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Evaluating the corporate environmental profile by analyzing corporate social responsibility reports

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Abstract

The environmental dimension of corporate sustainability is a key factor in firms' success and viability. This implies that firms put emphasis on resource conservation strategies in order to protect their financial position. In recent years, the environmental aspects of firms have been examined with respect to their corporate environmental profile. This paper proposes a new approach for assessing the corporate environmental profile in light of environmental management practices, the environmental performance and reporting practices. To do so, a flexible benchmarking-scoring methodology was developed. It is based on a set of well-defined indexes and environmental indicators proposed by the Global Reporting Initiative (GRI) in order to assess information published in Corporate Social Responsibility (CSR) reports. A sample of firms was used to test the proposed methodology so as to highlight its advantages and disadvantages.

**Keywords:** corporate social responsibility, benchmarking-scoring techniques, sustainability reports, environmental indicators, sustainability reporting practices

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#### Abstract

The environmental dimension of corporate sustainability is a key factor in firms' success and viability. This implies that firms put emphasis on resource conservation strategies in order to protect their financial position. In recent years, the environmental aspects of firms have been examined with respect to their corporate environmental profile. This paper proposes a new approach for assessing the corporate environmental profile in light of environmental management practices, the environmental performance and reporting practices. To do so, a flexible benchmarking-scoring methodology was developed. It is based on a set of well-defined indexes and environmental indicators proposed by the Global Reporting Initiative (GRI) in order to assess information published in Corporate Social Responsibility (CSR) reports. A sample of firms was used to test the proposed methodology so as to highlight its advantages and disadvantages.

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#### 1. Introduction

Environmental information is very useful for helping firms develop essential tools to improve communication with stakeholders as well as to face potential future risks and exploit possible new opportunities (Larrinaga-González et al., 2001; De Beer and Friend, 2006). Many theories (e.g. the stakeholder theory, the resource-based theory, the knowledge-based theory) and also accounting literature (the legitimacy theory and accountability theory) (Russo and Fouts, 1997; O'Donovan, 2002; Nikolaou, 2017) have been used to explain the efforts of businesses to improve their environmental profile through strategic management. Recently, many firms want to make progress on improving their environmental profile mainly as a response to the regulatory regime (*i.e.* the reactive approach) or as a strategy on a voluntary basis, in order to meet stakeholder needs (*i.e.* the proactive approach) (Alvarez, 2019). Moreover, literature provides evidence that benefits from improvements in a corporate environmental profile are different across sectors. Specifically, the mining and chemical industries gain "the social licence to operate" (Moffat and Zhang, 2014), while the food and beverage industry seeks a competitive advantage (Maloni and Brown, 2006). The credit sector mainly aims to eliminate potential transfer of financial risks to lending procedures due to firms' environmental failures (Coulson and Monks, 1999).

Undoubtedly, Corporate Social Responsibility (CSR) reports are an effective means of disseminating information about different aspects of corporate environmental performance, such as biodiversity, climate change, water resources, wastewater, waste materials and raw materials (Guthrie and Abeysekera, 2006). Despite the significance of such information, the majority of these reports are prepared on a voluntary basis and in a non-systematic way which causes a number of impediments to stakeholders' decisions owing to low reliability, lack of transparency and inability to use this information for comparing firms' corporate performance (Boyce, 2000).

In order to overcome many of these problems and to evaluate the quality level of CSR reports, different techniques have been developed which can be classified into two categories (Hooks and van Staden, 2011). The first category includes content analysis techniques which analyse the content of CSR reports by measuring the quantity of disclosed information for different environmental aspects (Jose and Lee, 2007). However, these techniques only measure the amount of relevant information without exploring its meaning. In addition, another weakness of content analysis techniques is related to the

font size, figures, length of pages which impact on the results (Unerman, 2000). The second category focuses on benchmarking-scoring systems which evaluate the quality of information provided by CSR reports (Skouloudis *et al.*, 2009). The assessment outcomes from benchmarking-scoring techniques offer substantial benefits such as the use of non-financial accounting purposes in order to satisfying the needs of stakeholders. However, they fail to evaluate disclosed information regarding the actual corporate environmental performance which is important factor for assessing the corporate environmental profile. This paper suggests the Corporate Environmental Profile Methodology (CEPM) for evaluating corporate environmental profiles; the CEPM is based on benchmarking-scoring techniques to evaluate corporate environmental profiles through CSR reports. More specifically, the proposed methodology develops a benchmarking-scoring technique mainly based on two different indexes to evaluate, firstly, the level of accountability (Accountability Index (AI)) and secondly, the level of performance (Performance Index (PI)) of firms in different environmental aspects. In other words, the first index aims to examine the quality of information published in CSR reports in relation to a set of different environmental indicators and the second index seeks to evaluate the progress of firms' environmental performance. Furthermore, since there is not a standard framework for disclosing information the majority of CSR reports are prepared in an arbitrary way. Thus, the comparison of corporate environmental profiles between firms from the same or different sectors is a difficult and complicated process. To overcome this problem, the suggested methodological framework adopts the Global Reporting Initiative (GRI) guidelines. Finally, the CEPM was applied to a sample of Greek firms in order to test its effectiveness and applicability.

The rest of the paper is comprised of five sections. The first section describes the theoretical background regarding corporate environmental profiles, CSR reports and benchmarking-scoring techniques. The second section analyzes the main components of the CEPM, while the third section presents the main outcomes of the empirical analysis. In section 4, the main implications of this paper are discussed and the final section outlines the main conclusions.

