed are reported in the table below.

Framework	Issuing entity	Purpose
GRI Reporting Guidelines	Non profit organization	Helping businesses, governments and other organizations understand and communicate the impact of business on critical sustainability issues
EU Guidelines on NFI	EU institution	Helping companies disclose high quality, relevant, useful, consistent and more comparable non-financial information
OECD Guidelines	Intergovernmental Organization	Providing non-binding principles and standards for responsible business conduct in a global context
UNGC (COP)	Intergovernmental Organization	Informing stakeholders about business efforts to implement the principles of the United Nations (UN) Global Compact
ISO 26000	Non profit organization	Providing a guideline on how businesses and organizations can operate in a socially responsible way
Integrated Reporting Famework	Non profit organization	Improving the quality of information available to providers of financial capital to enable a more efficient and productive allocation of capital

Table 1: Main frameworks of disclosure for CSR information

Source: personal elaboration

It should be born in mind each instrument has its own peculiarities in term of aims and scope. Therefore, they should not be looked at as alternative, but rather as complementary instruments to be considered in combination for a more comprehensive approach to sustainability reporting. I will provide a brief description of each one of them analysing how they treat the topic of environmental impact. In describing the different instruments, I will try to underline points of contacts and differences among them and to what extent reporting in accordance with one framework allows to comply also with the others.

Literature has widely recognised **Global Reporting Initiative** (GRI) as the most used guidelines for sustainability reporting. (Kolk, Perego, 2012; KPMG 2015). According to the most recent KPMG Survey (2015), 60% of the CSR reports surveyed referred to GRI. The graph below shows the percentage of reports following GRI framework broken down by geographic region in 2013 and 2015.

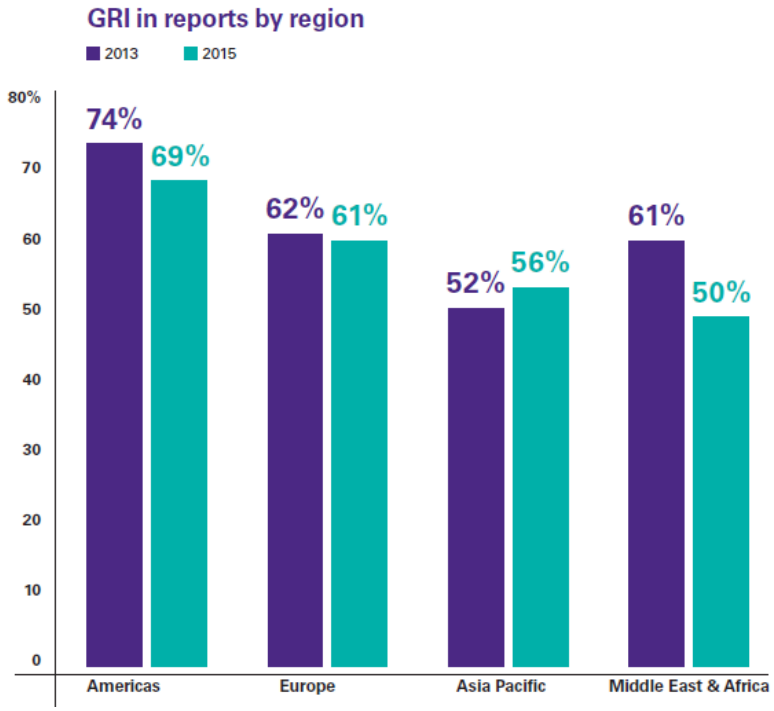

Figure 2: Companies following GRI guidelines by region

Source: KPMG International Survey of Corporate Responsibility Reporting (2015)

GRI is an international independent organization aimed at helping businesses, governments and other organizations to understand and communicate the impact of business on critical sustainability issues. GRI guidelines plays a significant role in the harmonization of sustainability reporting. Their final objective is, in fact, to give shareholders a tool to analyse the CSR performance of companies and compare them. The GRI started publishing non-financial information reporting guidelines in the 1990s. Since inception, the GRI has gained major attention from companies and has become a worldwide reference for reporting. The latest version – GRI Standard – has been issued in October 2016 and substituted GRI G4 Guidelines. GRI Standard provide framework consisting in a list of items of disclosures and key performance indicators that companies can follow in reporting their sustainability performance. Standards are grouped into three series of topic specific standards which cover economic, environmental and social impact. The environmental dimension, which is defined as "*an*

organization's impacts on living and non-living natural systems, including land, air, water and ecosystems" (GRI, 2016), includes items linked to materials, energy, water, biodiversity, emissions, effluents and waste, products and services, compliance and transport.

Guidelines help companies to report on the material issue of each dimension. GRI Standards guides companies in applying a "materiality process" that allow to decide whether an outcome is or not sufficiently material to be prioritized for inclusion in the report. In financial reporting, where the concept of materiality is deeply rooted, an information is considered material if its omission or misstatement could influence decisions that users make on its basis (IASB, 2017). Materiality therefore represent the threshold above which a certain information become sufficiently important to be disclosed. According to GRI Standard, a similar concept is also important in sustainability reporting, where materiality is the principle that determines which relevant topics are sufficiently important that it is essential to report on them. Reporting on material aspects is relevant to avoid information overload by including immaterial items (Unerman and Zappettini, 2014). The materiality assessment proposed by GRI considers a combination of internal and external factors that reflect significant economic, environmental, and/or social impacts, or for stakeholders' decision making.

Beyond GRI, several other parties have issued their own guidelines for sustainability reporting. Worth to mention are the recently issued **Guidelines of the European Commission**, published in July 2017, following the Directive 2014/95/EU. With the issue of its own guidelines, the European Commission, aims to "*help companies disclose high quality, relevant, useful, consistent and more comparable non-financial information"* (European Commission, 2017, p.6). Also the European Commission Guidelines are inspired by the principle of materiality as "*disclosing immaterial information may make non-financial statement less easy to understand since it would obscure material information. Generic or boilerplate information that is not material should be avoided"* (European Commission, 2017, p.8). Concerning environmental matters "*a company is expected to disclose relevant information on the actual and potential impacts of its operations on the environment, and on how current and foreseeable environmental matters may affect the company's development, performance or position*" (European Commission, 2017, p.15). The non-exhausting list of thematic aspects that companies are expected to consider when dealing with environmental matters include: material disclosure on pollution prevention and control, environmental impact from energy use, direct and indirect atmospheric emissions, use and protection of natural resources and related protection of biodiversity, waste management, environmental impact from the use and disposal of products and services, and development of green products and services.

Even if the European Commission issued its own guidelines, the Directive gives significant freedom to companies concerning the framework to follow for reporting. Following the entry into force of the directive, GRI published a document explaining how reporting in accordance with GRI allows a company to comply with the Directive. The European Commission mentioned also UN Global Compact, the OECD Guidelines for multinational enterprise and the ISO 26000 as other possibilities of framework to follow in the reporting of NFI.

The **UN Global Compact** is an initiative of the United Nations, created in 2000, aimed at encouraging business worldwide to adopt sustainable and socially responsible policies. It provides general principles that businesses participants have to comply with. The 10 principles concern human rights, labour, environment and anti-corruption. Among them, principles 7, 8 and 9 are related to environmental issues. They require businesses, respectively, to support a precautionary approach to environmental challenges, to undertake initiatives to promote environmental responsibility and to encourage the development and diffusion of environmentally friendly technologies. Commitment to UN Global Compact entails also submitting an annual Communication in Progress (COP), which means that businesses participates are asked to inform stakeholders about their efforts to implement the principles of the Global Compact. COP is addressed to stakeholders and should contain a statement by the chief executive expressing continued support for the Global Compact, a description of practical actions that the company has taken or plans to undertake to implement the Global Compact principles in each of the four issue areas (human rights, labour, environment, anti-corruption), and a measurement of outcomes (UN Global Compact, 2013). Since the signing of the agreement between UN Global Compact and GRI, in 2010, the GRI undertakes to integrate UNGC issue areas into its Sustainability Reporting Guidelines. Accordingly, GRI Guidelines can be used to produce annual COP.

The **OECD Guidelines for Multinational Enterprises** are recommendations addressed by governments to multinational enterprises operating in adhering countries. They provide non-binding principles and standards for responsible business conduct in a global context consistent with applicable laws and internationally recognised standards. (OECD, 2011). The Guidelines address the theme of reporting stating that "*enterprises should be transparent in their operations and responsive to the public's increasingly sophisticated demands for information"*. (OECD, 2011, p.28). For this purpose, reporting standards, such as GRI, provide useful references.

ISO 26000 is a guideline on how businesses and organizations can operate in a socially responsible way developed by the International Organization for Standardization in 2005. The

environmental dimension encompasses four issues: prevention of pollution, sustainable resource use, climate change mitigation and adaptation, protection of the environment, biodiversity and restoration of natural habitats. The ISO guidance provides a structure for companies to organize their activities but does not offer a practical guidance on reporting. Acknowledging that, ISO encourage to report following GRI, which represent "*the most suitable Guidelines to support organizations interested in reporting on the topics covered by ISO 26000 as part of its comprehensive Sustainability Reporting*" (GRI, ISO 26000, p.4)

The last framework I will deal with is the **Integrated Reporting Framework** (IRF), which has been issued by the International Integrated Reporting Council (IIRC). IIRC is a global coalition of regulators, investors, companies, standard setters and NGOs funded in 2010 with the aim to give investors more information about an organization's value creation. The IRF proposes an innovative point of view concerning the reporting approach. Its purpose is to encourage the substitution of the numerous and disconnected form of reporting issued by an organization with an integrated form of reporting. The final goal is to improve the quality of information available to providers of financial capital, enabling a more efficient and productive allocation of capital. An Integrated Report 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 over the short, medium and long term*". (IIRC, 2013, p.8). Integrated Reporting address the need to draw report readers' attention to the main connections between those social, environmental and economic actions and outcomes, preventing an excessive information overload, which would render difficult to appreciate the linkages between different social, environmental and economic impacts (De Villers et al, 2014). According to Adams, Integrated Reporting represents "*the early stage of widespread promulgation of a different way of thinking about corporate success and reporting*" (Adams, 2014).

The IRF establishes Guiding Principles and Content Elements that govern the overall content of an Integrated Report. Content elements encompasses eight categories. External environment category mention "*Environmental challenges, such as climate change, the loss of ecosystems, and resource shortages as planetary limits are approached*" (IIRC, 2013, p.25).

GRI has been involved with the International Integrated Reporting Council (IIRC) since its inception in 2010. In 2015 GRI and IIRC signed a Memorandum of Understanding in which the two parties acknowledge the complementarity of their respective roles, on the basis that sustainability reporting is central to integrated reporting and they are collaborating on the

Corporate Leadership Group on Integrated Reporting, bringing together corporate leaders to explore the future of integrated and sustainability reporting.

1.3 Sustainability Reporting Theories

The main theoretical frameworks for framing and explaining CSR reporting practice are Stakeholder Theory, Institutional Theory and Legitimacy Theory. Before narrowing the scope of attention to Legitimacy Theory, I will briefly introduce all the three of the three of them, analysing similarities, differences and complementarities.

Legitimacy Theory has become one of the most cited theories within the social and environmental accounting area (Tilling, 2004). Legitimacy can be defined as "*a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions*" (Suchman, 1995, p.574). An organization is legitimate when it is perceived it pursues its goals in a socially acceptable manner (Tilling, 2004).

Many scholars have turned to **Stakeholder Theory** to better specify better the concepts of CSR (Freeman et al 2010). Stakeholder Theory, first conceptualized by Freeman in 1984, is based on the idea that businesses should strive to meet the expectation of its stakeholders, where these latter are defined as all those that have an influence, and are influenced, by an organization. Stakeholder Theory highlights the fact that organization will react to the demand of those groups that control resources necessary to the organization operations. The disclosure of particular type of information can be explained, drawing on Stakeholder Theory, as a way to gain or maintain the support of particular groups. Both Legitimacy Theory and Stakeholder Theory conceptualize the organization as part of a broader social system wherein the organization impacts, and is impacted by, other groups within society. A difference could be found in the fact that Stakeholder Theory refers to how a company behave vis-à-vis a particular group within society - the stakeholders - whilst Legitimacy Theory discusses the expectation of the society in general (Deegan, 2014).

Institutional Theory considers the processes by which structures, rules, norms, and routines, guide social behaviour. According to Campbell (2007), the contribution of Institutional Theory is relevant in analysing the conditions that encourage corporations to behave in a social responsible way. According to Bebbington et al. (2007), Institutional Theory provides a useful complement to both Legitimacy Theory and Stakeholder Theory in understanding how

organizations respond to changing social and institutional pressure and expectations. The role of Institutional Theory is to link organizational practices (such as accounting and corporate reporting) to the values of the society in which an organization operates, and to a need to maintain it legitimacy (Deegan 2014).

The further of my discussion will provide a focus on Legitimacy Theory, as I believe is the most relevant one when digging into the phenomenon of external assurance of Sustainability Report on which I will concentrate from the next chapter onwards.

Legitimacy Theory suggests that, in order to obtain the right to operate, an organization should gain the acceptance by the society. Therefore, legitimacy is threatened if there is a lack of correspondence between how society believe an organization should behave and how it is perceived that the organization has acted, causing a "legitimacy gap". This gap worsen when a firm shows poor environmental performance (Cho and Patten, 2007; De Villiers and Van Staden, 2011). Moreover, Alrazi et al. (2016) underlined the fact that societal expectation could change even without a change in organisational functioning, as a result of increased awareness of the impacts of corporate activities on the environment. Accordingly, organizations seek legitimation strategy to grant their right to operate. Alrazi et al. (2016) underline that firms use disclosure to highlight actions taken to bring its performance up to societal expectations, or to justify any shortfall, in order to ensure continued access to resources. Reporting and related assurance is a strategic tool that organizations can use to influence the community's perceptions of their legitimacy (Choen and Simnett, 2015).

Legitimacy Theory suggests that companies can be in four different phases regarding their legitimacy. The earliest phase is "Establishing Legitimacy" and is typical of an organization in the first stage of its development. "Maintaining Legitimacy" is the phase that most of the companies have to deal with. The third phase is "Extending Legitimacy" and can be faced when an organization enter a new market or expand its domain of activity. Lastly, an organization may have to deal with the phase of "Defending Legitimacy". Ashforth and Gibbs stated that "*attempts to defend occur when the organization's extant legitimacy is threatened or challenged*" (Ashforth and Gibbs, 1990, p.183). This insight acknowledges that legitimacy is a dynamic concept and organizations need to be responsive to the environment in which they operate in order not to lose their legitimacy. According to Tilling (2014), the main focus of accounting researches tend to be on the phase of "Defending Legitimacy". This insight seems consistent with several attempts in the literature to reconcile environmental disclosure with Legitimacy Theory. Cho and Patten (2007), pointed out that firm seeking to maintain legitimacy have an incentive to use communication strategies, including financial report disclosure, to

potentially influence social perceptions. Companies facing higher public pressure in social/political environment, as companies with worse environmental performance provide more environmental disclosure comparing to better performers, in an attempt to prevent threats on their legitimacy (Cho and Patten, 2007).

Ashforth and Gibbs (1990) highlighted the fact that organizations adopt a wide variety of practices in the attempt to legitimize their activities and that these practices "s*hade greyly from substantive to symbolic*" (Ashforth and Gibbs, 1990, p.182). Substantive management refers to an approach that involves real, material change in organizational goals, structures, and processes, while Symbolic management refers to the case of an organization which simply portrays changes to appear consistent with social values and expectations but without substance.

Researchers have scrutinized different CSR practices to assess whether their role in enhancing legitimacy is substantive or symbolic. Berrone et al. (2009) examined the effectiveness of symbolic practices such as environmental trademarks and environmental dedicated board committee and substantive practices such as pollution prevention and environmental innovation. They conclude that substantive actions have a stronger and longer-term effect than symbolic actions. Rodrigue et al. (2013) analysed the adherence of environmental governance practices either to a symbolic or substantive approach. Focusing on a sample of environmentally sensitive firms, they came up with results consistent with environmental governance mechanisms being predominantly part of a symbolic approach to manage stakeholder perceptions on environmental management, having little substantial impact on organizations.

External assurance practice is widely used in increasing the confidences in firm's sustainability information. From a legitimacy perspective, the adoption of voluntary assurance statement may strengthen and legitimize social responsible activities (Faisal et al., 2012). It is unclear whether the role of external assurance in enhancing legitimacy could be considered symbolic or substantive. Michelon et al. (2015) found assurance not to be related to the quality or quantity of disclosure, leading to consider it a symbolic practice. Conversely, other researchers found evidence that firms with voluntary external assurance provide a higher extent of sustainability disclosure (Moroney et al., 2009; Faisal et al., 2012). According to Faisal et al. (2012) "*This result is consistent with Legitimacy Theory that firms voluntarily purchase additional assurance services in order to enhance their reputation*" (Faisal et al., 2012).

2. Assurance of CSR information

The International Audit and Assurance Standard Board (IAASB)[1] defines assurance as "*an engagement in which a practitioner aims to obtain sufficient appropriate evidence in order to express a conclusion designed to enhance the degree of confidence of the intended users other than the responsible party about the subject matter information*" (IAASB, 2013, p. 7)

The terms used to describe this process vary and include assurance, external assurance, verification, and certification (GRI, 2016). The GRI Standards use the term external assurance to refer to activities designed to result in published conclusions on the quality of the report and the information contained within it. The latest version of GRI Standard states that external assurance it is not required in order to claim that a report has been prepared in accordance with the GRI Standards although it is advised to enhance the credibility of the report (GRI, 2016).

EU Guidelines on non-financial information disclosure mention the independent external assurance as a way to make information fairer and more accurate (European Commission, 2017). In KPMG view, assurance is no longer just an option and companies should question themselves not about whether to assure sustainability disclosure, but rather about how to choose the appropriate assurance option that meet stakeholders' needs. (KPMG, p.12, 2013).

This chapter aims at providing a thorough analysis of the existing academic literature on the topic of sustainability assurance. Assurance practice has been subject to scrutiny of several academic studies focusing on different aspects. According to Faroq and De Villers (2017), researches in the field of sustainability assurance can be divided into five categories. The first category encompasses researches that undertake a macro examination of the practice examining the scope and objective of assurance engagements and evolutionary trend. The second refers to studies investigating factors that drive the demand of assurance engagement. The third, is comprised by several researchers evaluating assurance statements in an attempt to identify similarities and differences between accountants and non-accountants practitioners. Fourth, academics have tried to analyse the role played by assurance in enhancing stakeholders perceived credibility of sustainability reports. Finally, researches concentrated on the challenges faced by assurance providers and on the potential role of accounting profession in assurance market. I have tried to sort the most relevant articles I have reviewed for writing this

[1] The IAASB is a body supported by the International Federation of Accountants (IFAC)

chapter into the five categories proposed by Faroq and De Villers (2017). The table below report the sorting of the articles in the five categories.

Group	Area of research	Authors	Journal
1	Statistical breack up of the market of SA	Junior et al (2012)	*Journal of Business Ethics*
		Mock et al (2013)	*Australian Accounting Review*
		Cohen and Simnett (2014)	*Auditing: A Journal of Practice & Theory*
		Kolk and Perego (2009)	*Journal of Business Ethics*
2	Factors that drive the demand of SA services	Kolk and Perego (2012)	*Journal of Business Ethics*
		Kolk and Perego (2010)	*Business Strategy and the Environmant*
		Gillet Monjaret (2015).	*Accounting in Europe*
		Braam and Peters (2017)	*Corporate Social Responsibility and environmental management*
3	Differences among different type of assurance providers	Manett and Becatti (2009)	*Journal of Business Ethics*
		Perego (2009)	*Journal of International Management*
		O'Dwyer and Owen (2005)	*The British Accounting Review*
		O'Dwyer and Owen (2007)	*The Journal of Corporate Citizenship*
4	Role of SA in enahncing the credibility of SR	Moroney et al. (2009)	*Accounting and Finance*
		Ball and Otehrs (2000)	*Business Strategy and the Environmant*
		Sinmett and Others (2009)	*The Accounting Review*
		Sinmett and Others (2011)	*Auditing: A Journal of Practice & Theory*
		Faisal et al (2012)	*Australasian Accounting, Business and Finance Journal*
		Coram & Other (2009)	*Auditing: A Journal of Practice and Theory*
		Wong and Millington (2014)	*Accounting, Auditing and Accountability Journal*
		Michelon et al (2015)	*Critical Perspective on Accounting*
5	Role of accountants in the SA market	Gray (2000)	*International Journal of Auditing*
		Owen et al (2000)	*The European Accounting Review*
		Adams and Evans (2004)	*The Journal of Corporate Citizenship*
		Deegan et al (2006)	*Managerial Auditing Journal*
		O'Dywer (2011)	*Accounting Organizations and Society*

Table 2: Sorting the articles focusing on sustainability assurance into five areas of research
Source: personal elaboration

The reminder of the chapter is organized as follows: the first three paragraphs will try to answer to the questions: "what is an assurance engagement", "why organization seek assurance", and "who perform the assurance engagement". Articles clustered in the former three categories will mainly constitute the basis for these three paragraphs. The fourth paragraph will summarize all criticisms emerged in the literature over the practices of assurance, looking for seeds of criticisms in all the articles clustered the five different categories. The last paragraph will focus on the link between assurance and the extent of disclosure provided, which will be the focus of my research. Previous articles that investigated this topic are included in the category "Role of SA in enhancing the credibility of SR". The chapter will end up with the definition of the research questions.

2.1 The role of assurance providers

Assurance statements should address the questions: "*Does this report give an account of the company and its performance that readers can rely on*?" and "*is the report complete, accurate, honest and balanced in its portrayal of the organisation?*" (Adams and Evans, p.101, 2004). The assuror's key tasks are to assess and report on the completeness and credibility of a company's sustainability report, and the extent to which the company is responding to its stakeholders' concerns and interests. Assurance providers should act on behalf of stakeholder to ensure they receive all the information to which they are entitled (Adams and Evans, 2004). Gillet-Monjarret (2017) defines Sustainability Assurance as "*a disciplinary mechanism that certifies the reliability of sustainable reports and contributes to its credibility by reducing agency conflicts*" (Gillet-Monjarret, p. 5, 2017). The European Commission argues that: *"Verification by independent third parties of the information published in social responsibility reports is also needed to avoid criticism that the reports are public relations schemes without substance. Indeed such services are already beginning to be offered by a variety of companies, which would need to perform them following agreed standards. The involvement of stakeholders, including trade unions and NGOs, could improve the quality of verification."* (European Commission, p.21, 2001).

External assurance of sustainability reports is similar to financial audit, but it presents several additional criticalities (GRI, 2016). The main issue is due to the fact that sustainability assurance involves different kind of information on heterogeneous subject matters. Additionally, while for financial accounting there are long-established procedures, sustainability reporting deals with topics that are more critical to manage, measure and disclose. The main differences pointed out are the diversity of the subject matter examined, the absence of well-developed criteria and the lack of analytical rigor that arises in double entry system (Choen and Simnett, 2015). Additionally, the sustainability assurance is prepared for a broad range of stakeholders with different and often competing interests, in contrast with the financial audit which is prepared primarily for shareholders (Adams and Evans, 2004). Rasche and Esser (2006) raised the issue that stakeholder claims are never homogenous and that it is difficult to build consensus without being dominated by any party but by legitimate interests. Consistently, Unerman and Bennett (2004) stated that is difficult to determine a consensus set of stakeholder expectations from a range of potentially mutually exclusive views held by different stakeholders. Accordingly, the practice of sustainability assurance is the more and more concerned with the issue of stakeholder engagement. Manetti and Toccafondi analysed 160 assurance statements contained in each sustainability reports for the years 2009 and 2010

finding that, in the large majority of the cases, stakeholders were consulted by assurance providers during the assurance service. They concluded that *"Practice and theory have also shown the need for assurance practices to evolve from a mere check on data and information contained in the report to a more thorough control of the level of stakeholder engagement in SR, as well as of the alignment of corporate strategies with stakeholder expectations, in a climate of mutual commitment."* (Manetti and Toccafondi, 2012, p, 366)

There are different national and international standards for assurance of sustainability information. The two most widespread ones are the ISAE 3000 (IAASB, 2004) and AA1000 Assurance Standard (ISEA, 2003). ISAE 3000 is a generic standard used for all assurance other than financial audit, which has been issued in 2004 by the International Auditing and Assurance Standard Board (IAASB), the issuing agency of the International Federation of Accountants (IFAC). Only professional accountants can issue an assurance statement in accordance with ISAE 3000. Conversely, AA1000 Assurance Standard is addressed to anyone who provides external verification services. This latter has been issued in 2003 by the Institute of Social and Ethical Accountability (ISEA), a British no-profit organization.

Different variables play a role in shaping the nature of assurance engagement. Assurance may vary considerably in terms of the choice of the assurance provider, of the scope and level of assurance. (Braam, 2017). As far as the scope is regarded, this can range from assurance on information disclosed in specific sections of the report to assurance provided for the entire sustainability report. Concerning the level of assurance achieved, this can be, depending on the characteristics of the subject matter and investigation implemented, a limited or a reasonable assurance. A reasonable level of assurance means that the auditor finds information reported to be compliant with requirements, while a limited level of assurance is solely aimed at stating that nothing has come to the attention of the assurance providers to indicate the information is not presented in accordance with criteria (Hodge, 2009). The choice of which level of assurance should be desirable is quite discussed in literature. Manetti and Becatti (2009), are in favour of a limited assurance, claiming that, due to the complexity in investigating all the topics contained in a sustainability report, it will never be possible to guarantee highly reliable verification. According to other point of views, reports' users place more confidence in the information reported when the level of assurance providers is reasonable (Hodge, 2009). Moreover, both reporting companies and assurance providers have been criticized for exploiting the possibility of using limited assurance at their own advantage. According to O'Dywer and Owen (2005), limited assurance can be used to prevent the risk of litigation costs for assurance providers. Braan (2017) claims that managers of companies with a poor environmental performance may

take advantage of assurance practice by choosing limited assurance on specific sections of the sustainability report to manage stakeholder perception.

Adams and Evans (2004) mentions the following as activities normally involved in an assurance work:

- Interviewing managers and staff concerning policies, information management systems and controls in place.
- Testing systems and data.
- Reviewing accounting process.
- Consulting stakeholder representative where necessary.
- Checking commentary and graphical presentations in the report for consistency with the underlying data and to ensure that they do not misinterpret performance.
- Documenting investigation and findings.

The result of the work is the issue of an assurance statement drawing conclusions on the information in the report reviewed (Owen and O'Dywer, 2005). The assurance statement may be disclosed as part of the sustainability reporting process. Form and content of the statement vary depending on the scope, standard used and, to some extent, on the assurance provider preferences (GRI, 2013). The assurance statement should define the intended audience of the assurance statement, the scope and level of the assurance process, the criteria and methodologies used by the reporter, the standard used by the assurance provider to guide the assurer's approach. A summary of the actions performed by the assurance providers, mentioning any noteworthy limitations, could be included. Additionally, some assurance reports include a summary of recommendations for further actions. The assurance statement usually ends with a conclusion indicating whether the assured information is fairly presented, free of material misstatements and reported in accordance with reporting criteria. The statement is dated and signed by the most senior executive responsible for the assurance.

For instance, the assurance statement issued by EY for the Sustainability Report of Eni (2016) defines the intended audience as "*To the Board of Directors of Eni S.p.A*". The level of assurance is specified when saying "*We have carried out limited assurance engagement*" and again when saying "*Our examination has entailed a lower extension of work compared to the work to be performed for a reasonable assurance engagement in accordance with ISAE 3000 and, as consequence, we may not have become aware of all the significant events and circumstances which we could have identified had we performed a reasonable assurance engagement*." The topic of criteria and methodologies used by the reporter is addressed in the sentence "*The Directors are responsible for the preparation of the Report in accordance with*

the G4 Sustainability Reporting Guidelines", while the standard used by the assurance provider in *"Our work has been conducted in accordance with the criteria established by the principle International Standard on Assurance Engagement 3000 issued by IAASB for the engagements that consist in a limited assurance."* The actions performed are summarized as follows: "*Comparison of the economic and financial data and information included in the Report with those included in the Eni Group's consolidated financial statement as of December 31, 2016 on which we issued our audit report…"; "Analysis, through interviews, of the governance system and management process of the issues related to sustainable development regarding Eni Group's strategy and operations"; "Analysis of the process relating to the definition of material aspects included in the Report, with reference to the identification modalities in terms of their priority for the different stakeholders 'categories and to the internal validation of the process outcome"; "Analysis of the operation of the processes that support the generation, recording and management of quantitative data reported in the Report…"; " Analysis of compliance and internal consistency of the qualitative information included in the Report to the guidelines identified in the paragraph Directors' responsibility on the Report of the present report"; "Analysis of the process relating to the stakeholders engagement, with reference to the procedures applied, through the review of the summary minutes or any other existing documentation relating to the main topics emerged from discussion with them"; "Obtaining of the representation letter, signed by the legal representative of Eni S.p.A., relating to the compliance of the Report with the guidelines indicated in the paragraph Directors' responsibility on the Report, as well as to the reliability and completeness of the information and data presented in the Report."* The statement does not provide any recommendations for further actions. Conclusion states that "*Based on our work, nothing has come to our attention that cause us to believe that Eni for 2016-Sustainability Report of Eni Group as of December 31, 2016 is not in compliance, in all material aspects, with the guidelines G4 Sustainability Reporting Guidelines and Oil & Gas Sector Disclosures issued in 2013 by the GRI – Global Reporting Initiative, as stated in the paragraph Reporting principles and criteria of the Report*." The report is dated as of 6th April 2017 and signed by an EY Partner.

The main features of the assurance statement described are summarized in the table below, while the whole assurance statement is included in the Appendix.

Title: Independent auditor's report on "Eni for 2016-Sustainability Report"
Intended Audience: Board of Directors of Eni S.p.A
Level of assurance: Limited
Methodology udes by the reporter: G4 Sustainability Reporting Guielines
Standard used by the assurance provider: ISAE 3000
Actions performed: Summary of the main procedures undertaked
Conclusion: no reasons to belive the Report is not complying with Guidelines
Report date: Rome, April 6, 2017
Signature: Massimo Antonelli, Partner

Table 3: Main features of Independent auditor's report on "Eni for 2016-Sustainability Report"

2.2 Why organization seek assurance

The voluntary demand of independent verification can be explained by a willingness to enhance sustainability report's credibility vis-à-vis stakeholders (Kolk and Perego, 2012). Third-party assurance can improve stakeholders' confidence in the credibility of the sustainability information provided and thus enhance the corporate reputation (Simnett et al., 2009). According to GRI, external assurance reflects the seriousness with which companies approach sustainability reporting (GRI, 2013).

Literature has found the voluntary assurance decision to be influenced by a number of internal and external drivers (Farooq and De Villers, 2017). External drivers are primarily: size, industry, and county of origin. Size plays a role in the sense that large listed companies are more likely to seek assurance (Simnett et al., 2009). In terms of industry membership, studies have found that organisations operating in environmentally sensitive industries are more likely to purchase assurance service (Cho et al., 2014). Kolk and Perego (2010) argued that the main determinants for the adoptions of external assurance are county level variables rather than firm or industry specific factors. There is a general agreement in the literature on the fact that companies located in more stakeholder-oriented countries are more likely to have their report assured (Kolk and Perego, 2010; Simnett et al., 2009). In stakeholder-oriented countries, characterized by a higher focus on company ability to create value beyond wealth maximization, there is a higher need to increase the confidence of stakeholders in the credibility of information disclosed. Authors tend to consider North American countries, the UK and Ireland as shareholder oriented and European countries, excluding the UK and Ireland, more stakeholder oriented. This reasoning is consistent with the finding of Kolk (2010) that,

analysing Fortune Global 250 firms, find out that assurance practice is much more widespread in Europe.

An additional external driver in encouraging organization to seek assurance is media pressure. A study of Gillet-Monjarret (2015) on French listed companies, comparing assurance demands between 2007 and 2010, found that higher levels of negative media exposure positively influence the demand for sustainability assurance. Accordingly, media pressure increases the need to enhance the credibility of SR through assurance.

Since independent assurance is a costly mechanism, consistent benefits should be expected form this voluntary choice (Kolk and Perego, 2010). Clarkson et al (2015) examined the potential benefits associated with external assurance of CSR disclosure. Their findings suggest that assurance plays an incremental role in increasing the chance for reporting firm to be included in the Dow Jones Sustainability Index (DJSI) and, therefore, to attract more sustainable responsible investments. O'Dywer (2011) states that one of the argument that assurers use to boost their reputational value is the increased likelihood of inclusion on sustainability indices such as the Dow Jones Sustainability Index and/or the FTSE4Good Index. Coram (2009) examined the role of voluntary assurance on the share price of reporting organization. The research method consisted in an experiment giving participants a hypothetical annual report with both financial and non-financial information, some of which were assured, while others were not. The panel of financial expert and accountants involved in the experiment has been asked whether they believed the company's stock price would increase or decrease based on the information provided. Results suggest that assurance only had a significant effect on stock price estimates when the non-financial performance indicators were positive. Findings of Cho et al. (2014), instead, are inclined toward an irrelevant effect of assurance on stock price. In the panel of 216 CSR reports published by US companies ranked amongst the Fortune 500, they find assurance not to be associated with higher market value for report-issuing companies.

2.3 Types of assurance providers

External assurance of sustainability disclosures can be offered by a variety of service providers. Traditionally the market of assurance providers has been divided between certification bodies, and the Big-4 professional service firms (O'Dwyer, 2011). The GRI (2013) proposes a distinction into three categories: accounting firm, which are traditionally engaged in the audit

of financial report, engineering firms, that normally offer technical certifications and engineering expertise, and sustainability service firms, recognized because of their expertise with stakeholder and sustainability issues (GRI, 2013, p.10). Perego (2009) also distinguished between three categories: accounting firms, certification bodies and specialist consultancies. Junior et al. (2014), analysing assurance statement of companies listed in Fortune 500 for the year 2010, clustered the market of assurance providers into four categories. Accountants and non-accountants are the two more widely recognized categories. The third category is represented by "Third Party Review" performed by a different range of entities or individuals, such as stakeholder panels, academic institutions, nongovernmental organizations, and presidents/directors of international institutes operating in the sustainability reporting area. The fourth category refers to a "Mixed Approach", which means using two different types of assurance providers in the same sustainability report (an accounting firm combined with a non-accounting firm, or an accounting firm combined with a stakeholder or specialist review). They notice that accounting firms, which represent the dominant typology of assurance provider, perform most assurance engagements in European countries, Brazil and Canada. As far as the other three categories are concerned, stakeholder or specialist reviews was used by organizations in Japan, China and South Korea, the mixed approach was used only in Spain and Japan and non-accounting firms have dominance in Taiwan, US, India, Australia and China.

The figure below, retrieved from Junior at al. research (2014), summarizes the type of assurance providers for companies in the Fortune Global 500 list in 2010 by country.

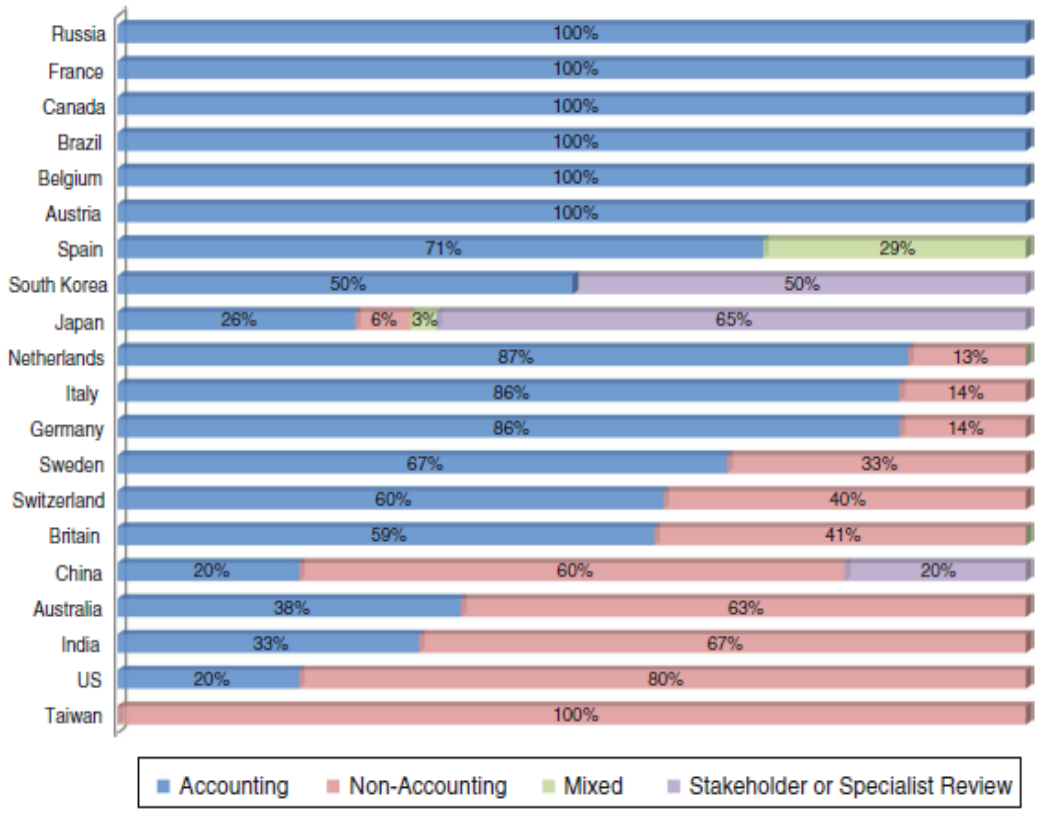

Figure 3: Type of assurance provider by country for companies in the Fortune Global 500 list in 2010

Source: Junior et al. (2014)

Regardless the fact that there is no univocal taxonomy of the assurance providers, what the literature seems to agree on is the fact that the market is dominated by accounting firms (Kolk, 2010; Junior et al., 2014; Kolk and Perego, 2012; GRI, 2003). This evidence is confirmed by the most recent KPMG survey (2015), which shows that 65% of top 250 of the Fortune Global 500 have their report assured by one of the major accountancy organization and, among the 100 biggest companies in the 45 countries surveyed by KPMG, 64% of them relied on accountancy organization.