## 2. Theoretical background

This section describes the theoretical background which was fundamental in the developing of the proposed methodological framework in order to measure corporate environmental profiles. Specifically, three interrelated topics are discussed: a) the conceptual analysis and definitional clarification of corporate environmental profiles, b) the links between CSR reporting and corporate environmental profiles and c) previous experience regarding benchmarking-scoring techniques.

### 2.1. Corporate environmental profiles

Many academics consider that a good corporate environmental profile is closely related to good economic performance; a number of corporate benefits are derived from improvements in corporate environmental profile, such as reputational gains, improvement of creditworthiness, enhancement of shareholder value, growth in market share and the creation of intellectual capital (Al-Tuwaijri *et al.*, 2004; Wagner and Schaltegger, 2004). The relationship economic performance and environmental profile may be explained by the fact that stakeholders request environmental information from firms in order to assess corporate strategies and their impacts on the natural environment (Funck, 2001; Høgevold, 2011). Clearly, each stakeholder group looks for specific environmental information so as to exploit opportunities and, of course, to avoid potential risks (Darnall *et al.*, 2000; Murillo-Luna *et al.*, 2008). The different motives stakeholders have for seeking out environmental information create an ambiguity in the evaluation of the overall corporate environmental profile. There are approaches which focus on production and operational processes while others on communication procedures. The stakeholder approach is successful in the case where the number of stakeholders is small (Toshi *et al.*, 2019).

More precisely, some indexes have been suggested to evaluate the environmental profiles of firms by focusing mainly on the production side. Høgevold (2011) present three aspects which could be used to evaluate the environmental profile of furniture products: assessing the utilization of the life-cycle thinking, the design of practices with less hazardous impacts on employees, and the adoption of recycled components and materials for their products. Similarly, Coltro *et al.* (2009) determine some general indexes suitable and necessary for orange farmers in Brazil (e.g. lower use of pesticides) in order to improve the product's environmental profile. Schmidt (2001) suggests life cycle thinking

as an excellent and required means to assist firms in making progress in the environmental profile of their products.

Other academics have focused on production and operational aspects in order to evaluate corporate environmental profiles. Du *et al.* (2014) assess environmental profiles by using information about corporate compliance with relevant environmental standards, the overall environmental effects of firms, the environmental impacts of corporate production and operational procedures and comparative results from corporate environmental performance. According to Guziana and Dobers (2013), corporate environmental profiles can be evaluated by means of four aspects: production, product, environmental projects and sponsorships and environmental education.

Sauter *et al.* (2002) suggested a two-steps analysis to evaluate corporate profiles through cradle-to-gate (i.e. examining manufacturing, packaging and product formulation) and cradle-to-grave (i.e. transportation, consumer use and disposal). Ibn-Mohammed *et al.* (2016) offer a comprehensive framework to assess the environmental profile of materials in a firm production system which is suitable for decision makers and consumers. Similarly, a material library was introduced by Allione *et al.* (2012) to assist decision makers in selecting materials for production systems with a better environmental profile from the cradle-to-grave point of view. Finally, Aslaksen and Synnestvedt (2003) consider that firms which invest in new, clean technologies and environmental practices can clearly communicate with key stakeholders regarding their environmental profile. They highlight that corporate environmental profiles are varied as a result of the different approaches adopted by firms regarding the level of investment and the selection of management tools in order to deal with environmental problems and challenges. Frondel *et al.* (2018) pointed out that these tools should be certified by third parties in order to bring tangible results for companies.

## 2.2. CSR reporting and corporate environmental profiles

Regardless the focal point of corporate environmental profile approach, the collection of reliable and relevant information is a necessary prerequisite for the evaluation of firms' environmental profile. Nowadays, many methods used to disclose relevant information can be classified into two categories: a) in situ data collection through questionnaire-based research techniques (Comoglio and Botta, 2012) and b) external data collection techniques

through evaluation of stand-alone CSR reports (Perrini and Tencati, 2006). The former category refers to questionnaire-based surveys which collect corporate environmental information through interviews with managers, employees and other groups of experts (Wagner, 2007; Comoglio and Botta, 2012). The latter category includes surveys based on the analysis of corporate CSR reporting published by firms (van Staden and Hooks, 2007; Guziana and Dobers, 2013).

A major part of the literature provides methodologies for assessing corporate environmental performance by analyzing CSR reports (Lozano and Huisingh, 2011). Since the information disclosed by firms in their CSR reports varies greatly (Jenkins and Yakovleva, 2006; Guidry and Patten, 2010), a significant challenge in order to analyze CSR reports is to design a standard set of appropriate indicators which would be used as a uniform approach for evaluating firms' environmental performance. An evaluating framework fulfilling these criteria forms the basis for reliable comparisons of corporate environmental profiles between firms operating in the same or different sectors.

There are a number of studies which provides useful insights into developing a standard framework for analysis of corporate environmental profiles by means of CSR reports. Specifically, Guziana and Dobers (2013) suggest three categories of information: core business operations (including production and product-related environmental profiles), environmental projects and sponsorships and environmental education. Van Staden and Hooks, (2007) suggested four categories to evaluate corporate environmental profile: management policy and systems, environmental impacts, stakeholders and financial environmental aspects. Clarkson *et al.* (2008) and Clarkson *et al.* (2011) assess the corporate environmental profile by analyzing information which shows the level of compliance with environmental legislation, the environmental impacts of firms, the corporate environmental operations and products of firms, and also data from environmental performance with respect to its competitors. Baumgartner and Ebner, (2010) suggest 21 sustainability aspects (e.g. innovation and technology, collaboration, discharges into the water, health and safety) and four maturity levels (e.g. poor, adequate, satisfactory and sophisticated) in order to evaluate corporate sustainability profiles.