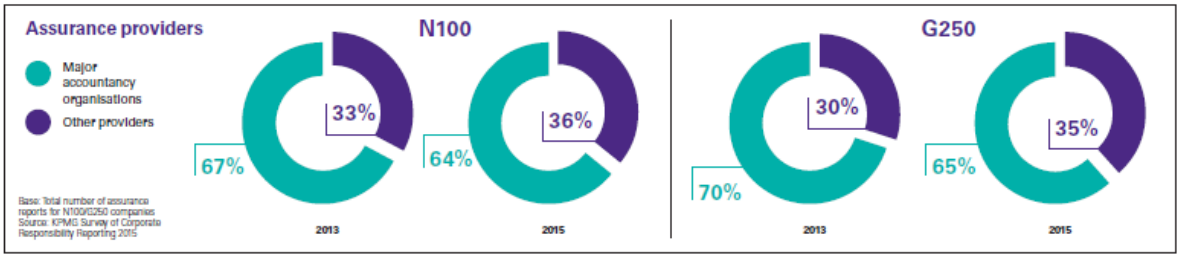

Figure 4: Assurance providers for the years 2013 and 2015

Source: KPMG (2015)

Prior researches have shown that substantive differences in the quality of assurance provided by assurors coming from different backgrounds can be found (O'Dwyer and Owen, 2005; Perego, 2009; Kok and Prego, 2012). The approaches to sustainability assurance differs significantly between accountants and consultants, the two dominant professional groups in the market for third-party verification (Kolk and Perego, 2012). Perego (2009) conducted an analysis of assurance statement provided by different categories of assurance practitioners finding significant difference in the end result of the assurance engagement. On one side, Big-4 accounting firms put more emphasis on aspects related to "*reporting format*" and "*assurance procedures*". On the other side, the "*quality of the recommendations*" and "*opinions in a sustainability assurance statement*" is positively associated with non-accounting assurance providers. Generally, accountants, seems to be hesitant to draw clear and precise conclusions from the assurance engagement given the uncertainties surrounding the domain of sustainability assurance provision (Perego, 2009). Conversely, consultants appear to adopt a more strategic approach to the audit exercise, which might be considered as adding value to the process from the perspective of external stakeholder group (O'Dwyer and Owen, 2005).

For instance, the assurance statement issued by TUV Austria Hellas for the Sustainability Report of Hellenic Petroleum mentions also three recommendations for the improvement of the company's future Sustainability Reports, namely "*Harmonize the procedures and data collection systems of all companies within the boundaries of the Report; extend the boundaries of the Report to include more companies of the Hellenic Petroleum Group; On site visit in more installations of the Hellenic Petroleum Groups within the boundaries of the Report*." The full assurance statement for the Sustainability Report of Hellenic Petroleum is included in the Appendix.

The question of which assurance provider should be preferable is an open debate in the literature. Arguments in favour of choosing an auditor are reputation, well developed standards, independence and ethical requirements. Big-4 are argued to be more independent, since their big dimension make them not dependent on any one client. (Perego and Kolk, 2012; Simnett et al., 2009). Gray (2000) highlighted the potential for the accounting profession to perform a key role in the area of sustainability assurance, since accountants benefit from their skill set coming from financial auditing. Based on these arguments, Simnett et al (2009) classified members of the auditing profession as higher quality assurance providers.

On the other hand, accounting firms have been criticized for lack of competences to operate in the field (Power, 1997). Environmental consultants appear to be more expert in the subject matter (Simnett et al., 2009). This argument can be demolished considering that big audit firms

can hire subject matter specialist to enhance their expertise. The ISAE 3000 explicitly foresees the possibility that auditors rely on the contribution of experts from other fields (Manetti and Becatti, 2009, p. 3).

Some researches have investigated which kind of assurance provider is preferred by different categories of stakeholders. Pflugrath et al. (2011) examined whether financial analysts from Australia, the United States, and the United Kingdom perceive a difference in the credibility of stand-alone sustainability reports depending on the type of assurance provider. The results show that financial analysts from the United States perceive information as more credible when the assurer is a professional accountant. Financial analysts from Australia and the United Kingdom perceive little difference in the enhanced credibility provided by the different assurance providers. Wong and Millington (2014) investigate assurance from the perspective of diverse stakeholders group through a questionnaire survey in UK. Findings point out the relevance of specialist environmental assurors and, accordingly, the preference toward specialist assurors rather than financial auditors. Hence, no clear opinion on which is the preferable assurance provider seems to exist.

In this context of freedom to select among different assurance providers and no clarity about which assurance provider should be considered preferable, literature has investigated factors that lead companies to choose whom to appoint for assuring its sustainability information. The main drivers found are size and country level factors. Company size plays a role to the extent that bigger firms are more likely to choose an auditing firm (Simnett et al., 2009). Concerning the country level factors, there is a general agreement on the fact that companies operating in more stakeholder oriented countries are more likely to choose an auditing professional assurer (Simnett et al., 2009; Braan, 2017). Perego (2009) found the tendency is greater among firms in countries with weak law enforcement because auditing serves as substitute of other institutions.

Some attempts to reconcile the assurance practice with the sustainability performance has also been made. Findings highlight the fact that companies with higher sustainability performance are more likely to choose a provider form the accounting profession, a broader scope and a higher level of third-party assurance (Braan 2017).

2.4 Criticisms on assurance practice

A great debate exists in the literature about whether social, ethical and sustainability accounts and reports should be audited, and about the quality and usefulness of audit of assurance statements. (Adams and Evans, 2004). As Owen and O'Dywer (2005) underlined, studies of assurance practices have raised serious questions over the credibility of that practice and as to whether they provide any added value form a stakeholder perspective. The purpose of this chapter is to highlight the focus of the empirical studies and identify the broad problem areas and criticalities emerged up to date. Concerns emerged in the literature mainly refer to the absence of stakeholder participation during the assurance process, the lack of independence of the assurance provider, the lack of specific regulation, the existence of a financial interest in performing the engagement and the triggering of a practice known as "*managerial capture"*. The table below summarizes the main criticism addressed to the assurance practices existing in the literature up to date.

Critic	Authors
Lack of specific criteria	Deegan & Othes (2006) Manenti & Beccati (2009) Junior & Others (2010)
Lack of stakeholder engagement	O'Dywer & Owen (2007) Adams & Evans (2004)
Lack of independence of the assurance provider	Ball & Other (2000) O'Dywer & Owen (2005)
Financial interest	Power (1997) Owen & Others (2000) Kolk & Perego (2012)
Managerial capture	Owen & Others (2000) Manurung & Basuki (2010)

Table 4: Main critics existing in the literature toward assurance practice

Source: Personal Elaboration

Deegan et al. (2006), analysing European and UK assurance statements form the years between 2000 and 2003, criticized the variability in the content of assurance statement and the lack of details in describing the process performed, claiming that this lack of standardization undermines the credibility of assurance statement. Manetti and Becatti (2009) examined 34 sustainability assurance statement issued by both auditors and others assurance providers for the year 2006. They underlined inconsistencies regarding scope of assurance, criteria employed

and levels of assurance provided. They criticized the most widespread standard for assurance engagement, the ISAE 3000, for not being specifically tied to sustainability assurance and suggest the need of specific guidelines for assurance providers. Junior et al. (2014) analysed reporting and assurance trend in Fortune Global 500 firms in 2010 and claimed that the lack of specific regulation about assurance process and the differences among assurance services provided by different practitioners could contribute to the uncertainties about assurance practice.

Adams and Evans (2004) claimed the need to give stakeholders more power on issues such as appointment of auditors and determination of audit scope. O'Dwyer and Owen (2007) undertake a detailed examination of assurance statement and pointed out the lack of stakeholder involvement in assurance and the reluctance to specify addressee of assurance statements. O'Dywer et al. (2011) investigated how accountancy firms strive to establish their legitimacy in the field of sustainability assurance both with clients and user audience. They defined lack of stakeholders engagement a key barrier to developing legitimacy for assurance and underlined an emerging effort to involve stakeholders in the assurance process as a way to overcome the barrier.

Ball et al. (2000) pointed out much evidence of auditee control over the process and accordingly, a lack of independence of the assurance provider. They performed a content analysis of 53 environmental reports and related third-party verification statements published by UK companies, with the aim to evaluate the extent to which third-party assurance promotes transparency and empowerment of external stakeholders. O'Dywer and Owen (2005) criticized the fact that assurance providers are engaged by management, which may restrict the assurance process as they wish, and that assurance statements are primarily addressed to management.

Criticism have addressed also the cost of assurance practice. Cost, in fact, has been observed to be one of the major drawback of the decision to assure (Simnett et al., 2009; Kolk and Perego, 2010). Big-4 are considered by literature as the most expensive assurance providers. While someone, has seen in this a signal of higher quality assurance service (Simnett et al., 2009), others have criticized them for taking advantage of their reputation to increase profit operating in a field where they have no legitimacy (Power, 1997). Owen et al. (2000) pointed out that accounting firms cannot be objective since they have financial interest in the audit. Additionally, assurance providers have been criticized for taking advantage of the service. Kolk and Pergo (2012) claimed that they pursue their own commercial interest through different means: for instance, limiting the scope of their engagements in order to minimise any potential liabilities and litigation costs.

Concerns have raised about the control management of the reporting company exercises over the assurance process. Owen et al. (2000) noted that sustainability assurance is subject to "*managerial capture*", meaning that it seems management take control of the whole process. Manurung and Basuki (2010) highlight evidence that management has control over the scope of assurance. Accordingly, managers of companies with a poor environmental performance may choose assurance solely on specific sections of the sustainability report to manage stakeholder perception (Braam, 2017).

Consequently, sustainability assurance seems more a managerial tool rather than a real instrument of accountability (O'Dywer and Owen, 2005). The criticism of "*managerial capture*" could seem consistent with the idea of assurance as a symbolic practice. Management would hijack assurance to their own advantage, strategically restricting disclosure to information that will enhance corporate reputation (Gillet-Monjarret, 2017). In this perspective, assurance result a symbolic practice unable to guaranteeing a real commitment toward CSR. This insight seems consistent with the findings of Michelon et al. (2015), which lead to consider assurance as a symbolic practice that firm use to influence stakeholder perception of corporate commitment toward CSR (Michelon et al., p. 34, 2015).

2.5 Assurance and quality of disclosure

The previous paragraph should have made clear that the debate on the value relevance of assurance is open. Accordingly, it is arguable whether it is worth to purchase assurance service. Couched within this debate, few studies have tried to examine the role of assurance in enhancing accountability, testing whether assurance is related with a higher level of disclosure. It seems in fact reasonable to question whether the decision of "investing" in sustainability assurance is accompanied by a commitment to disclose more and better information.

Previous researches that analysed the relation between assurance and disclosure quality have come up with mixed results. Some researchers find a positive correlation between assurance and quality of disclosure (Moroney et al., 2009; Faisal et al 2012), while others did not (Michelon et al., 2015). If only few researches have examined the role of assurance in enhancing the quality of disclosure, even fewer have investigated if different evidence could be reconciled with different assurance providers. Moroney et al. (2009) enquired whether quality of environmental disclosure can be linked to whom performed the assurance engagement. Their results showed no significant difference in environmental disclosure among companies that use

different assurance providers. Similarly, Clarkson et al. (2015) found that external assurance seems to be a signal of an effective commitment to CRS, but there is no relation between commitment and the choice of assurance providers.

Since literature provides contrasting evidence on the role of assurance in enhancing the quality of reporting, my work is aimed at digging deeper in this debate. The objective of my research is twofold. First, I want to investigate a topic on which literature has not a clear opinion. Second, I want to provide an added value comparing to the previous researches. My work will seek to propose a more comprehensive approach in measuring the extent of disclosure comparing to previous researches. All researches in this field relied on content analysis based on a disclosure framework, usually based on GRI item of disclosure. What differs significantly among the work performed by previous researchers are the procedures used in developing an index that measure the extent of disclosure. Faisal et al. (2012) simply awarded a score of zero or one depending on whether a certain item has been disclosed or not. Moroney et al. (2009) acknowledged the limits of a dichotomous disclosure or non-disclosure data approach and proposed a scale of zero to six to measure the extent of disclosure. Michelon et al. (2015) proposed an approach which attempts to better capture the complexity of the information that management can communicate. They argued that the quantity of information alone is a poor indicator, and proposed to combine it with other dimension of quality such as density, accuracy and managerial orientation (Michelon et al., p. 32, 2015). Relying on the insight of Michelon et al. (2015), I will try to develop a similar framework in an attempt to gathering evidence also on the quality of disclosure, not only on the quantity. Differently from their work, I will concentrate solely on the practice of assurance and on environmental dimension for companies belonging to environmentally sensitive industries. Michelon et al. (2015) analysed the impact on sustainability disclosure of three different CRS practices, namely the issue of standalone report, the use of GRI reporting guidance and the assurance. Conversely, my work will focus only on the assurance practices and on the type of assurance provider chosen.

Another difference of my work comparing to previous ones is the geographical area of analysis taken into account. Michelon et al. (2015) and Moroney et al. (2009) have focused their researches on a single country: UK the first and Australia in the second. Faisal et al. (2012) have used a random sample of companies belonging to 24 different countries. My research will be focused on a sample of European companies, analysing therefore the trend in an area which has not been previously investigated.

The flowing table summarizes research methodologies and findings of previous studies:

Authors	Companies Examined	Reaserch methods	Results
Moroney et al. (2009)	Companies listed in the Australian Security Exchange for the years between 2003 and 2007	Content analysis using an Environmental Disclosure Index based on GRI. A scale of zero to six is used to measure the quality of environmental disclosure	-Positive relation between assurance and environmental disclosure quality - No difference depending whether assurance is provided by accountants or consultants
Faisal et al. (2012)	Public companies form 24 different countries for the year 2009	Content analysis using a Sustainability Disclosure Index based on GRI. For each item it is awarded a score of 1 if disclosed and of 0 if not.	- Firms with assurance statement provide higher quality of sustainability disclosure
Michelon et al. (2015)	UK companies over the years 2005, 2006, 2007	Content analysis using a framework based on content, type of information and managerial orientation and based on GRI	-Assurance is not significantly associated with disclosure quality

Table 5: Papers analysing the link between assurance and disclosure

Source: personal elaboration

The objective of my research is, therefore, to analyse with a positivist approach whether quality of disclosure can be associated with the choice of sustainability assurance. The first hypothesis that I will test is:

H1: Firms with external assurance of their sustainability reports provide higher quality of environmental disclosure than firms with no assurance statement.

Additionally, moving from the idea that Big-4 are more costly assurance providers, I will test whether choosing a Big-4 is accompanied by a higher disclosure. This lead to the second hypothesis:

H2: Firms that choose a Big-4 as assuror provide higher quality of environmental disclosure than firms that choose other assurance providers.

3. Research method

The objective of this research is to study whether the presence of external assurance is related to higher environmental disclosure quality. The research has been conducted analysing the trends reported within a sample of selected companies. The quality of disclosure provided has been investigated conducting a content analysis of environmental information disclosed by each company either in a dedicated report either in the annual report.

This chapter is aimed at describing in detail how the empirical research has been conducted. In the first paragraph, I will introduce the sample of analysis describing the steps which has been followed to construct it. The second paragraph will describe the framework and the procedure used to conduct the content analysis of the reports examined. The last paraph will provide specification of the empirical analysis used to test the two hypotheses.

The end scope of this chapter is to explain how the data set has been constructed. The inference on the data gathered will be the subject matter of the next chapter.

3.1 The sample

Industry has been found as one of the main determinant of environmental disclosure and it is generally recognized in the literature that environmentally sensitive industries tend to report more on sustainability matters. Kolk (2010) stated that more polluting sectors have traditionally been more active in reporting. Cho and Patten (2007) demonstrated that firms operating in environmentally sensitive industries tend to disclose more than companies operating in non-sensitive industry (Cho and Patten, 2007; Kolk, 2010). Relying on this evidence, I decided to focus the scope of attention of my research on companies operating in environmentally sensitive industries.

The first step I took in order to select companies to be included in the sample it has been to consult the EU ETS (Emission Trading Scheme) Company Database[2]. The database provides strategic information and carbon data about more than 1000 companies form 31 European countries and it aims is to be "*a powerful tool for helping professionals conducting a carbon footprint analysis*" (Carbon Market Data, p.6). I believed that, in the actual context of high

[2] www.carbonmarketdata.com

concerns for climate changes and emission reduction, framing an analysis of environmental disclosure on emission intensive companies could be interesting and meaningful.

The EU ETS (Emission Trading Scheme) is the system introduced by the European Union in 2005 to cut emissions of carbon dioxide (CO2) and greenhouse gases. European Commission define the EU ETS as "*the cornerstone of the European Union's drive to reduce its emissions of manmade greenhouse gases which are largely responsible for warming the planet and causing climate change*" (European Commission, 2016, p.1). The system harnesses market forces to find the cheapest ways to reduce emissions: it sets a limit on overall emission from covered installations and it allows companies to buy and sell emission allowances as needed within this limit. The purpose is to guarantee companies the flexibility they need to cut their emission in the most cost-effective way. The practical result is that a price is assigned to carbon and, accordingly, a financial value to each tone of emission saved. Emission allowances are the "currency" of the EU ETS, and the limit on the total number available gives them a value. Each allowance gives the holder the right to emit one tonne of CO_2, or the equivalent amount of two other greenhouse gases. Emission allowances are allocated through auctions. For the emissions which are not covered by allowances, companies need either to buy additional allowances, either to draw on surpluses allowances saved from previous years. Companies can also sell allowances. This give an incentive to companies to reduce their emissions by investing in more efficient technology or shifting to less carbon-intensive energy sources, while allowing them to choose the most cost-effective options to address their emissions. Therefore, companies can choose among three alternatives: produce emissions within the legal requirements, buying emission allowances in the carbon market to compensate for excess pollution, or reducing emissions below the legal requirements and sell the excess allowances on the market (Czerny and Letmathe, 2016). The system is limiting greenhouse gas emissions from approximately 11000 energy intensive installations in power generation and manufacturing industry sectors, regulating around 45% of total EU greenhouse gas emissions. Alrazi et al. (2016) analysed the quality of the CO_2 emissions related disclosure and the overall environmental disclosure of 205 electricity generation firms in 35 countries, finding that firms in countries with a high commitment towards the environment and a carbon emissions trading scheme are likely to disclose more comprehensive environmental information. Additionally, firms domiciled in the countries with an ETS have a greater proclivity to have their environmental information assured by a third party (Alrazi et al., 2016). Participation to the EU ETS system is mandatory for companies operating in the sectors covered, which are power and heat generation, energy-intensive industry sectors including oil refineries, steel works and production of iron,

aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals, and commercial aviation.

I restricted the list of companies available on EU ETS companies Database selecting two sectors covered by the system: Power & Heat and Oil & Gas. The total number of companies available were 333 for Power and Heat and 128 for Oil & Gas. Among them I had to skim down the list in order to keep only the companies which provided environmental disclosure available in English either in their annual report either in a stand-alone report. To find whether companies were providing environmental disclosure I searched both on companies' websites and on GRI Database[3]. The majority of the companies had to be excluded, either because no environmental information was available, either because information where available only in the local language. Among the remaining companies a portion has to be removed because no data about ESG performance, necessary as control variable to be included in the regression model, were available into Thomson Reuters ASSET4[4]. The final sample, resulting after this procedure, encompasses 53 companies.

Selecting companies subject to EU ETS Database is per se a criterion to select companies operating in environmentally sensitive industries. Additionally, considering Power & Heat and Oil & Gas as environmentally sensitive industries find support in the existing literature that has pointed out which industries should be considered environmentally sensitives: Cho and Patten (2007) defined as environmentally sensitive paper, chemical and allied products, petroleum refining, metals, mining and utilities; Kolk (2010) mentioned chemical and pharmaceutical, computer and electronics, automobiles, utilities, as traditionally high reporting sectors; Michelon et al. (2015) coded as environmentally sensitive industries chemical, mining, metals, paper, petroleum and utility. Analysing trends in reporting practices by sector, Kolk (2010) finds out that reporting has become a common practice for both Electric Utilities and Oil & Gas companies.

I chose these two industries since they are both involved in energy production. Climate change and energy are closely interlinked, due to the fact that production and consumption of energy generated from fossil fuels substantially contributes to global warming. "*Among the many human activities that that produce greenhouse gases, the use of energy represents by far the largest source of emission*" (IEA, 2016). CO_2 emissions form energy represent about 60% of global emissions.

[3] http://database.globalreporting.org/search/

[4] Environmental scores retrieved from Thomson Reuters ASSET4 will be used as control variable in the regression model

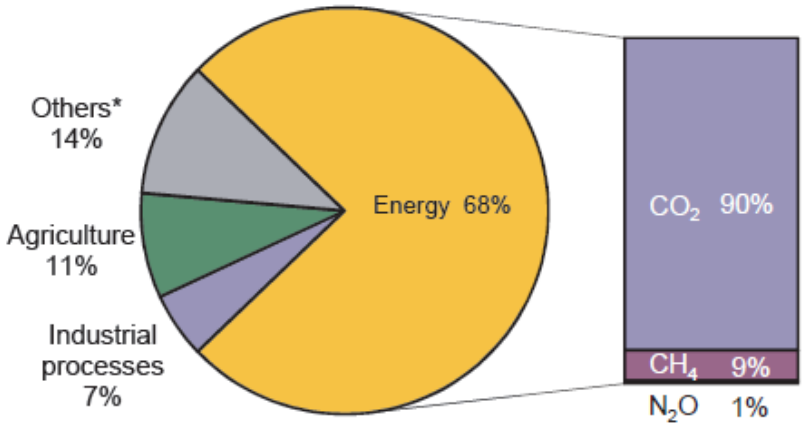

Figure 5: Estimated shares of global anthropogenic GHG

Source: International Energy Agency (2016)

Both the industries are involved in meeting growing energy demand around the world, while seeking to mitigate adverse impact of their activities and tackle the risk associated with climate changes. The more and more the entire world is concerned with the challenge of addressing climate change and reducing gas emission while ensuring economic growth and development. European Union signed three objectives for climate and energy policy, to be reached by 2020. The three objectives are reducing GHG emissions by at least 20 % compared with 1990 levels, increasing the share of renewable energy in final energy consumption to 20 %; and moving towards a 20 % increase in energy efficiency (Eurostat, 2017). In this scenario companies belonging to these two environmentally sensitive industries play a substantial role toward the goal of sustainable development. Accordingly, the practice of reporting on their environmental performance is a critical issue. For this reason, I believed focusing the scope of my research on these companies could have been of relevant interest.

The sample of analysis included 53 companies from 16 different countries. The countries with the higher number of observation are UK (9 companies), Spain (8 companies), Italy (7 companies) and France (7 companies). The number of companies for each country is displayed in the table below:

Country	Number of companies
Austria	2
Check Republic	1
Denmark	2
Finland	2
France	7
Germany	4
Grece	1
Italy	7
Netherlands	2
Norway	3
Poland	1
Portugal	2
Russia	1
Spain	8
Sweden	1
UK	9

Table 6: Number of companies for each country

For each company, environmental information referring to the year 2016, included either in a stand-alone report either in a specific section of the annual report, has been considered. The majority of the document analysed are stand-alone reports (33 cases). The most common names of these reports are "Sustainability Report" (used 22 times) or "CSR Report" (used in 7 cases). Few companies provide different names: one "Sustainable Development Report", one "Environmental Report", one "Our Responsibility" and one "Communication on Progress". This last document makes explicit reference to the framework of reporting provided by the UN Global Compact since, as already said in the first chapter, Communication on Progress is the name of the document a company should use to inform stakeholders about its efforts in implementing the principles of the Global Compact. The remaining 20 companies disclose environmental information in the annual report or in an in an integrated report.

The majority of the reports (38 and 72% of the total) refer to GRI guidelines. This evidence provides an empirical confirmation of the fact that GRI are the most used guidelines for sustainability reporting, which is an argument well rooted in the literature. The great majority refers to the G4 version of GRI guidelines, only three companies reports in accordance with the new version of GRI Standard. The table below shows the list of companies included in the sample and the name of the document analysed.

Company Name	Name of the document analyzed
A2A	Integrated Report 2016
Acciona	Sustainability Report 2016
Acea	Sustainability Report 2016
Areva	Reference Document 2016
Centrica	Annual Report 2016
CEZ as	Annual Report 2016
Dong Energy	Sustainability Report 2016
Drax Power	Annual Report 2016
Eon	Sustainability Report 2016
EDF	Annual Report 2016
Edison	Sustainability Report 2016
EDP Energia De Portugal	Annual Report 2016
Engie	Registration Document 2016
Endesa	Sustainability Report 2016
Enea	CSR Report 2016
Enel	Sustainability Report 2016
Fortum	Sustainability Report 2016
Gas Natural Fenosa	CSR Report 2016
Iberdrola	Sustainability Report 2016
Linde	CSR Report 2016
MVV	Annual Report 2016
National Grid	Environmental Report 2016
Red Electrica de espania	CSR Report 2016
RWE	Our Responsibility 2016
Scottish & Southern Energy	Sustainability Report 2016
Terna	Sustainability Report 2016
VESTAS WIND SYSTEMS	Annual Report 2016
Veolia environnement	Sustainability Report 2016
Verbund	Integrated Report 2016
United Utilities	Annual Report 2016
Total	Registration Document 2016
Royal Dutch Shell	Sustainability Report 2016
BP	Sustainability Report 2016
ENI	Sustainability Report 2016
REPSOL	Sustainability Report 2016
STATOIL	Sustainability Report 2016
Galp Energia	Annual Report 2016
Gazprom	Sustainable Development Report 2016
OMV	Sustainability Report 2016
NESTE	Annual Report 2016
Lundin Petroleum	Sustainability Report 2016
Gamesa	CSR Report 2016
SBM Offshore	Annual Report 2016
Tullow Oil	Annual Report 2016
Amec Foster Wheeler	Sustainability Report 2016
TGS Nopec Geophysical	Sustainability Report 2016
Petrofac	Annual Report 2016
Hellenic Petrolemu	CSR Report 2016
Rubis	Annual Report 2016
SNAM Rete Gas	Sustainability Report 2016
Akastor	CSR Report 2016
CGG SA	Communication on Progress 2016
Enagas	Annual Report 2016

Table 7: List of the companies inside the sample of analysis and name of the document analysed

Evidence on whether the report had been subject to external assurance has been gathered by searching for a specific statement of assurance on sustainability matters inside the report. In the cases where the document of analysis was an annual report, I have checked also whether the financial auditor provided any reference to assurance of the sustainability topics. This evidence gathered by digging into the documents has been reconciled with the information provided by the GRI Database on the caption External Assurance.

The great majority of companies provide external assurance for their CSR information: 43 companies out of 53 (81%) have their report assured by a third party. Among them, 35 are assured by a Big-4 (66% of the total) and 8 (15% of the total) by a different assurance provider. The companies that do not have their report assured are 10 (19% of the total). The chart below displays a graphical representation of this evidence.

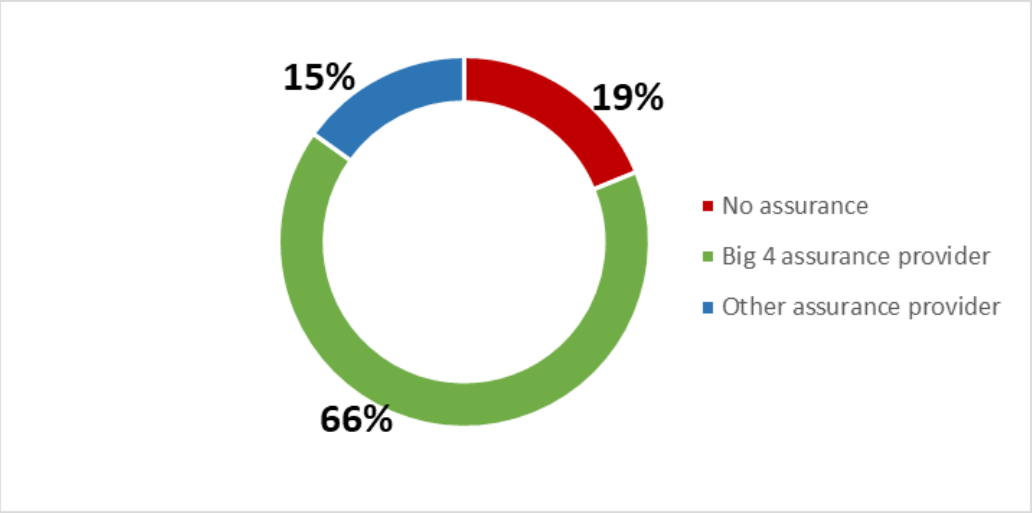

Figure 6: Trend on the practice of assurance within the sample of analysis

This empirical finding is in line with the shared argument supported by the literature that the market of sustainability assurance is dominated by major accounting organization.

Companies assured by a different assurance provider turned to accountants other than Big-4, consultants and engineering firms. Two companies have been assured by an accountant other than a Big-4: Rubis and Royal Dutch Shell. The assurance providers are Mazar SA in the former case and Loyd in the second. Three companies from UK (Scottish & Southern Energy, United Utilities and Amec Foster Wheeler) chose consultants: Corporate Citizen in two cases and Environmental Resources Management LTD in one. Two companies are assured by

engineering firms: National Grid has been assured by WSP Parsons Brinckerhoff and Hellenic Petrolemu by Tuv Austria Hellas. A peculiar case is the one of Grazprom which has been assured by RUIE (Russian Union of Industrialists and Entrepreneurs).

Among the report that are assured by a Big-4, 7 are assured by Deloitte, 11 by PWC, 13 by EY and 4 by KPMG. The chart below provides a graphical representation of the share of report assured by each Big-4 within the sample.

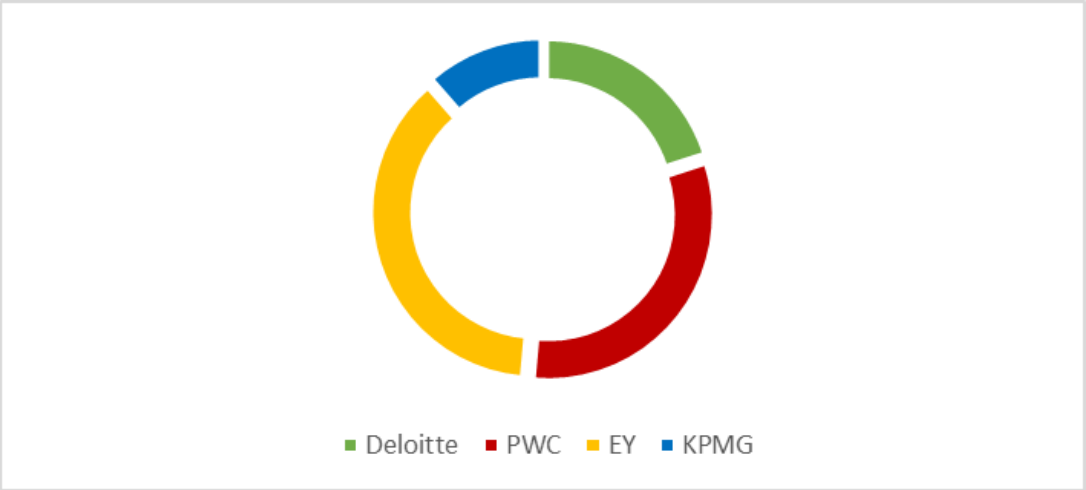

Figure 7: Share of report assured by each Big-4 within the sample of analysis

In most of the cases the Big 4 that performed the sustainability assurance is the same that performed the financial auditing. An overlapping between the Big4 that provides financial auditing and sustainability assurance occurs in 31 cases (58% out of the total sample).

The only case in which the assurance statement specifies a reasonable level of assurance is the one of the Sustainability Report of Royal Dutch Shell which is assured by Loyd. In the majority of the cases the assurance statement mentions a limited level of assurance (38 cases), while in few cases the level of assurance is not specified in the assurance statement (3 cases).

3.2 Content analysis

This paragraph is aimed at describing how empirical evidence on the quality of environmental disclosure has been assessed through content analysis. According to Guthrie and Abeysekera (2006) content analysis "*is a technique for gathering data. It involves codifying qualitative and quantitative information into pre-defined categories in order to derive patterns in the presentation and reporting of information.*" (Guthrie and Abeysekera, p. 15, 2006).

The application of the content analysis involves the choice of the framework used to classify information and the definition of the recording unit, which is the specific segment of content to be placed into a given category (Guthrie and Abeysekera, 2006). The framework of analysis used in this research is based on GRI framework, which are the most recognised guidelines for sustainability disclosure. Since most of the companies included in the sample reported in accordance with the G4 version of GRI Guidelines, the framework of analysis has been based on this latter. The disclosure framework provided by GRI covers impact related to inputs (such as energy and water), outputs (such as emission effluents and waste) and other additional topics (as biodiversity, transport, and products and service-related impacts, as well as environmental compliance and expenditure). The table below reports the items of disclosure encompassed in the environmental section of GRI G4.

Framework of disclosure
Emission
Effluents and Waste
Energy
Water
Biodiversity
Material
Suppliers environmental assessment
Compliance
Overall
Environmental Grievance Mechanism
Transport
Products and Services

Table 8: Disclosure framework provided by GRI G4

The topic of *Material* concerns information on the material used, such as the volume and the extent to which they will be recycled as input. *Energy* deals with the energy consumption and the extent to which an organization strive to reduce it. *Water* pertains to the volume of water withdrawn and the extent to which water is recycled or reused. *Biodiversity* deals with impact on natural sites and protected areas. *Emission* section includes indicators on greenhouse gas (GHG) emission, divided by Scope 1, Scope 2 and Scope 3, as well as ozone-depleting substances NO_x, SO_x and other significant air emissions. *Effluents and Waste* category requires a company to report on its total waste by type and disposal method, on the total number and volume of significant spills, on waste deemed hazardous and on significant water discharges. *Products and Services* category deals with the environmental impact mitigation of products and services. *Compliance* is the section that deals with sanctions and fines for non-compliance with environmental laws and regulations. *Transports* concerns the significant environmental impact of transporting products, materials and members of the workforce. *Overall* section is the one dedicated to the disclosure of expenditures and investments for environmental protection. *Supplier Environmental Assessment* relates with the screening methods based on environmental criteria that are used to choose suppliers. Lastly, *Environmental Grievance Mechanism* refers to the formal grievance mechanism deployed to resolve grievances about environmental impacts.