However, most studies use information from CSR reports in order to examine specific aspects of corporate sustainability strategies or corporate operational processes. For example, Kolk *et al.* (2008) and Evangelinos *et al.* (2015) have offered analytical tools to evaluate carbon disclosures in order to determine the level of corporate carbon disclosure



profile. Similarly, other academics have focused on examining the water risk profile of firms through CSR reports (Mudd, 2008; Lambooy, 2011; Nikolaou *et al.*, 2014), while some academics have focused on examining how firms respond to stakeholders groups regarding various sustainability aspects (Perrini and Tencati, 2006; Prado-Lorenzo *et al.*, 2009). Finally, there are studies which examine the environmental impacts of products and others estimating the environmental impacts of corporate operational procedures (Lev and Daum, 2004; Montabon *et al.*, 2007).

The analysis of such information has shown that there are two general trends in CSR reports. The first implies the aim of firms to use an institutional language to respond to regulation requirements and competitive language to gain a privileged position in the market (O'Connor and Gronewold, 2013). This aims at overcoming the asymmetric information between firms and stakeholders which could play a critical role in the operation of firms either as a barrier or challenge to exploit new opportunities. The rate of disclosure of environmental information is associated with the power of stakeholders and the necessity for disclosing the appropriate information for each stakeholder group. With the use of a game-theoretic approach, Nikolaou *et al.* (2013) showed that stakeholders' power has a significant effect on the quantity and quality of corporate environmental disclosures.

### 2.3 Benchmarking-scoring techniques

CSR reports provide valuable financial and non-financial information about corporate sustainability profiles. To assess such information, content analysis techniques can be applied. These techniques assess the corporate environmental profile by measuring the amount of information published in CSR reports. They adopt various measurement units, such as keywords (Hahn and Lülfs, 2014), sentences (Perrini, 2005), pages (Unerman, 2000) or paragraphs (Rahman Belal, 2001). Moreover, such codifying systems are classified in two further categories such as mechanistic and interpretative (Beck *et al.*, 2010).

Nevertheless, content analysis techniques suffer from some significant weaknesses. A major weakness of content analysis is that they focus solely on the amount ("how much") of disclosures without examining the meaning ("what") of the reported information (Guthrie and Abeysekera 2006). In a similar vein, Manetti (2011) examines the engagement of stakeholders in CSR reporting procedures pointing out that content analysis techniques

are insufficient to accurately evaluate the information published in CSR reports since the number of words used as a measurement scale is explained differently from various experts. Additionally, other weaknesses lie in the text format. In particular, a different font size of the disclosed information can either underestimate or overestimate the final score of the measurement index affecting the evaluation results (Unerman 2000).

Apart from content analysis techniques, benchmarking-scoring systems are another promising tool for assessing corporate environmental profiles. Scoring systems provide a clear rating scale for evaluating the data and information disclosed by CSR reports for each of selected indicators (Daub, 2007). A wide variety of rating scales have been proposed which range from 0 "no information disclosed" to 5 "full information is disclosed" (see Nikolaou and Tsalis, 2013; Skouloudis *et al.*, 2009). For example, Daub (2007) suggested a 5-point scale to evaluate sustainability information: 0: "when no meaningful information is mentioned", 1: "when poor information is mentioned", 2: "when good information is mentioned" and 4 "when full information is mentioned". Similarly, Morhardt *et al.* (2002) suggested a 4-point scale with 0: "when there is no information", 1: "when there is brief information", 2: "when there is detail information" and 3: "when there is comparative information". In contrast to content analysis techniques which assess the amount of the disclosed information, benchmarking-scoring techniques evaluate the quality of the disclosed information. Despite the progress of such techniques on the evaluation of reported information, they have a limited scope of assessing only the quality of the CSR reports and determine the degree of their completeness in relation to international guidelines (e.g. ISO 14031, GRI guidelines). Due to the lack of formal international institutional interventions to prepare generally accepted guidelines in order to facilitate firms in measuring and presenting corporate sustainability information, non-governmental institutions (e.g. the World Business Council for Sustainable Development (WBCSD) and GRI set up voluntary actions and initiatives to develop CSR reporting guidelines. For instance, GRI has developed certain guidelines to assist firms in preparing CSR/sustainability reports based on five principles: accountability, comparability, transparency, accuracy, and clarity. Such guidelines are very useful tools for designing practical and effective benchmarking/scoring techniques since they assist in delimiting the area where suitable indicators will be designed.

Also, a drawback of scoring systems is associated with the definition of scoring levels. In many cases, the structure of a scoring system is not clearly defined and as a

consequence, experts and practitioners face practical problems during the evaluation of disclosed information. The confusion over the determination of what information is assessed by each scoring level reduces the credibility and objectivity of the assessment results (Tsalis *et al.*, 2018). Another important weakness is the lack of verification of collected information since CSR reports represent static annual information in a voluntary basis without including crucial information on the viability of business including negative information. Finally, although benchmarking-scoring techniques try to assess the content of environmental and social information, the majority fail to assess the actual corporate environmental and social performance.

### 3. Corporate Environmental Profile Methodology (CEPM)

This section presents the proposed methodological framework (i.e. CEPM) used to define and assess corporate environmental profiles utilizing data and information disclosed by CSR reports. It is an innovative framework which adopts the basic components of benchmarking-scoring techniques in order to meet the main goals of the CEPM providing an objective evaluation of firms' environmental profile. It is based on the techniques that have been suggested from many scholars in order to draw, quantify and evaluate in a systematic manner information from CSR reports (Davis-Walling and Batterman, 1997; Morhardt *et al.*, 2002; Widiarto Sutantoputra, 2009; Nikolaou and Tsalis, 2013). Each component of the CEPM is carefully designed and selected aiming to enhance its applicability and effectiveness as well as to increase the accuracy of the assessment results.