For each of these items I searched for information disclosed within the document analysed. I considered as recoding units sentences included in the narrative description and KPI included within table, assigning one point to each sentence or each KPI deemed relevant for a certain item of disclosure. The coding system I used tries to gather evidence on both quantity and quality of information, relying on the insight of Beretta and Bozzolan (2007), later adopted by Michlon et al. (2015) in the field of CRS disclosure, that quantity is not a sound proxy of quality of disclosure. This approach goes beyond the vast majority of researches conducted through content analysis that simply award a point in case a certain item is disclosed, failing to make a clear distinction between quality and quantity of disclosure. Michelon et al. (2015) proposed a framework that captures three different yet complementary dimensions: the content of the information disclosed, the type of information used to discuss CSR issues and the managerial orientation. Following this approach, I have developed a multidimensional framework aimed at gathering evidence on quantity and quality of environmental disclosure for each of the twelve items included in the framework of analysis. Coding information within this multidimensional framework allowed to measure the level of disclosure from three different perspectives: the amount of information provided, the type of these information, and the level of commitment they reflect. The three indexes used to measure disclosure are: *quantity, type of information*

(TOI) and *managerial orientation* (*MAN).* The former (*Quantity*) is aimed at measuring the amount of information provided counting the recording unit for each disclosure item included in the reporting framework reported in Table 8. A score of 1 is assigned to each sentence or each KPI deemed relevant for a certain item of disclosure. The second index (*TOI*) measures, for each item of environmental disclosure reported in Table 8, the incidence of recording units containing environmental information in quantitative term over the total of the recording units containing environmental information for that item. This index is aimed at measuring the incidence of recording unit which are deemed more significant because providing quantitative information over the total of the recording unit provided. The table below provides an example of qualitative and quantitative recording units retrieved from Enel Sustainability Report (2016):

Type of information	Example of sentence
Qualitative	*"The specific emissions fell in 2016 linked to the lower operation of the coal-fired power plants and the removal from the scope of the plants of Slovenské elektrárne as from August 2016"*
Quantitative	*"In 2016 the direct emissions of CO2 equivalent (Scope 1), of 106.7 million tons, fell by 11% compared to 2015"*

Table 9: Example of quantitative and qualitative sentences

The third index *(MAN*) is constructed in a similar way to *TOI*, but focuses on the managerial orientation beyond each recording units instead that on the type of information. Specifically, *MAN* measures, for each item of sustainability disclosure in table 8, the incidence of recording units containing environmental information and showing a real commitment over the total of the recording units containing environmental information for that item. Following the approach of Michelon et al. (2015), a recording unit is considered showing a committed approach when it communicates results, in the case of backward looking information, and objectives, in the case of forward looking information. Conversely, information is considered showing a boilerplate approach if it describes initiatives and strategies, in the case of backward looking information, and expectations and hypothesis, in the case of forward looking information. Thus, the managerial orientation divides between committed and boilerplate approach as follows:

Managerial Orientation	*Forward Looking*	*Backward Looking*
Boilerplate approach	Context - Expectations - Hypotheses	Policies, initiatives and strategies
Committed approach	Objectives and goals	Results and outcomes of actions

Table 10: Managerial orientation: Committed vs Boilerplate approach

Source: Michelon et al. (2015)

The table below provides an example of information showing a committed approach and a boilerplate approach retrieved from Enel Sustainability Report (2016):

Managerial Oreintation	**Example of sentence**
Committed approach	*"Over the years the reduction target for specific CO 2 emissions to 2020 has increased going from -18% to -25%"*
Boilerplate approach	*"Enel's industrial activities contribute to the emission of carbon dioxide (CO2), sulfur hexafluoride (SF6) and methane (CH4)"*

Table 11: Example of sentences showing a committed approach and a boilerplate approach

Fist the three indexes has been computed for each one of the 12 items of disclosure. The analytical formulation of three indexes is constructed as follows:

- $QNT_{itk} = \sum_{j=1}^{n} CSR_{itk}$, where QNT_{itk} is the index of quantity of disclosure for company *i* in year *t* pertaining to the topic *k*. CSR_{itk} is equal to 1 for each disclosure items referring to the topic *k*;
- $TOI_{itk} = \frac{\sum_{j=1}^{n}(w*CSR_{ijt})}{QNT_{itk}}$, where *w=0* if the information is qualitative and *w=1* if the information is quantitative.
- $MAN_{itk} = \frac{\sum_{j=1}^{n}(z*CSR_{ijt})}{QNT_{itk}}$, where *z=0* if the information shows a boilerplate approach and *z=1* if the information shows a committed approach.

The first index (QNT_{itk}) is standardized dividing the score obtained by each company *i* for each item *k* by the maximum score obtained by a company *n* for that same item. Where *n* is the company that obtained the highest score for that item of disclosure *k*. Therefore, *Quantity* score is calculated as follows:

$$Quantity_{itk} = \frac{QNT_{itk}}{max_i\,(QNT_{ntk})}$$

These procedure makes *Quantity* to vary between 0 and 100%, with the company providing the highest amount of information for a certain item scoring 100%. *TOI* and *MAN* are straightforwardly varying between 0 and 100% since they have been constructed as percentage. So that all the three indexes have the same scale.

The figure below displays an example of the scores obtained by a subset of companies for the three indexes pertaining to the topic of Emission:

Company Name	Emission	Quantity	TOI	MAN
Acciona		48%	39%	61%
Acea		34%	32%	32%
Centrica		22%	79%	86%
CEZ as		35%	22%	52%
Dong Energy		15%	40%	60%
EDF		31%	40%	60%
EDP Energia De Portugal		51%	79%	88%
Engie		31%	50%	60%
Endesa		66%	28%	30%
Enea		18%	67%	67%
Enel		82%	75%	79%
Fortum		69%	51%	60%
Gas Natural Fenosa		46%	60%	80%
Iberdrola		40%	69%	81%

Table 12: Examples of scores for a subset of companies pertaining to the topic of Emission

The final indexes obtained by each company are the average of the indexes obtained for each of the twelves disclosure items. Being computed as average, also the final indexes ranges from 0% to 100%. The analytical formulation works as follows:

- $Quantity_{it} = \frac{1}{k} * (\sum_{k=1}^{12} Quantity_{itk})$
- $TOI_{it} = \frac{1}{k} * (\sum_{k=1}^{12} TOI_{itk})$
- $MAN_{it} = \frac{1}{k} * (\sum_{k=1}^{12} MAN_{itk})$

Coding information within these three indexes allowed to obtain a more comprehensive evaluation of the quality of disclosure based on three different but complementary dimension: the *quantity* of disclosure, the *type of information* and the *managerial orientation*.

3.3 Empirical analysis

This paragraph provides specification of the model that will be used to test the two hypotheses. The aim is to introduce all the variables that will be used in the regression which will be the subject matter of the next chapter.

Recalling that hypothesis 1 was:

H1: Firms with external assurance of their sustainability reports provide higher quality of environmental disclosure than firms with no assurance statement.

The following model is adopted to test hypothesis 1:

$$Disclosure_{it} = \beta_0 + \beta_1 Assurance_{it} + \beta_2 SR_{it} + \beta_3 Years_{it} + \beta_4 Size_{it} + \beta_5 Lev_{it} + \beta_6 ROA + \beta_7 Environmental\ score + \beta_8 Sector + \varepsilon$$

Where *Disclosure* is equal to any one of the three indexes presented in the previous paragraph (*Quantity, TOI, MAN*).

Assurance is the variable of interest in this study to test whether any difference in the indexes of disclosure can be linked with the presence of Assurance. *Assurance* is a binary variable coded as 1 for companies that assure their environmental disclosure and 0 for companies with unassured environmental information. Although the hypothesis has been formulated such that a positive association is expected between *Assurance* and *Disclosure,* the open debate existent in the literature, which has been analysed in depth in chapter two, renders not straightforward in predicting a positive sign in this relation.

The regression model includes six other control variables: *SR, Years, Size, Lev, ROA and Environmental score* and *Sector*.

SR is a binary variable coded as 1 if the company provides a stand-alone sustainability or CSR report and 0 if environmental information is included within the annual report or an integrated report. I included this variable in the model consistently with the model deployed by Michelon et al. (2015) and drawing on the insight that companies issuing a stand-alone report may provide more information. Accordingly, I expect a positive relation with the issue of a stand-alone report and disclosure *Quantity* while no clear expectation can be formulated for *TOI* and *MAN*.

Years measures the number of years since which the company started to disclose CSR information. *Years* is used as control variable consistently with Moroney et al. (2009) analysis that found out a significant relation between the number of reports incorporating environmental

disclosure issued by a company and environmental disclosure. Evidence on the number of years since which a company started to disclose environmental information has been gathered either by checking the number of reports published on GRI Database, either by looking on the company website. A positive relation is expected between years and any of the three indexes since a company that has acquired more experience in the field is expected to disclose more and better information.

Size is measured as the natural logarithm of market capitalization[5]. Company's size has been found by the literature as one of the main determinant of disclosure and a control variable for size has been deployed by all models I have referred to (Michelon et al, 2015; Faisal et al, 2012; Moroney et al., 2009). I expect a positive relation between *Size* and *Disclosure* based on the argument that bigger companies have more means to disclose more.

Lev is the leverage ratio[5], measured as the ratio of long term debt divided by total asset. Similar studies have used leverage as control variable (Faisal et al, 2012; Moroney et al., 2009) based on the insight that further environmental disclosure reduce information asymmetry for debtholders. Therefore, a positive relation is expected between *Lev* and the three indexes.

ROA is the return on asset[4], measured as ratio of net income and total asset. Prior researchers have found a positive relation between *ROA* and *Disclosure* (Faisal et al, 2012; Moroney et al., 2009), accordingly a positive relation is expected between those two variables also in my model.

Environmental score has been measured as the average of three indexes gathered from Thomson Reuters ASSET4 and is used as a proxy for environmental performance. The three indexes are *Resource use score, Emission score* and *Environmental innovation score.* They are measures of performance that range from 0 to 100%, with a higher score indicating a better environmental performance. Specifically: *Resource use score* reflects a company performance and capacity to reduce the use of materials, energy or water and to find more eco-efficient solutions by improving supply chain management; *Emission score* reflects the extent to which a company have a policy to improve emission reduction; *Environmental innovation score* reflects a company capacity to reduce the environmental costs and burden for its customers, and thereby creating new market opportunities through new environmental technologies and processors or eco designed products.[6] According to Legitimacy Theory, there is a relationship between environmental performance and environmental disclosure, however the mixed findings in the prior literature render me unable to hypothesize the sign of the relation.

[5] Data retrieved from Eikon Database
[6] Descriptions of the three indexes has been retrieved from Eikon Database

Sector is a binary variable coded as one for companies belonging to Power & Heat industry and 0 for companies belonging to Oil & Gas industries. Usually researches that control for industry effect divide between sensitive and non-sensitive industries. In this case both industries are considered environmentally sensitive and thus highly reporting therefore a control variable for industry effect could have been omitted. However, I acknowledge that there might be different trends in disclosure between the two industries. Therefore, I have opted for the introduction of *Sector* as a control variable.

For testing the hypothesis 2 the sample will be sized down by removing companies without assurance and the variable *Assurance* will be replaced with *Big4,* which is the new variable of interest for the test of the second hypothesis, recalling that hypothesis 2 was:

H2: Firms that choose a Big-4 as assuror provide higher quality of environmental disclosure than firms that choose other assurance providers.

The following model is adopted to test hypothesis two:

$$Disclosure_{it} = \beta_0 + \beta_1 Big4_{it} + \beta_2 SR_{it} + \beta_3 Years_{it} + \beta_4 Size_{it} + \beta_5 Lev_{it} + \beta_6 ROA + \beta_7 Environmental\ score + \beta_8 Sector + \varepsilon$$

Big 4, which is a binary variable coded as 1 if the assurance provider is a Big-4 and 0 if not. A reasoning similar to the one made for the variable *Assurance* holds for *Big 4*: the hypothesis has been framed such that a positive relation is expected between *Big 4* and *Disclosure*, however the existing criticisms on the role played by Big-4 in performing sustainability assurance made difficult to define expectations about this relation.

All the other variables are the same deployed for hypothesis one. The table below summarizes the variables included in the model to test the two hypotheses:

Variable	Name	Description
Dependent variable	**Disclosure**	*Any one of the three disclosure indexes (Quantity, TOI, MAN)*
Independent variables	**Assurance**	*Binary variable coded as 1 for companies that assure their SR and 0 otherwise*
	Big 4	*Binary variable coded as 1 if the assurance provider is a Big-4 and 0 if an assuror different form a Big-4 is chosen*
	SR	*Binary variable coded as 1 if the company issue a stand alone report for CSR disclosure and 0 if information are included in the annual report or in an integrated report*
	Years	*Number of years since which the company started to disclose CSR information*
	Size	*Natural logarithm of market capitalization is used as a proxy of size*
	Lev	*Leverage ratio measured as total long term debt to total asset*
	ROA	*Return on asset*
	Environmental score	*Control variable for environmental performance measured as average of Resource use score, Emission score and Environmental innovation score*
	Sector	*Binary variable coded as 1 for Power & Heat and as 0 for Oil & Gas.*

Table 13: Variables included in the model

4. Results

This chapter is aimed at analysing the results obtained. The first paragraph presents descriptive statistics of the variables included in the data set. The second paragraph is devoted to the testing of hypothesis 1 and hypothesis 2 using the multivariate regression model. The third paragraph provides additional analysis addressing some concerns about the model used. The chapter ends with a comparison between the results I have obtained and the results of similar researches existent in the literature, analysing to what extent my analysis has confirmed previous findings and to what extent it has come up with new results.

4.1 Descriptive results

The dataset constructed encompasses the three indexes used to measure disclosure (*Quantity*, *TOI*, *MAN*), the two variables of interest (*Assurance* and *Big4*) and the other seven control variables (*Size*, *Lev*, *Years*, *ROA*, *Environmental Score*, *SR* and *Sector*). The table below summarizes descriptive statistics for all the variables included in the dataset with exception of the dummy variables.

	Mean	Std. Dev.	Min	Max
Quantity	0,18	0,14	0,01	0,58
TOI	0,27	0,14	0,00	0,59
MAN	0,29	0,15	0,00	0,65
Size	22,81	1,58	18,38	25,86
Lev	0,25	0,16	0,00	0,78
Years	9,72	4,45	1,00	18,00
ROA	0,02	0,05	-0,12	0,13
Env. Score	74,62	14,08	24,11	95,00
Number of companies	53			

Table 14: Descriptive statistics of the variables included in the dataset

Quantity index range from 58% of Iberdrola to 1% of TGS, with an average score of 18%. For both *TOI* and *MAN*, the highest score has been achieved by Edison (59% for *TOI* and 65% for *MAN*). This means that almost 60% of the information provided are quantitative and more than 60% communicate objectives or results. The lowest scores have been achieved by TGS Nopec (0%) which provided only qualitative information and without a committed approach. The

average score for *TOI* is 27%, for *MAN* it is 29%. A table displaying the three scores obtained by each company in the sample is included in the Appendix.

The only topic for which all the companies in the sample provide information is *Emission*. This is consistent with the fact that companies have been selected because of their subjection to the EU ETS and, therefore, *Emission* should be a material topic for them. The only company that report on all the topics is Iberdrola. On average companies reports on 6,3 topics. Assured companies seem to report on more topics comparing to the unassured: on average, assured companies report on 6,8 tropics, while unassured only on 4,3. It is also evident that the average scores obtained by the group of companies with assurance are higher than the ones of unassured companies. The average scores obtained by the group of companies with assurance are 21% for *Quantity*, 29% for *TOI* and 31% for *MAN*. Conversely, the group of unassured companies scored, on average, 6% for *Quantity*, 18% for *TOI* and 21% for *MAN*. The level of confidence at which the mean values obtained by the two groups can be considered significantly different has been assessed through hypothesis testing. The same analysis has been extended to all the other variables included in the model in order to analyse different features between the group of companies with assurance and the group of companies without.

Since t-test can be performed only for normally distributed variables, a preliminary test for distribution has been conducted for all the variables. The hypothesis of normal distribution has been tested with the Skewness/Kurtosis test. The variables that can be assumed normally distributed at a level of significance of 5% are: are *TOI*, *MAN*, *Size* and *Years*. For the variables that can be considered normally distributed, the t-test has been performed. For the other variables, which cannot be assumed normal, I opted for he Wilcoxon-Mann-Whitney test. No test has been performed on the dummy variables *SR* and *Sector*. The table below shows the results obtained from the Skewness/Kurtosis test:

	Skewness	Kurtosis	p-value
Quantity	0,004	0,401	0,021
TOI	0,620	0,164	0,317*
MAN	0,556	0,548	0,694*
Size	0,044	0,272	0,077*
Lev	0,001	0,058	0,004
Years	0,515	0,078	0,153*
ROA	0,014	0,066	0,016
Env. Score	0,001	0,026	0,002
Number of companies	53		

** variables that can be condidered normally distributed at a level of signifiicance of 5%*

Table 15: Results of the Skewness/Kurtosis test

The evidence resulting from the t-test and Wilcoxon-Mann-Whitney test is that all variables but *Lev* are significantly different for the group of assured and unassured companies. *Quantity* scores higher for the assured group at a level of significant of 1% (p-value 0,000) while the other two indexes (*TOI a*nd *MAN*) are higher for the group with assurance at a level of significance of 5%. The hypothesis testing would allow to conclude with a certain level of reliability that assured companies do provide more information, while more cautious conclusion should be drawn for the *type of information* provided and the *managerial orientation,* although the difference recoded by the scores in the two groups is significant also in these cases. These results provide preliminary insight for hypothesis 1 but, a more meaningful test will be performed with the multivariate regression model controlling for the other variables.

Concerning the control variables, a significant difference is reported for *Years* (p-value 0,000) meaning that on average assured companies have been disclosing environmental information for a significantly higher number of years (10,67 years) comparing to unassured companies (5,60 years). Other significant differences are for *Size, ROA* and for *Environmental Score*. This means that, on average, assured companies have a higher market capitalization than unassured ones: the mean of the natural logarithm of market capitalization is 23,01 for the former group and 21,95 for the latter. As far as *ROA* is concerned, it is interesting to notice that the average value is positive for the assured group (2%) and negative for the unassured group (-1%). The group of assured companies scores better also in terms of environmental performance (77% vs 63%). No significant defence emerges for *Lev,* meaning that the two groups are comparable in term of financial structure.

The table below summarizes the mean and standard deviation values for each variable and the t-statistic/z-statistic[7] and p-value for hypothesis testing:

[7] Stata report the t-statistic for the t-test and the z-statistic for the and Wilcoxon-Mann-Whitney test

Variable	Assured companies n=43		Unassured companies n=10		t-statistic/ z-statistic	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Quantity	0,21	0,14	0,06	0,04	-3,70	0,000***
TOI	0,29	0,14	0,18	0,13	-2,27	0,027**
MAN	0,31	0,15	0,21	0,14	-1,99	0,051*
Size	23,01	1,55	21,95	1,43	-2,20	0,013**
Lev	0,25	0,15	0,25	0,21	-0,30	0,768
Years	10,67	4,01	5,60	4,03	-3,60	0,000***
ROA	0,02	0,05	-0,01	0,06	-1,86	0,062*
Env. Score	0,77	0,11	0,63	0,20	-2,18	0,029**

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 16: Hypothesis testing of the difference between the two groups means

No one of the two tests has been performed for the dummy variable *SR*. Since I believe it is interesting to analyse the dynamics existent between the CSR practice of issuing a stand-alone report and that of assuring sustainability information, some specific analysis has been performed to study the relation between *SR* and *Assurance*. The overlap between *Assurance* and *SR* is present in 27 cases, which represent 51% of the total observation. The cases of annual report/integrated report with assurance on CSR information are 16 (30% of the total). The cases of lack of assurance statement have been recorded 6 times for standalone reports and 4 times for annual report/integrated (respectively 11% and 8% of the total observations). The following table displays the frequencies of occurrences of the two variables:

	No Assurance		Assurance		Total	
No SR	4	8%	16	30%	20	38%
SR	6	11%	27	51%	33	62%
Total	10	19%	43	81%	53	100%

Table 17: Frequency tabulation of SR and Assurance

Analogous analysis has been performed for the two groups of companies that chose a Big4 as assurance provider (*Big4*=1) and companies that chose a different assurance provider (*Big4*=0). First, the hypothesis of normality has been retested for all the variables after sizing down the sample by removing the unassured companies. The hypothesis of normal distribution does still hold for *TOI*, *MAN* and *Years*, while this time is rejected for *Size* (p-value = 0,012). *Lev* and *Environmental Score* can be assumed normal at a level of significance of 5%. The table below

shows the results obtained from the Skewness/Kurtosis test performed for the sample of companies with assurance:

	Skewness	Kurtosis	p-value
Quantity	0,027	0,674	0,083
TOI	0,785	0,311	0,561*
MAN	0,698	0,740	0,878*
Size	0,011	0,049	0,012
Lev	0,023	0,523	0,068*
Years	0,455	0,405	0,517*
ROA	0,030	0,027	0,016
Env. Score	0,074	0,679	0,165*
Number of companies	43		

** variables that can be condidered normally distributed at a level of signifiicance of 5%*

Table 18: Results of the Skewness/Kurtosis test performed for companies with Assurance =1

Accordingly, the t-test has been performed on *TOI*, *MAN*, *Lev*, *Years* and *Environmental Score*, while the Wilcoxon-Mann-Whitney test has been chosen for *Quantity*, *Size*, and *ROA*. Hypothesis testing shows no significant difference for *Quantity* score between the two groups (p-value > 0,1), meaning that no significant differences in term of amount of information provided emerges between the two groups. Conversely, a significant difference emerges for *TOI* and *MAN* scores: on an average, companies assured by a Big4 score 32% for *TOI* and 34% for *MAN*, while companies assured by a different provider score 16% for *TOI* and 20% for *MAN*. This means that the incidence of recording unit containing environmental information and expressed in quantitative terms over the total of the recording units containing environmental information and the incidence of recording units containing environmental information and showing a committed approach over the total of the recording units containing environmental information tend to be higher for companies assured by a Big4. The difference of the scores between the two groups is significant at a level of 1% for *TOI* (p-value = 0,004) and at 5% for *MAN* (p-value = 0,014). Other significant difference is reported for *Years* (p-value = 0,057). On average, companies assured by a Big-4 have been disclosing CSR information for the last 11,23 years, while companies that chose other assurance providers only for 8,25 years. The last variable significantly different between the two groups is *Environmental Score* (p-value = 0,080), with a higher average score for companies assured by a provider other than Big4 (83% vs 76%). For the other variables, no significant differences emerge between the two groups of companies. This means that these two groups are similar in term of financial measures (*Size, Lev, ROA*).

The table below displays means and standard deviation for all the variables divided by the two groups and the t-statistics/z-statistics and p-values for hypothesis testing:

Variable	Big-4 n=35		Other assurance provider n=8		t-statistic/ z-statistic	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Quantity	0,23	0,01	0,14	0,07	-1,37	0,169
TOI	0,32	0,13	0,16	0,11	-3,04	0,004***
MAN	0,34	0,14	0,20	0,13	-2,56	0,014**
Size	22,96	1,57	23,23	1,58	0,16	0,876
Lev	0,24	0,14	0,32	0,19	1,42	0,163
Years	11,23	3,66	8,25	4,80	-1,96	0,057*
ROA	0,02	0,04	0,03	0,05	1,12	0,261
Env. Score	0,76	0,11	0,83	0,11	1,79	0,080*

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 19: Hypothesis testing of the difference between the two groups means

The subsequent step of my analysis has been to examine the relation existing between the variables included in the model. This analysis has been performed by computing Pearson's correlation coefficients. The Table below represent the matrix with the correlation coefficients for the variables used to test hypothesis 1.

	Quantity	TOI	MAN	ssuranc	SR	Size	Lev	Years	ROA	Env. Score	Sector
Quantity	1,00										
TOI		1,00									
MAN			1,00								
Assurance	0,43	0,30	0,27	1,00							
SR	0,36	0,17	0,22	0,02	1,00						
Size	0,39	-0,03	0,02	0,27	0,11	1,00					
Lev	0,01	-0,07	-0,05	0,00	0,00	0,04	1,00				
Years	0,48	0,45	0,42	0,45	0,29	0,45	0,03	1,00			
ROA	0,07	0,01	0,01	0,26	0,26	0,39	0,00	0,11	1,00		
Env. Score	0,20	0,18	0,13	0,39	0,13	0,36	0,01	0,45	0,05	1,00	
Sector	0,26	0,06	0,11	0,06	-0,05	0,06	0,06	-0,05	0,03	-0,02	1,00

Table 20: Pearson correlation coefficients for variables included in H1

Assurance is positively correlated with all the disclosure indexes, as expected. Correlation coefficients are respectively 43% with *Quantity*, 30% with *TOI* and 27% with *MAN*. Other variables with a significant positive correlation with the indexes of disclosure are *SR*, *Years*,

and *Environmental Score*. *Size* and *Sector* are positively correlated only with *Quantity* and not with the two other indexes.

Concerning correlation among control variables, a positive correlation has been found between A*ssurance* and *Size* (27%), meaning that bigger companies are more likely to have their report assured. A*ssurance* is also positively correlated with *Years* (45%) meaning that companies that have acquired more years of experience in CSR reporting are more likely to have their report assured. Lastly, *Assurance* is positively correlated both with environmental performance (the correlation coefficient with *Environmental Score* is 39%) and financial performance (the correlation coefficient with *ROA* is 26%). *Years* is also positively correlated with *SR* (29%) and *Size* (45%) meaning that companies that have been disclosing CSR information for a longer period of time tend to be bigger and to issue a stand-alone report dedicated to CSR topics.

Correlations coefficients has been computed also to provide an early indication of multicollinearity concerns. However, no correlation index among the independent variables is too high to represent a potential threat of multicollinearity.

Correlation coefficients has been computed also for variables involved for the test of hypothesis 2. The correlation matrix is reported below:

	Quantity	TOI	MAN	Big4	SR	Size	Lev	Years	ROA	Env. Score	Sector
Quantity	1,00										
TOI		1,00									
MAN			1,00								
Big4	0,24	0,43	0,37	1,00							
SR	0,47	0,28	0,37	-0,12	1,00						
Size	0,33	-0,17	-0,11	0,07	0,18	1,00					
Lev	-0,03	-0,19	-0,19	-0,22	-0,01	0,14	1,00				
Years	0,41	0,39	0,38	0,29	0,37	0,39	0,04	1,00			
ROA	-0,05	0,01	0,00	-0,04	-0,35	0,27	0,27	-0,10	1,00		
Env. Score	0,07	0,03	0,02	-0,27	0,26	0,30	0,30	0,04	-0,06	1,00	
Sector	0,27	0,05	0,09	0,20	-0,07	-0,11	0,15	-0,18	0,14	-0,37	1,00

Table 21: Pearson correlation coefficients for variables included in H2

Big4 is positively correlated with all the three indexes. The highest correlation is recorded for *TOI* (43%), the lowest for *Quantity* (24%). After removing companies without assurance form the sample *SR*, *Years* are still positively correlated with all the three indexes, while the correlation for *Environmental Score* with the indexes of disclosure is much lower in this case. *Size* and *Sector* are again positively correlated only with *Quantity* and not with the two other indexes. *Big4* is also positively correlated with *years* (29%). Conversely, it is negatively

correlated with *Environmental Score* (-27%) and *Lev* (-22%). Also in this case no correlation coefficient among the independent variables seems to be too high to represent a potential threat of multicollinearity.

4.2 Multivariate results

This paragraph exposes the results obtained with the multiple regression model. First, the regressions will be used to test hypothesis 1: one regression will be performed for each of the three disclosure indexes focusing on the variable of interest *Assurance.* The sign and the significance of *Assurance* will be investigated to make inference on the relation between external assurance and disclosure. Then, the same approach will be followed for the test of hypothesis 2, considering only the companies with assurance and focusing on the variable *Big4* to verify whether, given that the company has purchased an assurance service, choosing one of the major accountancy organization has a positive influence on the three measures of disclosure.

Hypothesis 1:

First, the regression model is used to test hypothesis 1 using *Quality* as dependent variable to measure the disclosure. The results obtained show that *Assurance* has a positive and significant (p-value = 0,025) association with *Quantity,* meaning that companies that have their report assured by a third party provide more information at a confidence level of 5%. Other significant variables are *SR, Size a*nd *Sector.* As expected the amount of information provided is positively associated with the choice of issuing a stand-alone report dedicated to CSR topics and with company size, in the sense that bigger companies disclose more information. *Sector* is positively associated with *Quantity*, meaning that companies operating in the Power & Heat industry provide more information than companies operating in Oil & Gas.
Multicollinearity analysis has been performed computing the variance inflation factor (VIF): VIF range from 1, 01 of *Lev* to 1,69 of *Years,* therefore multicollinearity is not a concern.[8]

The table below summarize the results obtained from the first regression displaying the regression coefficient, the t-statistic, the p-value and the VIF.

[8] A VIF value above 10 is usually considered a threshold above which multicollinearity represent a problem

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,48	-1,92	0,061	
Assurance	0,11	2,31	0,025**	1,44
SR	0,07	2,12	0,040**	1,22
Size	0,02	1,80	0,078*	1,56
Lev	0,02	-0,18	0,861	1,01
Years	0,01	1,56	0,126	1,69
ROA	0,36	-0,98	0,333	1,48
Environmental score	-0,07	-0,53	0,597	1,50
Sector	0,07	2,26	0,029**	1,16
R^2	47%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 22: First regression for H1

Different results are obtained when using *TOI* as dependent variable. *Assurance* is not significant when looking at the type of information provided (p-value > 0,1). In this case significant variables are *Size* and *Years.* However, the relation with *Size* works in the opposite direction in this case, showing that bigger companies disclose lower incidence of recording units containing environmental information expressed in quantitative terms over the total of the recording unit containing environmental information. *Y*ears has a positive relation with *TOI* at a level of significance of 1% providing evidence that companies that disclose environmental information since more time have acquired more expertise in providing better quality of information measured by the *type of information.* The results of this second regression are reported in the table below.

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,71	2,35	0,023	
Assurance	0,05	0,90	0,374	1,44
SR	0,02	0,50	0,623	1,22
Size	-0,03	-2,05	0,046**	1,56
Lev	-0,07	-0,61	0,543	1,01
Years	0,02	3,10	0,003***	1,69
ROA	0,10	0,23	0,822	1,48
Environmental score	0,02	0,15	0,881	1,50
Sector	0,03	0,71	0,480	1,16
R^2	31%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 23: Second regression for H1

Similar reasoning holds when using *MAN* as dependent variable. No significant relation emerges between *Assurance* and *managerial orientation* (p-value > 0,1). The only significant variable is *Years*, so that companies that acquired more years of experience over CSR reporting tend to communicate more recording units containing environmental information showing a committed approach over the total amount of recording units containing environmental information. The table below displays the results obtained for the regression of hypothesis 1 using *MAN* as dependent variable.

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,61	1,88	0,067	
Assurance	0,05	0,78	0,439	1,44
SR	0,04	0,91	0,369	1,22
Size	-0,02	-1,46	0,152	1,56
Lev	-0,06	-0,51	0,611	1,01
Years	0,02	2,68	0,010***	1,69
ROA	0,07	0,14	0,879	1,48
Environmental score	-0,03	-0,15	0,879	1,50
Sector	0,04	0,98	0,332	1,16
R^2	26%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 24: Third regression for H1

Overall, the results obtained by these three regressions provided confirmation for the hypothesis 1 only when *Quantity* index is used. Conversely, no significant evidence has been obtained for any of the other indexes. Accordingly, there is an association between the decision to have sustainability information assured by a third party and a commitment to disclose more environmental information, but, given that amount of information, neither the *type of information* nor the *managerial orientation* seem to be related with *Assurance*.

Hypothesis 2:

After sizing down the sample of companies by taking off those without assurance, hypothesis 2 has been tested by removing the variable *Assurance* and introducing *Big4*. The regression

model has been run again to investigate the sign and the significance of *Big4* on the three indexes of disclosure.

When *Quantity* is used as dependent variable no significant impact of the variable *Big4* emerges. The sign of the relation is positive but cannot be considered statistically significant (p-value > 0,1). Consistently with the regression performed on *Quantity* with the entire sample of companies, significant positive relations are detected for the variables *SR* and *Sector*, which are both significant at 5%. Conversely, after removing form the sample the companies without assurance, this hypothesis of significance for *Size* is rejected even at a level of 10% (p = 0,107).

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,52	-1,69	0,100	
Big4	0,06	1,15	0,256	1,59
SR	0,11	2,67	0,012**	1,49
Size	0,02	1,66	0,107	1,45
Lev	-0,08	-0,63	0,530	1,16
Years	0,01	0,95	0,315	1,92
ROA	0,03	0,06	0,949	1,38
Environmental score	0,02	0,09	0,926	1,52
Sector	0,09	2,32	0,026**	1,31
R^2	47%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 25: First regression for H2

Different evidence emerges when looking at the *type of information*: in this case *Big4* is positively associated with *TOI* with a level of significant of 5%. Consistently with the results obtained for hypothesis 1 when looking at *TOI*, other significant variables are *Size* and *Years*, the former with a negative sign, the latte with a positive sign. New variables that emerge with a significant and positive relation are *SR* and *ROA.* In the regression performed with the whole sample they were positively associated with *TOI* but not significant, while in this case they are both significant at a level of 5%. Accordingly, the choice of issuing a stand-alone report does not only have an impact in enhancing the Q*uantity* of disclosure, as emerged by previous regressions, but also in enhancing the *type of information*. Lastly, a better profitability, measured by *ROA*, seems to have a positive association with *TOI.*

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,82	2,96	0,011	
Big4	0,12	2,28	0,029**	1,59
SR	0,11	2,51	0,017**	1,49
Size	-0,04	-2,99	0,005***	1,45
Lev	-0,11	-0,95	0,348	1,16
Years	0,01	1,97	0,057*	1,92
ROA	0,99	2,26	0,030**	1,38
Environmental score	0,11	0,57	0,574	1,52
Sector	0,01	0,15	0,884	1,31
R^2	49%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 26: Second regression for H2

Analogous results emerge for *managerial orientation*. *Big4* is positively related also with *MAN*, but at a level of significance of only 10%. *Size* has a negative relation with *MAN* at a level of significance of 5%. Significant positive relations are detected for *SR*, *Years* and *ROA*. Similarly, to the results obtained for *TOI*, empirical evidence shows that the quality of information measured by *managerial orientation*, is enhanced by the choice of issuing a standalone report, the number of years of experience a company has in CSR reporting and the company profitability.

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,75	2,22	0,033	
Big4	0,11	1,76	0,088*	1,59
SR	0,13	2,76	0,009***	1,49
Size	-0,03	-2,30	0,027**	1,45
Lev	-0,15	-1,11	0,275	1,16
Years	0,01	1,77	0,086*	1,92
ROA	0,99	2,04	0,049**	1,38
Environmental score	0,06	0,28	0,783	1,52
Sector	0,02	0,55	0,583	1,31
R^2	45%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 27: Third regression for H2

Overall, hypothesis 2 is confirmed when looking at *TOI* and *MAN*, while it is not when looking at *Quantity*. Therefore, given that companies with assurance disclose more information, it seems not to be relevant whether the assurance has been performed by a Big4 or not. Conversely, when looking at the two other measures, it is not sufficient that the companies has an external assurance, rather it seems to be relevant whether the assuror is a Big4. The choice of a Big4 has a significant relation with the type of information provided, to the extent that companies assured by a Big4, on average, provide more environmental information expressed in quantitative terms over the total environmental information they disclose. With a weaker level of significance, it seems also that companies assured by a Big4 provide more environmental information showing a real commitment over the total environmental information disclosed.

4.3 Additional analysis

This paragraph addresses some concerns which may arise pertaining to the model presented in the previous paragraph. Some additional analysis have been run with the aim to test the validity of the results obtained when changing some assumptions.

Materiality concerns:

One concern of this study may be the fact that it is not considering what information is material for the stakeholders. Specifically, computing the final scores as an average of the scores obtained for each topics of disclosure ignores the fact that some items of disclosure may be more material than others. A sound definition of materiality would involve a process of stakeholder interview which was not inside the boundaries of my research. To address this concern, I have used as a proxy of materiality the number of companies inside the sample reporting on a certain topic. This reasoning is based on the idea that if a lot of companies are reporting on a certain item it means that this item could be considered material. To choose which items could be deemed more material, I have ranked the items of disclosure based on the number of companies that report on that item. The table below shows the ranking of the disclosure items:

Intem of disclosure	Number of companies reporting on that topic
Emission	53
Effluents and Waste	47
Energy	45
Water	42
Biodiversity	38
Material	22
Suppliers environmental assessment	19
Compliance	19
Overall	18
Environmental Grievance Mechanism	14
Transport	10
Products and Services	8

Table 28: Ranking of the items of disclosure by number of companies that report on that topic

I decided to select as more material topics the first four items: *Emission*, *Effluents and Waste*, *Energy* and *Water*. For these four topics, at least the 80% of the companies included in the sample is providing some information. I computed the overall scores for *Quantity*, *TOI* and *MAN* as average of the scores obtained for these four items and I run again the regression analysis with these new indexes as dependent variables.

In this case *Quantity* ranges from a maximum of 80% obtained by Endesa to a minimum of 2% of TGS Nopec Geophysical, with an average score of 31%. For *TOI* and *MAN*, the lowest scores (0%) have been obtained by TGS Nopec Geophysical which did not provide any quantitative nor committed information for the topics considered. The highest score has been obtained by Tullow Oil for both index (100%). The average score is 47% for *TOI* and 52% for *MAN*. The following table displays descriptive statistics for the three variables computed as average of the four material topics:

	Mean	Std. Dev.	Min	Max
Quantity	0,31	0,18	0,02	0,80
TOI	0,47	0,21	0,00	1,00
MAN	0,52	0,21	0,00	1,00
Number of companies	53			

Table 29: Descriptive statistic for disclosure scores based on material topics

A table with the scores obtained by each company for the three indexes when limiting the analysis to material topics is included in the Appendix.

The results for hypothesis 1 are consistent with the ones presented in the previous paragraph when weighting all the twelve disclosure items: *Assurance* is significant when looking at *Quantity*, while it is not for the other two indexes.

The table below shows that *Assurance* is highly significant when considering *Quantity* (p-value = 0,007). Also the significant positive effect of *Size* detected in the main model is confirmed. Conversely neither *S*R, nor *Sector* seems to have a significant role in enhancing *Quantity*. Accordingly, no significant difference in terms of amount of information disclosed emerges between companies that issues a standalone report and companies that include environmental information within the annual report. Moreover, companies operating in Power & Heat sector and those operating in Oil & Gas do not show significant differences for the quantity of information disclosed concerning *Emission*, *Effluents and Waste*, *Energy* and *Water.*

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,59	-1,72	0,093	
Assurance	0,18	2,81	0,007***	1,44
SR	0,06	1,36	0,181	1,22
Size	0,04	2,17	0,036**	1,56
Lev	-0,08	-0,64	0,529	1,01
Years	0,01	1,62	0,112	1,69
ROA	-0,55	-1,29	0,202	1,48
Environmental score	-0,23	-1,29	0,202	1,50
Sector	0,03	0,64	0,526	1,16
R^2	44%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 30 First regression for H1 focusing only on material topics

Assurance is not significant neither on *TOI* nor on *MAN* (p-value >0,1). Moreover, this analysis confirms the high positive significance of the number of years of experience a company has in CSR reporting in determining higher score for both *TOI* and *MAN*. Also the weak negative effect of *Size* on *TOI* is still present confirming the previous evidence that bigger companies tend to disclose a lower incidence of environmental information expressed in quantitative terms over the total amount of environmental information. The two following tables reports the outputs of the two regressions.