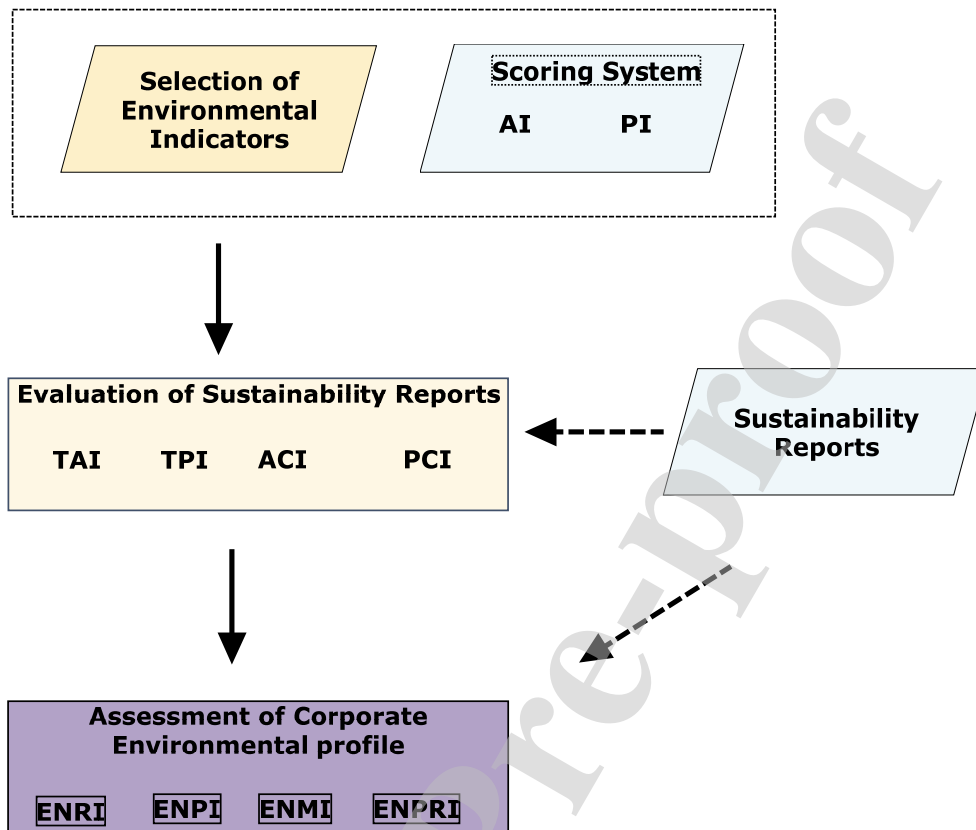


Figure 1. The flow chart for the development of Corporate Environmental Profile Methodology

Figure 1 depicts the necessary steps for the development of the CEPM. The proposed methodology is divided into three phases: The first phase of the proposed methodology is the selection of suitable environmental indicators based on basic principles such as accountability, comparability, accurately and transparency. Additionally, this phase includes the development of a scoring system used to evaluate the data and information disclosed in CSR reports. The suggested scoring system is used not only to estimate the level of corporate accountability but also the progress of corporate performance. The second phase is focused on the evaluation of CSR reports in order to gather all necessary data for estimating the corporate environmental profile (third phase). All phases and components of the proposed methodology are presented in the following sections.

### 3.1. Selection of environmental indicators.

The basis of the proposed methodology is a set of environmental indicators utilized for defining the major aspects of the corporate environmental performance essential for evaluating firms' environmental profile. Since CEPM is a holistic approach that focuses on the environmental dimension of a firm's sustainability, the selected indicators should as far as possible be associated with all impacts of business operations on the natural environment. As an integral part of the benchmarking-scoring technique, the selection of environmental indicators has to follow principles, such as accountability, accuracy, comparability and transparency (Veleva and Ellenbecker, 2001). Accountability refers to the completeness of information necessary for the comprehensive description of firms' performance on a specific indicator (Kolk, 2008), while the accuracy principle is related to the structure of each indicator. Accuracy is increased when numeric information is presented to estimate the corporate performance for a specific indicator (Dhaliwal *et al.*, 2012). Additionally, a high level of transparency and comparability is reached in a case where indicators are obtained from formal and generally accepted guidelines from international institutions (O'Dwyer and Owen, 2005; Khan *et al.*, 2011).

The GRI's G4 CSR reporting guidelines satisfy, to some degree, these principles and thus it was used as a repository of environmental indicators (GRI, 2013a, b). A practical benefit of using these indicators is that managers are able to respond to the latest challenges regarding environmental issues (Brammer and Pavelin, 2008). Moreover, the GRI indicators facilitate firms to measure and report the results of their sustainability management practices informing stakeholder groups about their efforts to contribute to the goals of sustainable development. The popularity of GRI among firms is another important factor which improves the comparability level of environmental information utilized to evaluate corporate environmental profiles (del Mar Alonso-Almeida *et al.*, 2014; Wagner and Seele, 2017; González *et al.*, 2018).

For the purpose of achieving the goals of CEPM, the GRI environmental indicators were used. Specifically, regarding the environmental dimension of corporate sustainability, GRI's G4 reporting guideline proposes 12 environmental aspects and 34 environmental indicators (GRI, 2013a, b). These indicators are classified into two categories, namely Type 1 and Type 2, based on the nature, the focal point and the definition of each indicator (Table 1). Type 1 includes indicators through which firms are able to clearly demonstrate their performance progress on various environmental aspects, whereas Type 2 indicators are descriptive indicators and in a case where firms disclose quantitative information, it

is difficult to draw safe conclusions about the progress of their environmental performance.

Table 1. Classification of GRI environmental indicators (EN)

	Type 1	Type 2
GRI Indicators	EN1, EN2, EN3, EN4, EN5, EN6, EN7, EN8, EN10, EN15, EN16, EN17, EN18, EN19, EN20, EN22, EN23, EN24, EN27, EN28, EN29, EN31, EN32, EN34	EN9, EN11, EN12, EN13, EN14, EN21, EN25, EN26, EN30, EN33
Total	24	10

### 3.2. Scoring System.

Another integral part of the proposed methodology is a scoring system devised to analyze the environmental information published in CSR reports so as to draw appropriate information for assessing the overall corporate environmental profile. The proposed system consists of two simple and easy-to-use indexes. In order to evaluate the level of accountability of firms, Accountability Index (AI) was suggested. It assesses the quality of corporate disclosures for each selected environmental indicator (Nikolaou and Tsalis, 2013). Table 2 shows the four-point scoring scale adopted for measuring AI which evaluates four discrete quality levels in relation to the disclosed information (Cantele *et al.*, 2018; Tsalis *et al.*, 2018). The majority of CSR reports cover much of such environmental information in an individual style and in various measurement units which make it very difficult to examine such information in a systematic manner (Beattie *et al.*, 2004). It is interesting to note that the last scoring level (i.e. Level D) are not used to access the environmental indicators of Type 2 (see Table 1). As stated above, due to the GRI definition and scope of these indicators, firms can fully cover these indicators by providing only qualitative information or quantitative information which hardly show the progress of firms' performance. Thus, the AI score of these indicators ranges from zero to two points.

Table 2. The scoring scale for the Accountability Index (AI)

Quality Levels	Points	Description
Level A	0	When information is not disclosed for a particular environmental indicator
Level B	1	When qualitative information is disclosed for a particular environmental indicator
Level C	2	When quantitative information is disclosed for a particular environmental indicator
Level D	3	When the disclosed information provides a clear indication of the progress of corporate performance for a particular environmental indicator

Currently, the majority of scoring techniques evaluates the quality of the information published in CSR reports satisfying the accountability principle of benchmarking-scoring techniques. But simultaneously, these techniques fail to estimate the progress of corporate performance in each selected indicator. To overcome this shortcoming and follow the accuracy principle, Performance Index (PI) was suggested which evaluates the progress of corporate performance in the environmental indicators examined (Tsalis *et al.*, 2017; Demertzidis *et al.*, 2015; Nikolaou *et al.*, 2014). Due to its objective, this index can be only applied to the quantitative environmental indicators for which CSR reports publish quantitative information demonstrating their performance progress. A three-level scoring scale is used to evaluate the performance progress of each proposed quantitative environmental indicator (Table 3).

Table 3. The Performance Index

Points	Description
0	When the performance of a particular environmental indicator is worse than the previous year
1	When the performance of a particular environmental indicator is the same with the previous year
2	When the performance of a particular environmental indicator is better than the previous year

### 3.3. Evaluation of sustainability reports

Based on the scoring system and the set of environmental indicators, four composite indexes were devised in order to evaluate the CSR reports. In order to satisfy the comparability principle, it is very useful to develop composite indexes which measure the total performance scores necessary for stakeholders to make decisions (Singh *et al.*, 2007). With this rationale, the Total Accountability Index (TAI) was suggested. It assesses the total quality of CSR reports, which ensures comparability of report quality between firms from the same or different sectors. TAI is calculated as the sum of the AI scores assigned to all environmental indicators (Equation 1).

$$TAI = \sum_{i=1}^{24} AI_{Type\ 1} + \sum_{j=1}^{10} AI_{Type\ 2} \quad (1)$$

Where  $i$  is the number of Type 1 environmental indicators and  $j$  is the number of Type 2 ones.

The value of TAI ranges from 0 to 92 points. Scores near to the highest value denotes that a CSR report provides high quality information and disclosed data for the vast majority of the selected environmental indicators. Similarly, for comparability reasons, the Total Performance Index (TPI) has been developed as the sum of PI scores achieved by each quantitative environmental indicator (Equation 2). The maximum TPI score is 48 points when a CSR report indicates that a firm has improved its performance for all environmental aspects assessed by the proposed indicators.

$$TPI = \sum_{i=1}^{24} PI_{Type\ 1} \quad (2)$$

Where  $i$  is the number of quantitative environmental indicators (Type 1).

However, due to the aggregation procedures used for the construction of composite indicators, the evaluation results may not provide the actual picture of corporate environmental profile performance (Searcy, 2012). That is to say, it is conceivable that,



in the case where a firm which has achieved an outstanding performance for several environmental indicators, a composite indicator used to estimate the overall corporate environmental performance score, which is based on a large number of indicators, might fail to inform interest parties for firm's improvements in specific aspects of environmental performance. Also it is difficult to assess the effect of the number of indicators in the score achieved by a composite indicator. For this purpose, two additional composite indexes have been suggested: Accountability Completeness Index (ACI) and the Performance Completeness Index (PCI). The former measures the number of environmental indicators for which a CSR report provides information, whereas the latter measures the number of quantitative environmental indicators for which a CSR report provides Level D information. Given the number of quantitative and qualitative indicators (see Table 1), maximum scores of ACI and PCI are 34 and 24 points, respectively.