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,21	2,76	0,008	
Assurance	0,10	1,28	0,207	1,44
SR	-0,05	-0,87	0,389	1,22
Size	-0,04	-1,89	0,065*	1,56
Lev	0,01	0,05	0,960	1,01
Years	0,02	3,09	0,003***	1,69
ROA	0,06	0,1	0,922	1,48
Environmental score	-0,12	-0,52	0,605	1,50
Sector	-0,06	-1,12	0,267	1,16
R^2	30%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 31: Second regression for H1 focusing only on material topics

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,18	2,58	0,013	
Assurance	0,08	1,00	0,324	1,44
SR	-0,03	-0,51	0,610	1,22
Size	-0,04	-1,61	0,115	1,56
Lev	-0,03	-0,15	0,878	1,01
Years	0,02	2,77	0,008***	1,69
ROA	0,16	0,24	0,814	1,48
Environmental score	-0,12	-0,52	0,607	1,50
Sector	-0,05	-0,83	0,409	1,16
R^2	24%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 32: Third regression for H1 focusing only on material topics

Conversely, different results have been obtained for hypothesis 2: *Big4* is still not significant on *Quantity*, but, when limiting the scope of analysis to material topics, *Big4* is also not significant on *TOI* and *MAN*. This evidence suggest that more cautious conclusion should be drown on the role played by Big4 in enhancing the quality of environmental disclosure.

For *Quantity*, significant role is played by *SR* as it was in the main model used for H2, while the effect of *Size* is more significant than it was in that case. Conversely, the effect of *Sector* drops when limiting the scope of analysis to more material topics. This confirm the evidence obtained from the test of H1 on material topics that companies operating in Power & Heat sector

and those operating in Oil & Gas sector do not show significant differences in term of amount of information provided pertaining to *Emission*, *Effluents and Waste*, *Energy* and *Water*. Accordingly, the higher quantity of information disclosed by companies in Power & Heat sector seems to be attributable to the other topics, which have not been deemed material for the purpose of this analysis.

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,41	-0,94	0,355	
Big4	0,02	0,21	0,832	1,59
SR	0,11	1,77	0,086*	1,49
Size	0,03	1,86	0,072*	1,45
Lev	-0,21	-1,18	0,245	1,16
Years	0,01	1,30	0,204	1,92
ROA	-1,15	-0,23	0,817	1,38
Environmental score	-0,27	-0,98	0,332	1,52
Sector	0,04	0,80	0,430	1,31
R^2	36%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 33: First regression for H2 focusing only on material topics

Big4 has still a positive relation with the scores on *TOI* and *MAN* but it is not significant in none of the two cases. Accordingly, it seems that companies assured by a Big4 obtain better scores for *TOI* and *MAN* when looking at a broader range of topics, but not when limiting the analysis to a subsample of selected topics. The only variable which has a significant effect in this case is *Size*, whose relationship with *TOI* and *MAN* works with a negative direction.

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,21	2,57	0,015	
Big4	0,12	1,37	0,179	1,59
SR	0,05	0,74	0,465	1,49
Size	-0,04	-2,02	0,052*	1,45
Lev	-0,19	-1,00	0,322	1,16
Years	0,01	1,34	0,188	1,92
ROA	1,06	1,57	0,126	1,38
Environmental score	0,05	0,18	0,860	1,52
Sector	-0,07	-1,18	0,247	1,31
R^2	29%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 34: Second regression for H2 focusing only on material topics

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,14	2,35	0,025	
Big4	0,11	1,25	0,219	1,59
SR	0,07	1,11	0,273	1,49
Size	-0,04	-1,87	0,070*	1,45
Lev	-0,24	-1,24	0,222	1,16
Years	0,01	1,11	0,275	1,92
ROA	1,10	1,59	0,122	1,38
Environmental score	0,17	0,57	0,575	1,52
Sector	-0,06	-0,93	0,361	1,31
R^2	28%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 35: Third regression for H2 focusing only on material topics

Overall, the analysis addressing material topics strengthened hypothesis 1 while does not support hypothesis 2. In light of this analysis it can be reasonably concluded that, on average, companies that have their reports assured provide more information, no matter who performed the assurance. Conversely the fact that the report has been subject to external assurance seems not to be sufficient to explain a better quality of information measured by *type of information* and *managerial orientation*. What is seems to have a certain relevance on the quality of information is who performed the assurance. Empirical evidence shows that companies that chose a Big4 assurance provider disclose more environmental information in quantitative terms and more environmental information expressing a committed approach over the total

environmental information disclosed overall. However, when looking only at *Emission, Effluents and Waste, Energy* and *Water*, there is no significant evidence that companies assured by a Big4 score better in term of *TOI* and *MAN*. Accordingly, when limiting the analysis to material topics, no significant differences for companies assured by a Big4 and companies assured by a different provider emerges in term of *type of information* and of *managerial orientation*.

Robustness check

I acknowledge that my model may suffer from heteroskedasticity meaning that the size of the error term may not be constant across the values of the independent variable. In this case the standard errors of the estimates would be biased. To mitigate this concern, I re-run the regressions estimated with heteroscedasticity-robust standard errors. When performing regression with robust standard error, t-statistics and p-values are subject to some slight changes. What I am interested in is the level of significance of my variables of study (*Assurance* and *Big4*) when controlling for heteroscedasticity.

After performing this additional analysis, it turns out the *Assurance* is still significant on *Quantity*. The level of significance is 5% (p-value = 0,022) when using the overall score and 1% (p-value = 0,004) when using the score for material topics. *Assurance* is still not significant for *type of information* and *managerial orientation*. *Big 4* is still significant at a level of 5% for both *TOI* and *MAN* while it is not for *Quantity*. Moreover, *Big4* remains significant, although only at 10% level, on *TOI* when limiting the scope of analysis to material topics, while is still not significant for *MAN* and *Quantity.* Accordingly, in this case hypothesis 2 is not rejected for *TOI*, meaning there is a positive association between the choice of a Big4 and a higher proclivity to provide higher incidence of environmental information in quantitative terms over the total environmental information disclosed also when limiting the scope of analysis to more material topics.

In conclusion, this additional test provides confirmation for the relation between *Assurance* and *Quantity* and strengthen the evidence on the association between *Big4* and *type of information.* All the results of the regressions performed with the robust command are included in the Appendix.

4.4 A comparison with prior findings

This paragraph is aimed at comparing the results I have obtained with the findings of prior studies that have addressed the same topic. I will highlight to what extent the results of my analysis provide confirmation of previous findings and to what extent results I have obtained represent novel findings.

The evidence obtained that companies with assurance report more information is in line with other studies which have addressed the same research question employing traditional measures of disclosure quantity (Moroney et al., 2009; Faisal et al., 2012). A different conclusion is emphasized when looking at *type of information* and *managerial orientation* as proxy of quality. In this case results are more in line with the evidence highlighted by Michelon et al. (2015) that found no relationship between assurance and any dimension of disclosure quality. Accordingly, my research provides also a confirmation of the fact that previous studies performing content analysis of sustainability reports have been more focused on disclosure quantity then on quality, with the exception of Michelon et al (2015) that specifically addressed this gap in the literature developing a framework more concerned with quality measures.

Concerning hypothesis 2, the fact that I did not find any significant impact of having a Big4 assuror on the quantity of information, is in line with the result of Moroney et al. (2009) which did not find a significant effect of the type of assuror on disclosure. Conversely, some novel findings concerning the role of Big4 can be inferred form my analysis looking at the *type of information* and at *managerial orientation.* This could be seen as an additional confirmation of the fact that previous researches have been more focused on quantity rather than quality. Although, it should be noticed a significant difference in the research methodology I have adopted and the one adopted by Moroney et al. (2009): I divided the group of assurors into Big4 and non, while Moroney et al. (2009) divided between accountant and non, therefore, there is not a complete overlapping between these two classifications as there are accountant assurors which are not Big4.

The table below proposes a summary of the results of the three main researches with which I have compared my results. The last column of the table summarizes whether these previous results have been confirmed by my analysis or whether I have reached different evidence.

Authors	Results	Comparison with my research
Moroney et al. (2009)	-Positive relation between assurance and environmental disclosure quality - No difference depending whether assurance is provided by accountants or consultants	-Confirmed for disclosure Quantity but not for TOI and MAN -A weak positive association with Big4 has been detected for TOI and MAN
Faisal et al. (2012)	- Firms with assurance statement provide higher quality of sustainability disclosure	-Confirmed for disclosure Quantity but not for TOI and MAN
Michelon et al. (2015)	-Assurance is not significantly associated with disclosure quality	-Confirmed for TOI and MAN

Table 36: Comparison between the results of previous studies and the results of my analysis

Also the inference on control variables included in the model could be reconciled with prior findings existent in the literature. The significant impact of the number of years since which a company started to issue CSR information is in line with the findings of Moroney et al. (2009) showing that the level of experience reached by a company over CSR reporting has a relation with environmental disclosure quality. The role played by company's size in enhancing the amount of information disclosed is a confirmation of the idea that bigger companies disclose more information, which is already a well rooted argument in the literature. What my analysis shades a light on is the fact that, given this higher amount, bigger companies tend to provide a lower incidence of environmental information expressed in quantitative terms and of environmental information showing a committed approach over the total amount of environmental information disclosed.

Finally, although the results show that companies operating in Power & Heat industry disclose more information than companies operating in Oil & Gas, this evidence is not confirmed when limiting the scope of analysis to material topics. Moreover, no significant difference has been detected in term of *type of information* and *managerial orientation*. Therefore, the two industries seem quite comparable in term of disclosure quality, which is consistent with the fact that literature has considered both as environmentally sensitive industries.

Conclusions and limitations

This study addressed both theoretically and empirically the practice of assurance and, more in details, investigated the relationship between environmental disclosure quality and assurance practice in a sample of companies belonging to environmentally sensitive industries. I have measured environmental disclosure using a multidimensional framework in an attempt to overcome the idea that quantity of disclosure is a proxy for quality. Thus, in this study, disclosure quality is measured not only by the quantity of information disclosed but also by the *type of information* and by the *managerial orientation* which underline the information itself. This definition of quality is based on the idea that quantitative information matter more than qualitative ones relying on the motto *"What gets measured gets managed",* and that information communicating concrete results and objectives showing a committed approach is more relevant than information showing a generic or boilerplate approach.

My research demonstrated that nor the fact of having assurance nor who performed it are irrelevant when analysing environmental disclosure quality. Results allow to conclude with a certain confidence that companies using external assurance provider tend to disclose more environmental information. It seems also possible to infer that, among assured companies, those that are assured by a Big4 provide better quality of disclosure, both in term of *type of information* and of *managerial orientation*. However, more cautious conclusion should be drawn for this finding, since the relation is not strongly significant and, for *managerial orientation,* it is not confirmed when limiting the scope of analysis to more material topics.

I have drawn on Legitimacy Theory to interpret the approach showed by companies in adopting the practice of assurance. According to Legitimacy Theory, the variety of practices adopted by companies to legitimize their activities "s*hade greyly from substantive to symbolic*" (Ashforth and Gibbs, 1990, p.182). The evidence observed by my analysis concerning the practice of assurance is in line with that statement. On one side, the choice to use an external assurance provider is accompanied by a commitment to disclose more information, thus suggesting a substantive approach. On the other side, there is no commitment to disclose information of better quality, when we look at the type of information disclosed and the managerial orientation, which could be interpreted as a symbolic use of assurance practice.

I decided to add a further investigation on the effect played by different types of assurance provider based on fact that, on one side, Big4 have been considered higher quality assurance provider (Simnett et al., 2009), while, on the other side, they have been criticized for taking

advantage of their reputation to increase profit operating in a field where they have no legitimacy (Power, 1997). What emerge from my analysis is that the decision to purchase assurance service form a Big4 is accompanied by a tendency to disclose more environmental information of quantitative type over the total amount of environmental information and, to a lesser extent, more environmental information communicating objectives and results over the total amount of environmental information disclosed.

My research allows also to detect other variables which play a significant role in determining environmental disclosure quality. Consistently with previous studies on voluntary disclosure, company size has a significant role in enhancing the quantity of information, but not the quality measured by the two other dimensions. Bigger companies, in fact, seem to disclose more information, but, given this total amount, the incidence of environmental information expressed in quantitative terms and of environmental information showing a committed approach over the total amount of environmental information disclosed tend to be lower. The choice of issuing a standalone report dedicated to sustainability topics rather than including them within the annual report is positively associated with the quantity of information. Additionally, my analysis demonstrates that environmental disclosure improves over time: companies reporting environmental information for longer period of time tends to provide better quality of environmental disclosure.

Moreover, my research allows to make some inference on the different features of companies that make different choices concerning assurance practice. Companies that decide to assure their sustainability information tend to be bigger and more profitable. On average, companies that decide to assure have been disclosing environmental information for more years, and, among them, companies that chose a Big4 have been disclosing environmental information for more years than companies that chose a different assurance provider. In term of environmental performance, companies that chose to assure tend to score better than companies that did not, and companies that chose an assuror other than Big4, on average, have a better performance than companies choosing a Big4.

Finally, my research provides confirmation of some evidences which are already well rooted in the literature, namely the evidence that GRI are the most widespread guidelines for sustainability reporting and the evidence that Big4 dominate the market of sustainability assurance. Moreover, the empirical findings of my research show that, in the majority of the cases, the Big4 that performed the assurance engagement is the same that performed the financial audit.

This study is not without limitations. The main limit is the restricted sample of analysis which has been determined by two factors. First, restricting the analysis to two industries in a specific geographical area, limited the number of companies eligible to be included in the sample. Second, content analysis is a time-consuming research method, accordingly a trade-off had to be found between the need to have a significant sample of companies and the need to conduct the analysis within a reasonable amount of time. The second limitation is the level of subjectivity involved in performing the content analysis. This is a shared concern for all the studies relying on content analysis as research method. Specifically, in my analysis the main issues have been that deciding whether a certain information could be deemed relevant for a certain topic could involve a level of discretion. Additionally, if deciding whether an information is qualitative or quantitative is quite straightforward, the same does not hold for the managerial approach: defining whether a certain information is showing a committed or a boilerplate approach could sometimes require a certain dose of subjectivity. To deal with that issue, I have tried to be more objective as possible and to adopt a consistent criterion in all the document I have analysed.

Some limits which are intrinsic in the boundaries of my research could also represent interesting insights for further analysis. A first area of improvement is the approach I used in addressing the concern of materiality. I tackled it by constructing disclosure indexes that consider only more material topics, based on the intuition that the number of companies reporting on a certain topic could be considered a proxy for materiality. However, I acknowledge that this is a rough approach to deal with the issue. Materiality, as defined by GRI, is linked with the usefulness of the information for the stakeholders, therefore a more significant assessment of materiality should have been conducted considering which information is deemed material for the stakeholders of a certain company. Therefore, a step forward comparing to my research, could be verifying whether the topics for which a higher number of companies is disclosing could also be considered more material by the stakeholders.

Another possible area of improvement could be to retest the hypotheses using a slightly different version of the indexes. For example, an additional analysis could have been run calculating *type of information* and *managerial orientation* as absolute values instead of incidence. Specifically, *type of information* could have been calculated simply as the number of recording units containing environmental information expressed in quantitative terms instead of, as I did, the incidence of these latter over the total recording unit containing environmental information. Similarly, *managerial orientation* could have been calculated simply as the number of recording units that contain environmental information and showing a committed

approach instead of the incidence of these latter over the total of the recording units containing environmental information. This solution could provide an additional approach in measuring environmental disclosure quality. An additional test measuring *type of information* and *managerial orientation* in such way could be used to reconcile the evidence gathered from my analysis in order to obtain a more comprehensive test of the two hypotheses.

A further development of the research could also be to analyse the same companies over more years in order to investigate whether the decision to turn to an external assurance provider at a certain point in time has a relation with disclosure quality. Specifically, it could have been interesting to analyse whether the same company shows an enhanced disclosure quality since when it decided to turn to an external assuror. My analysis did not allow to make such inference as all the documents analysed were referring to the same year, however I believe this type of analysis could be an interesting step forward.

Another aspect that I didn't take into account but that I believe it would have been meaningful to investigate is the amount of money paid to the assurance provider. Since one of the main drawback of assurance practice mentioned in the literature is the cost, it would have been interesting to have information on the size of this fee. With that purpose, I tried to dig into the financial statement of each company looking for this information. However not all the companies, provided information on audit and related services fees, and even when this information is available, the financial statement does not provide such detailed information to allow to isolate the fee paid for sustainability assurance.

Finally, I think a next avenue for research could be to extend a similar analysis to other dimensions of sustainability disclosure and to other industries. I have addressed the topic of environmental disclosure within environmentally sensitive industries, therefore, a complementary analysis could be to investigate disclosure of topics concerning social dimension within industries that faces greater social exposure (socially sensitive industries).

Concerning the limitations inherent in the regression model, I acknowledge that my OLS model might suffer from endogeneity bias due to omitted variables. Consequently, my model does not intend to claim any direction of causality neither between *Assurance* and *Quantity,* nor between *Big4* and any of the quality measures. Additionally, the potential presence of endogeneity in the model does not allow to get rid of the threat of reverse causality. A phenomenon which could by reasonable to expect, in fact, is that companies may decide to turn to an external assurance provider once they have reached a certain threshold in the quantity and/or quality of information they disclose. My research did not address this concern and further analysis would be necessary to deal with that issue. The only result that can be inferred from my model is that

there is an association between the practice of external assurance and the quantity of information provided and an association between the choice of a Big4 as assurance provider and *type of information* and *managerial orientation*. Accordingly, all I can say is that, on average, firms with assurance over CRS information disclose more environmental information than firms without assurance. Among the companies with assurance, on average, the ones assured by a Big4 disclose more environmental information in quantitative terms and more environmental information showing a committed approach over the total environmental information they disclose comparing to companies that chose a different assurance provider.

It should be born in mind that, when looking toward the end goal of sustainable development, both the quantity and quality of information provided is of relative importance. What matter more is the substance beyond this information. For example, it is of relative interest to know how many sentences a company wrote concerning the topic of emission and it is also of limited interest to know if it is providing commitments to reduce those emissions. What matters more is the amount of emission the company is releasing or the value of target the companies is posing for their reduction. I addressed the topic from the perspective and with the background of an accounting student. Therefore, my research did not make any attempt in judging the substance of the information provided with a focus on the environmental performance a company is achieving. However, I believed the analysis I have conducted focusing on reporting practice could have been of a certain relevance in any case. Moreover, reconciling this evidence on reporting practice and quality of disclosure with the choice of assurance could be an interesting research question since there is still an open debate concerning the relevance and the credibility of assurance.