#### 3.4. Assessment of corporate environmental profiles

As stated above, several studies analyse the quality of reports through CSR and the environmental profile of firms (Fonseca, 2010; Fernandez-Feijoo *et al.*, 2014). Some academics suggest three types of information in order to evaluate the corporate environmental profile in relation to operational, production and product environmental impacts and stakeholder issues (van Staden and Hooks, 2007; Guziana and Dobers, 2013). For the scope of this study, corporate environmental profiles are defined by the following key corporate perspectives: quality of environmental reporting practices, the completeness of environmental management and the environmental performance.

To assess corporate environmental profiles, four environmental profile indicators were developed using the equations presented in Table 4. The first indicator is the Environmental Reporting Indicator (ENRI) that evaluates the environmental disclosure practices adopted by firms. An effective environmental reporting mechanism should provide high quality information for all aspects of corporate environmental performance strengthening the accountability and transparency of firms. Given that, TAI and ACI are used to fulfil the aim of the ENRI. TAI is used to assess the quality of information published in CSR reports and the ACI to assess the extent of disclosed practices (*i.e.* the number of the disclosed environmental indicators). The second useful indicator is the Environmental Performance Indicator (ENPI) defined as the total progress of a firm's

environmental performance (TPI) in relation to the actual number of environmental indicators on which the performance has been assessed (i.e. PCI).

Table 4. Environmental profile indicators

Environmental Profile Indicators	Equations	Description
Environmental Reporting Indicator (ENRI)	$ENRI = \frac{1}{2} \left( \frac{TAI}{TAI_{max}} + \frac{ACI}{ACI_{max}} \right)$	Evaluation of corporate environmental reporting practices
Environmental Performance Indicator (ENPI)	$ENPI = \frac{1}{2} \left( \frac{TPI}{TPI_{max}} + \frac{PCI}{PCI_{max}} \right)$	Evaluation of corporate environmental performance
Environmental Management Indicator (ENMI)	$ENMI = \frac{1}{2} \left( ENPI + \frac{ACI}{ACI_{max}} \right)$	Evaluation of corporate environmental management practices
Total Environmental Profile Indicator (TENPRI)	$TENPRI = \frac{1}{3} (ENPI + ENRI + ENMI)$	Evaluation of corporate environmental profile

Another indicator is the Environmental Management Indicator (ENMI) which evaluates the management approaches and policies implemented by firms in order to deal with the environmental impacts from their daily operations. This indicator assesses both the effectiveness and the range of corporate environmental management practices. For this reason, the ENMI is based on the ENPI which assesses the outcomes of environmental strategies and the ACI that provides an indication of the diversity of management practices. The last indicator devised to assess the total corporate environmental profile is the average score of the three above indicators (TENPRI).

It is interesting to note here that each of the first three indicators (ENRI, ENPI and ENMI) evaluates a specific perspective of the environmental profile, whereas the TENPRI provides an overall assessment of the corporate environmental profile. Also, due to their structure, all indicators can take values from 0 to 1 which corresponds to an exceptional corporate performance. Also, the value 0.5 is defined as threshold value for all corporate environmental profile indicators.

#### 4. Empirical analysis

##### 4.1. Sample selection

As CEPM is a new methodological framework for evaluating corporate environmental profiles, an empirical analysis was carried out in order to test its completeness and applicability. In practical terms, through the empirical analysis, the possible advantages and drawbacks could be recognized providing valuable feedback for further improvement of the CEPM.

The empirical analysis was conducted in a sample of CSR reports published by 21 Greek firms. All firms sampled operate in various industrial sectors (such as financial services, telecommunications, energy, construction materials and material products) and they are members of the Hellenic Network for Corporate Social Responsibility which is a business association aiming to share and spread information about the latest trends in CSR and help its members to deal with new environmental and social challenges. The final sample included the latest available CSR report published by each selected firm which were gathered from research on firms' websites and the database of the Hellenic Network for Corporate Social Responsibility (available at <https://www.csrhellas.net/>, 12/8/2017). All reports were written in Greek and were published during the period 2014 to 2016. Also, it is important to stress that a code name was used for each selected firm in order to preserve their anonymity.

#### 4.2. Data analysis and results

Taking into consideration the articulation of the proposed framework, the first task of assessing the corporate environmental profile is to calculate the four composite indexes, namely TAI, TPI, ACI and PCI, for each CSR report sampled. To do so, the environmental information disclosed in the reports was meticulously examined so as to assure the accuracy of the outcomes from the environmental profile assessment of the sampled firms. Table 5 presents the values of the four composite indexes for each firm's CSR report as well as the average, minimum and maximum scores of the reports sampled.

Table 5. The results from the evaluation of CSR reports

Firms	TAI	TPI	ACI	PCI	Firms	TAI	TPI	ACI	PCI
F1	17	8	6	4	F12	40	8	15	4
F2	24	9	8	5	F13	18	4	6	2
F3	24	7	9	4	F14	37	6	15	3
F4	31	15	13	8	F15	50	14	30	8

<b>F5</b>	51	20	26	10	<b>F16</b>	33	3	12	2
<b>F6</b>	83	30	34	22	<b>F17</b>	37	18	14	9
<b>F7</b>	21	10	8	6	<b>F18</b>	44	16	16	9
<b>F8</b>	25	15	9	8	<b>F19</b>	30	13	11	7
<b>F9</b>	6	4	2	2	<b>F20</b>	51	7	24	4
<b>F10</b>	52	14	20	7	<b>F21</b>	31	10	13	6
<b>F11</b>	44	18	22	10					
		<b>TAI</b>		<b>TPI</b>		<b>ACI</b>		<b>PCI</b>	
<b>Average Score</b>		35.67		11.86		14.9		6.67	
<b>Max Score</b>		83		30		34		22	
<b>Min Score</b>		6		3		2		2	

Firm F6 had the highest score for all composite indexes. Through its CSR report, not only did firm F6 provide information for all environmental indicators (ACI=34) achieving the highest TAI score but also F6 demonstrated the progress of its performance for the overwhelming majority of the environmental aspects (PCI=22). Conversely, the results from firm F9 are disappointing. The examination of its CSR report showed that it provides scant information about the environmental performance covering only two of the proposed GRI indicators.

As a next step, the four environmental profile indicators were calculated for each firm in order to evaluate the corporate environmental profile which is the ultimate goal of this methodology (Table 6). By doing so, it was able to obtain some insights into how the selected firms deal with the challenges which arise from the environmental dimension of corporate sustainability.

According to Table 6, the obvious conclusion of the assessment of corporate profiles is that there is a lot room for further improvement as regards the sampled firms' approaches to environmental sustainability. The average score of each environmental profile indicator was below the threshold (0.5) which denotes that firms have to try hard to improve their performance in each aspect of the environmental profile. More specifically, although the ENRI's average score was the highest among the other two indicators, only 6 out of the 21 firms achieve a reporting performance above the threshold score. This implies that Greek firms have to improve their reporting practices implementing effective mechanisms in order to provide high quality information and data about all aspects of their environmental performance.

With respect to the performance perspective of the environmental profile, the results clearly indicate that firms failed in making satisfactory progress in their environmental

performance. Except for firm F6, the ENPI score of each firm was below the threshold score with firm F16 having the lowest environmental performance (ENPI=0.07).

Table 6. The evaluation of the environmental profile indicators

Firms	Perspectives of Environmental Profile			Corporate Environmental Profile
	ENRI	ENPI	ENMI	TENPRI
F1	0.18	0.17	0.17	0.17
F2	0.25	0.20	0.22	0.22
F3	0.26	0.16	0.21	0.21
F4	0.36	0.32	0.35	0.35
F5	0.66	0.42	0.59	0.56
F6	0.95	0.77	0.89	0.87
F7	0.23	0.23	0.23	0.23
F8	0.27	0.32	0.29	0.29
F9	0.06	0.08	0.07	0.07
F10	0.58	0.29	0.44	0.44
F11	0.56	0.40	0.52	0.49
F12	0.44	0.17	0.30	0.30
F13	0.19	0.08	0.13	0.13
F14	0.42	0.13	0.28	0.28
F15	0.71	0.31	0.60	0.54
F16	0.36	0.07	0.21	0.21
F17	0.41	0.38	0.39	0.39
F18	0.47	0.35	0.41	0.41
F19	0.32	0.28	0.30	0.30
F20	0.63	0.16	0.43	0.41
F21	0.36	0.23	0.31	0.30
<b>AVERAGE</b>	<b>0.41</b>	<b>0.26</b>	<b>0.35</b>	<b>0.34</b>

In a similar vein, few sampled firms had an acceptable level of environmental management performance. The average score of ENMI signifies that the environmental management policies and strategies adopted by Greek firms should be redesigned in such a way that managers can minimize the environmental impacts related to their firms' daily operations. Considering the aim of the ENMI, managers need to focus on new systematic management approaches which would help them to plan and implement effective strategies addressing all crucial environmental aspects. Such environmental management practices are an important precondition for superior environmental performance.

Finally in line with the previous findings, the results from TENPRI corroborate the poor corporate environmental profile of the selected firms. The average score of TENPRI was 0.34 which means that Greek firms do not pay sufficient attention to the environmental dimension of corporate sustainability without understanding its key role in securing their long term viability. Therefore, firms have to develop a new holistic and

multifaceted environmental approach as an essential component of the core corporate strategy which would help them to reap the benefits and avoid the risks associated with their environmental impacts. However, three firms' (F5, F6 and F15) environmental profile can be regarded as good, especially F6 which achieved an exceptional performance in all aspects of environmental profile (see Table 6). In addition, even though F5 and F15 had a good environmental profile, they should focus on improving their environmental efforts.

## 5. Discussion

This paper contributes to the relevant literature in two ways. First of all, it develops a novel benchmarking-scoring system to evaluate the corporate CSR reports complying with the fundamental principles and procedures of corporate environmental accounting. Furthermore, it constructs a new methodological framework for assessing corporate environmental profiles by utilizing three interrelated perspectives which adds a new dimension to the discussion on corporate environmental profiles.

There are currently a number of techniques that put emphasis on evaluating the quality of CSR reports by using content analysis and benchmarking-scoring systems (Morhardt *et al.*, 2002; Jose and Lee, 2007). Particularly, one significant limitation in content analysis techniques concerns the measuring of only the quantity (the amount) and not the quality (the meaning) of disclosed information (Guthrie and Abeysekera, 2006). The majority of such techniques attempt to measure the amount of environmental information through words, sentences, paragraph, and pages. This implies quantitative data useful for statistical analysis but with low interest for the environmental veracity of business performance. Although there are efforts to overcome such weaknesses by using benchmarking-scoring approaches, a basic limitation of these approaches is that the assessment criterion is the quality of information disclosed by corporate CSR reports (Nikolaou and Tsalis, 2013; Tsalis *et al.*, 2018). Another limitation is associated with the high level of subjectivity and the confusion over the definition of point-levels in the scoring systems as well as the ability of experts to effectively use these scoring scales (Skouloudis *et al.*, 2009).