My analysis does not find a solution to the open debate on practice of assurance. My research is couched within this debate and is dealing with it from a field of analysis that the literature has started to investigate: the link between the choice of assurance and disclosure quality. However, this is only one perspective to perform a critical analysis of the assurance practice. All I can say is that, on average, companies that adopt assurance show a commitment to disclose more environmental information. However, this finding does not opt out the criticisms toward assurance practice which have been analysed in depth in the literature review. The fact that companies with assurance disclose more environmental information does not mean that they show a better stakeholder engagement, nor that we can get rid of the concern of managerial capture. My goal it has only been to investigate the relation between assurance and disclosure quality, analysing the evidence reported within a sample of selected companies. There is no

presumption to give a value judgement on the practice of assurance, nor any attempt to conclude whether sustainability reports should or should not be audited.

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Appendix

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Building a better working world

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Independent auditors' report on "Eni for 2016 – Sustainability Report" (Translation from the original Italian text)

To the Board of Directors of
Eni S.p.A.

We have carried out a limited assurance engagement of "Eni for 2016 – Sustainability Report" (hereinafter also the "Report") of Eni S.p.A. and its subsidiaries (hereinafter "Eni Group") as of December 31, 2016.

Directors' responsibility on the Report

The Directors are responsible for the preparation of the Report in accordance with the "G4 Sustainability Reporting Guidelines" and "Oil & Gas Sector Disclosures", issued in 2013 by GRI – Global Reporting Initiative, that are detailed in the paragraph "Reporting principles and criteria" of the Report, as well as for that part of internal control that they consider necessary in order to allow the preparation of a Report that is free from material misstatements, even caused by frauds or not-intentional behaviors or events. The Directors are also responsible for defining the Eni Group's commitments regarding the sustainability performance and for the reporting of the achieved results, as well as for the identification of the stakeholders and of the significant matters to report.

Auditors' responsibility

It is our responsibility the preparation of this report on the basis of the procedures carried out. Our work has been conducted in accordance with the criteria established by the principle "International Standard on Assurance Engagements 3000 – Assurance Engagements other than Audits or Reviews of Historical Financial Information" ("ISAE 3000"), issued by the International Auditing and Assurance Standards Board for the engagements that consist in a limited assurance. This principle requires the respect of relevant ethical principles, including those related to independence, as well as the planning and the execution of our work in order to obtain a limited assurance that the Report is free from material misstatements. These procedures included inquiries, primarily with company's personnel responsible for the preparation of the information included in the Report, documents analysis, recalculations and in other procedures in order to obtain evidences considered appropriate.

The procedures performed on the Report were related to the compliance with the principles for defining report content and quality, as articulated in the "G4 Sustainability Reporting Guidelines", and are summarized below:

a. Comparison of the economic and financial data and information included in the Report with those included in the Eni Group's consolidated financial statements as of December 31, 2016 on which we issued our audit report, pursuant to art. 14 and 16 of Legislative Decree dated January 27, 2010, n.39, on March 22, 2017;

b. Analysis, through interviews, of the governance system and management process of the issues related to sustainable development regarding Eni Group's strategy and operations;
c. Analysis of the process relating to the definition of material aspects included in the Report, with reference to the identification modalities in terms of their priority for the different stakeholders' categories and to the internal validation of the process outcome;
d. Analysis of the operation of the processes that support the generation, recording and management of the quantitative data reported in the Report. In particular, we have carried out the following procedures:
    - interviews and discussions with personnel of the Corporate and Business Units of Eni S.p.A., and of the subsidiary Eni U.S. Operating Co. Inc., to obtain an understanding about the information, accounting and reporting system in use for the preparation of the Report, as well as about the internal control processes and procedures supporting the collection, aggregation, data processing and transmission of data and information to the department responsible for preparation of the Report;
    - on-site verifications at Mantova plant of Versalis S.p.A., production sites Garibaldi C and K of Distretto Centro Settentrionale (DICS) of Eni S.p.A. and production site Allegheny of Eni U.S. Operating Co. Inc.;
    - analysis on a sample basis of the documentation supporting the compilation of the Report, in order to confirm the processes in use, their adequacy and the operation of the internal control for the correct reliability of data and information in relation to the objectives described in the Report;
e. Analysis of the compliance and internal consistency of the qualitative information included in the Report to the guidelines identified in paragraph "Directors' responsibility on the Report" of the present report;
f. Analysis of the process relating to the stakeholders engagement, with reference to the procedures applied, through the review of summary minutes or any other existing documentation relating to the main topics emerged from discussions with them;
g. Obtaining of the representation letter, signed by the legal representative of Eni S.p.A., relating to the compliance of the Report with the guidelines indicated in paragraph "Directors' responsibility on the Report", as well as to the reliability and completeness of the information and data presented in the Report.

Our examination has entailed a lower extension of work compared to the work to be performed for a reasonable assurance engagement in accordance with ISAE 3000 and, as consequence, we may not have become aware of all the significant events and circumstances which we could have identified had we performed a reasonable assurance engagement.

Conclusion

Based on our work, nothing has come to our attention that causes us to believe that "Eni for 2016 - Sustainability Report" of Eni Group as of December 31, 2016 is not in compliance, in all material aspects, with the guidelines "G4 Sustainability Reporting Guidelines" and "Oil & Gas Sector

Disclosures" issued in 2013 by the GRI - Global Reporting Initiative, as stated in the paragraph "Reporting principles and criteria" of the Report.

Rome, April 6, 2017

EY S.p.A.
Signed by: Massimo Antonelli, Partner

This report has been translated into the English language solely for the convenience of international readers

TÜV AUSTRIA Hellas

Assurance Statement for Hellenic Petroleum's Corporate Sustainability and Social Responsibility Report 2016

Information on the Assurance Statement

The Assurance Provider TÜV AUSTRIA Hellas ('the Provider') has been engaged to provide external assurance on the disclosures published in the Corporate Sustainability and Social Responsibility Report 2016 ('the Report') of Hellenic Petroleum Group ('the Company'). The Company is exclusively responsible for the data and information within the Report. The assurance process was conducted by the Provider in terms of sample-based audits of data and information as well as audits of data collection systems and procedures.

The Provider has not offered any consulting services to the Company.

Economic and financial data were not audited. Instead, they were assessed with respect to the information contained in the 2016 annual report and financial statement which have been audited by other third parties.

Scope of Assurance

The Provider undertook the following tasks during the months June / July 2017:

1. Reviewed the Report against the requirements of Global Reporting Initiative (GRI) Sustainability Reporting Guidelines G4 and confirmation that the GRI-G4 "Comprehensive option" requirements are fulfilled.
2. Verification of the data included in all the chapters of the Report.
3. Site visits at the Company's Head Offices in Marousi and its refineries located in Aspropyrgos, Eleusina and Thessaloniki, for the implementation of verification and sampling inspections of files in order to evaluate:
    - the reliability and accuracy of performance indicators of the Sustainability Report
    - the reliability of processes for generating, gathering and managing information included in the Report.

Conclusions

During the assurance engagement, it was confirmed that the data and information are reliable. The accuracy of the disclosed statements and assertions was found to be within acceptable limits. The Company provided a comprehensive and proper presentation of performance on the basis of reasonably documented information as well as that there is an effective data gathering, management and reporting system in place for issues which pertain to sustainable development.

The Provider concurs that the GRI-G4 "Comprehensive option" requirements have been met, including the Oil and Gas Sector Supplement.

Opportunities for Improvement

Based on the observations and concluding remarks derived from the assurance engagement, the Provider's recommendations for the improvement of the Company's future Sustainability Reports are as follows:

- Harmonize the procedures and data collection systems of all companies within the boundaries of the Report.
- Extend the boundaries of the Report to include more companies of the Hellenic Petroleum Group.
- On site visit in more installations of the Hellenic Petroleum Group within the boundaries of the Report.

Note: This Independent Assurance Report has been prepared as a translation of the original Greek version

On behalf of TÜV AUSTRIA Hellas,

Athens, 18th of July 2017

Kallias Yiannis General Manager		Sifakis Nikolaos Lead Auditor

Companies	Quantity	Type of information	Managerial orientation
A2A	15%	47%	48%
Acciona	37%	47%	45%
Acea	35%	34%	37%
Areva	8%	23%	21%
Centrica	2%	15%	15%
CEZ as	10%	3%	9%
Dong Energy	6%	11%	15%
Drax Power	12%	14%	17%
Eon	20%	21%	21%
EDF	42%	27%	36%
Edison	22%	59%	59%
EDP Energia De Portugal	20%	35%	34%
Engie	11%	38%	44%
Endesa	53%	44%	47%
Enea	6%	18%	26%
Enel	58%	51%	57%
Fortum	39%	21%	28%
Gas Natural Fenosa	27%	33%	43%
Iberdrola	44%	53%	65%
Linde	18%	20%	21%
MVV	8%	5%	7%
National Grid	14%	2%	3%
Red Electrica de espania	24%	41%	52%
RWE	40%	18%	24%
Scottish & Southern Energy	11%	21%	33%
Terna	37%	35%	28%
VESTAS WIND SYSTEMS	10%	29%	29%
Veolia environnement	3%	19%	19%
Verbund	12%	35%	37%
United Utilities	2%	4%	5%
Total	22%	12%	12%
Royal Dutch Shell	24%	20%	23%
BP	28%	29%	31%
ENI	24%	29%	31%
REPSOL	10%	21%	22%
STATOIL	16%	27%	28%
Galp Energia	5%	32%	32%
Gazprom	21%	36%	37%
OMV	17%	26%	31%
NESTE	10%	43%	43%
Lundin Petroleum	12%	19%	26%
Gamesa	37%	40%	43%
SBM Offshore	3%	13%	13%
Tullow Oil	6%	42%	42%
Amec Foster Wheeler	15%	12%	19%
TGS Nopec Geophysical	1%	0%	0%
Petrofac	6%	9%	13%
Hellenic Petrolemu	9%	26%	30%
Rubis	20%	11%	11%
SNAM Rete Gas	23%	45%	44%
Akastor	2%	18%	18%
CGG SA	7%	49%	48%
Enagas	18%	33%	34%

Table 37: Final scores obtained by each company

Companies	Quantity	Type of information	Managerial orientation
A2A	23%	90%	92%
Acciona	46%	67%	65%
Acea	41%	47%	53%
Areva	21%	63%	64%
Centrica	6%	45%	46%
CEZ as	17%	7%	19%
Dong Energy	13%	24%	29%
Drax Power	17%	24%	35%
Eon	29%	55%	55%
EDF	60%	52%	63%
Edison	27%	60%	60%
EDP Energia De Portugal	39%	63%	58%
Engie	20%	34%	49%
Endesa	80%	42%	43%
Enea	16%	41%	64%
Enel	60%	61%	65%
Fortum	73%	49%	50%
Gas Natural Fenosa	34%	51%	78%
Iberdrola	65%	44%	59%
Linde	46%	50%	51%
MVV	23%	13%	16%
National Grid	17%	5%	8%
Red Electrica de espania	39%	75%	76%
RWE	58%	34%	39%
Scottish & Southern Energy	17%	48%	55%
Terna	30%	30%	39%
VESTAS WIND SYSTEMS	19%	51%	66%
Veolia environnement	7%	31%	31%
Verbund	26%	57%	63%
United Utilities	5%	13%	14%
Total	29%	23%	22%
Royal Dutch Shell	41%	47%	52%
BP	52%	39%	47%
ENI	36%	53%	57%
REPSOL	22%	37%	42%
STATOIL	36%	56%	58%
Galp Energia	13%	70%	71%
Gazprom	39%	57%	60%
OMV	37%	53%	67%
NESTE	28%	78%	80%
Lundin Petroleum	21%	45%	47%
Gamesa	48%	67%	73%
SBM Offshore	9%	40%	40%
Tullow Oil	15%	100%	100%
Amec Foster Wheeler	42%	37%	58%
TGS Nopec Geophysical	2%	0%	0%
Petrofac	18%	28%	40%
Hellenic Petrolemu	22%	65%	78%
Rubis	51%	34%	33%
SNAM Rete Gas	44%	74%	78%
Akastor	5%	30%	30%
CGG SA	14%	71%	70%
Enagas	46%	60%	63%

Table 38: Final scores obtained by each company on material topics

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,48	-2,13	0,039	
Assurance	0,11	2,38	0,022**	1,44
SR	0,07	2,39	0,021**	1,22
Size	0,02	1,96	0,056*	1,56
Lev	0,02	-0,19	0,851	1,01
Year	0,01	1,96	0,056**	1,69
ROA	0,36	-1,06	0,294	1,48
Environmental score	0,00	-0,58	0,564	1,50
Sector	0,07	2,42	0,020**	1,16
R^2	47%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 39: First regression for H1 with robust standard error

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,71	1,99	0,053	
Assurance	0,05	0,77	0,444	1,44
SR	0,02	0,50	0,621	1,22
Size	-0,03	-1,73	0,090*	1,56
Lev	-0,07	-0,62	0,536	1,01
Year	0,02	3,10	0,003***	1,69
ROA	0,10	0,20	0,840	1,48
Environmental score	0,00	0,16	0,872	1,50
Sector	0,03	0,68	0,498	1,16
R^2	31%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 40: Second regression for H1 with robust standard error

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,61	1,61	0,115	
Assurance	0,05	0,68	0,499	1,44
SR	0,04	0,90	0,374	1,22
Size	-0,02	-1,27	0,212	1,56
Lev	-0,06	-0,49	0,627	1,01
Year	0,02	2,58	0,013***	1,69
ROA	0,07	0,13	0,898	1,48
Environmental score	0,00	-0,17	0,864	1,50
Sector	0,04	0,95	0,348	1,16
R^2	26%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 41: Third regression for H1 with robust standard error

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,52	-1,91	0,065	
Big4	0,06	1,64	0,110	1,59
SR	0,11	2,95	0,006***	1,49
Size	0,02	1,69	0,100	1,45
Lev	-0,08	-0,80	0,428	1,16
Years	0,01	1,11	0,274	1,92
ROA	0,03	0,07	0,944	1,38
Environmental score	0,00	0,14	0,892	1,52
Sector	0,09	2,75	0,010***	1,31
R^2	47%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 42: First regression for H2 with robust standard error

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,82	2,67	0,011	
Big4	0,12	2,56	0,015**	1,59
SR	0,11	2,85	0,007***	1,49
Size	-0,04	-2,88	0,007***	1,45
Lev	-0,12	-1,23	0,227	1,16
Years	0,01	2,30	0,028*	1,92
ROA	0,99	2,66	0,012**	1,38
Environmental score	0,00	0,52	0,608	1,52
Sector	0,01	0,15	0,882	1,31
R^2	49%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 43: Second regression for H2 with robust standard error

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	0,75	2,31	0,027	
Big4	0,11	2,43	0,021**	1,59
SR	0,13	3,08	0,004***	1,49
Size	-0,03	-2,23	0,032**	1,45
Lev	-0,15	-1,42	0,164	1,16
Years	0,01	2,15	0,039**	1,92
ROA	0,99	2,44	0,020**	1,38
Environmental score	0,00	0,31	0,759	1,52
Sector	0,02	0,61	0,543	1,31
R^2	45%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 44: Third regression for H2 with robust standard error

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,59	-2,19	0,034	
Assurance	0,18	3,08	0,004***	1,44
SR	0,06	1,53	0,132	1,22
Size	0,04	2,73	0,009***	1,56
Lev	-0,08	-0,66	0,514	1,01
Year	0,01	1,54	0,131	1,69
ROA	-0,55	-1,18	0,245	1,48
Environmental score	0,00	-1,24	0,222	1,50
Sector	0,03	0,66	0,511	1,16
R^2	44%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 45: First regression for H1 on material topics with robust standard error

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,21	3,07	0,004	
Assurance	0,10	1,20	0,236	1,44
SR	-0,05	-0,70	0,487	1,22
Size	-0,04	-2,24	0,030**	1,56
Lev	0,01	0,05	0,963	1,01
Year	0,02	2,57	0,014**	1,69
ROA	0,06	0,09	0,925	1,48
Environmental score	0,00	-0,56	0,577	1,50
Sector	-0,06	-1,12	0,268	1,16
R^2	30%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 46: Second regression for H1 on material topics with robust standard error

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,18	2,67	0,011	
Assurance	0,08	0,93	0,358	1,44
SR	-0,03	-0,41	0,682	1,22
Size	-0,04	-1,84	0,073*	1,56
Lev	-0,03	-0,14	0,888	1,01
Year	0,02	2,30	0,026**	1,69
ROA	0,16	0,23	0,818	1,48
Environmental score	0,00	-0,52	0,605	1,50
Sector	-0,05	-0,81	0,421	1,16
R^2	24%			
Number of companies	53			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 47: Third regression for H1 on material topics with robust standard error

	Dependent variable: Quantity			
	Coefficient	t-statistic	p-value	VIF
Intercept	-0,41	-1,18	0,247	
Big4	0,02	0,25	0,806	1,59
SR	0,11	1,98	0,056*	1,49
Size	0,03	2,20	0,035**	1,45
Lev	-0,21	-1,30	0,203	1,16
Years	0,01	1,42	0,164	1,92
ROA	-1,15	-0,25	0,817	1,38
Environmental score	-0,27	-0,99	0,327	1,52
Sector	0,04	0,87	0,392	1,31
R^2	36%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 48: First regression for H2 on material topics with robust standard error

	Dependent variable: Type of information			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,21	2,86	0,007***	
Big4	0,12	1,73	0,093*	1,59
SR	0,05	0,67	0,506	1,49
Size	-0,04	-2,34	0,052*	1,45
Lev	-0,19	-1,06	0,298	1,16
Years	0,01	1,49	0,146	1,92
ROA	1,06	1,9	0,066*	1,38
Environmental score	0,00	0,18	0,859	1,52
Sector	-0,07	-1,31	0,197	1,31
R^2	29%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 49: Second regression for H2 on material topics with robust standard error

	Dependent variable: Managerial orientation			
	Coefficient	t-statistic	p-value	VIF
Intercept	1,14	2,32	0,027	
Big4	0,11	1,57	0,126	1,59
SR	0,07	1,01	0,319	1,49
Size	-0,04	-1,89	0,067*	1,45
Lev	-0,24	-1,30	0,201	1,16
Years	0,01	1,29	0,205	1,92
ROA	1,10	1,87	0,070*	1,38
Environmental score	0,00	0,59	0,557	1,52
Sector	-0,06	-1,06	0,295	1,31
R^2	28%			
Number of companies	43			

*Statistical significance at level ***(1%); **(5%); *(10%)*

Table 50: Third regression for H2 on material topics with robust standard error

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