To address the above limitations, the proposed benchmarking-scoring technique puts emphasis on evaluating not only the quality of disclosed information but also the actual progress of corporate environmental performance. To be more specific, an Accountability

Index has been designed (AI) in order to evaluate the level of firms' accountability regarding various corporate environmental aspects. This index only focuses on assessing how firms address the needs of stakeholders regarding environmental information. It also assists in overcoming the lack of a general accounting system which follows the Generally Accepted Accounting Principles (Al-Tuwaijri *et al.*, 2004). A well-defined and straightforward scoring scale is adopted which overcomes the subjectivity problems in the evaluation process mentioned by Skouloudis *et al.* (2009) ("how can partial and average coverage be distinguished and defined?", p.302). Moreover, by reducing subjectivity, the credibility of the evaluation results is enhanced. Owing to the clear and explicit definition of each level of the scoring scale, the subjectivity on the evaluation process owned to abilities, the perceptions and knowledge of specialists and academics on environmental issues is minimized.

An advantage of the proposed evaluation technique is the environmental performance index (PI). Thus far, the techniques suggested have mainly focused on issues of the quality, accountability and completeness of corporate CSR reporting practices (Jose and Lee, 2007). However, although corporate environmental reports disclose valuable information about corporate sustainability performance, a limited number of studies have tried to examine the progress of firms towards aspects of sustainability and measure the environmental profile of firms through quantitative data (Nikolaou and Tsalis, 2013). Given this background, this paper adopts a simple three-point scoring scale aiming to measure the actual progress of corporate performance across a range of environmental aspects. Furthermore, it is anticipated that the accountability and performance completeness indexes (ACI, PCI), used to evaluate the CSR reports, could address the concern of Morhardt *et al.* (2002) over the evaluation outcomes.

Specifically, in a case where two firms achieve the same score, it does not necessarily mean that the firms have similar performance as this can be explained in different ways (Morhardt *et al.* 2002). The suggested methodology offers the potential to assess the progress of firms in each environmental aspect. In particular, it uses a simple three-point scale to evaluate if the corporate performance in a particular environmental aspect has deteriorated or improved in relation to the previous year's performance (0 or 2 points points, respectively) or the performance has not changed (1 point). This assists researchers to draw valuable information from CSR reports regarding the environmental profile performance of firms for which, so far, very little work has been done.

The assessment of corporate environmental profiles is another significant contribution of this paper. Practical and innovative indicators are suggested to evaluate corporate environmental profiles by way of the GRI guidelines which is very popular and broadly accepted in the business community. Previous attempts to evaluate and define corporate environmental profiles concentrated on the production and operational aspects of firms (Coltro *et al.*, 2009) through normative models. This paper tries to advance the discussion on corporate environmental profiles by proposing a three perspective approach to determine corporate environmental profiles. In particular, it is suggested that corporate environmental profiles are linked with the competence of environmental management, the progress of environmental performance and the quality of environmental reporting practices.

This requires the collection of appropriate information from firms through their formal statements. However, the lack of assurance systems, certain book-keeping formats and generally accepted principles offered the opportunity to develop a framework to evaluate each corporate statement and report under certain composite indexes. The suggested framework to overcome this lack is a benchmarking-scoring methodology which evaluates such reports taking into account standard accounting principles such as accountability, transparency, comparability and accuracy. A request of many academics is to make the information released in CSR reports more transparent (Manetti and Becatti, 2009). This also offers a clear signal to management and stakeholders to make safe and transparent decisions.

## 6. Conclusion

This paper develops an integrated methodological framework to evaluate corporate environmental profiles. According to the definition of a corporate environmental profile, four indicators (i.e. ENPI, ENMI, ENRI and TENPRI) have been devised in order to evaluate profiles and their perspectives using data from CSR reports which offer significant information regarding the environmental and social aspects of firms' operations. In addition, given the lack of standard methodology to present sustainability information the widely used GRI guidelines was utilized.

An empirical analysis was carried out so as to reveal the weak and strong points of the proposed methodology. The main advantage of the CEPM is its practicability. Regardless



of the experience and knowledge of practitioners, it offers an effective way to rank firms in relation to their corporate environmental profile performance (TENPRI) or firms' performance in a specific perspective of the corporate environmental profile. Moreover, due to the simple structure of the proposed indexes and environmental profile indicators, the CEPM ensures a high level of accuracy and the objectivity of results eliminating confusion during the evaluation process. Thus, the proposed method could be a practical tool for interested parties to make decisions.

There are some limitations which could indicate future research opportunities. One significant limitation of the suggested framework is related to the recommended performance index (PI) and the scoring scale used to assess the progress of corporate performance in specific environmental aspects. Specifically, the suggested short point-scale offers a brief picture regarding the level of change in firms' environmental performance. A broad scoring scale should be developed in such a way that PI could assess the percentage of improvement or deterioration in corporate environmental performances in relation to a reference point, such as legal requirements and the performance from the previous year. Another important limitation is that firms which may be "best-in-class" could have a high PI score but a low AI one. This could be the trigger for designing some new indexes. The effect of each perspective of the corporate environmental profile should also be reexamined. The proposed framework regards that each perspective has the same influence on the environmental profile which may lead either to underestimation or overestimation in the overall corporate environmental profile performance. A possible solution could be the use of weight factors in order to calculate the different effect of each environmental perspective as well as the investigation of possible relationships between performance and accountability indexes.

Moreover, another limitation is that this paper uses only CSR reports in order to evaluate the corporate environmental profile without examining valuable information published by firms on their websites or other corporate documents and reports. Aside from CSR reports, future research should evaluate other sources of information which substantially improve the accuracy of the evaluation results. Finally, a number of new case studies are necessary in order to enhance the structure and the effectiveness of the proposed methodology. These case studies could focus on various industrial sectors in order to allow comparative analyses. This could offer good feedback for the suggested

methodology in order to redesign indicators and indexes in the light of the aforementioned limitations.

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