

Full Length Research Paper

Environmental reporting in Greece: The Athens stock exchange

Konstantinos G. Papaspyropoulos*, Vaios Blioumis and Athanasios S. Christodoulou

Faculty of Forestry and Natural Environment, Laboratory of Forest Economics, Aristotle University of Thessaloniki, University Campus, P. O. Box 242, GR-54124, Thessaloniki, Greece.

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There is a growing interest in Greece about subjects such as sustainable development, corporate social responsibility and corporate environmental performance. They are an after-effect of the international calls about the responsibility of corporations towards natural environment. Therefore, Greek corporations have started implementing practices for better environmental performance and reporting them to the public. The present research aimed to investigate Greek corporations' disclosures about their behavior towards the protection of natural environment. The research year was 2007. It examined the listed corporations in Greek stock market and tested whether there were differences among company groups in terms of environmental reporting. It also tested whether the notion that the environmentally sensitive sectors usually disclose more environment related data compared to other sectors is confirmed in the Greek context. Then the research sought on which environment related aspect tend the Greek companies to report on and finally it clustered them in similar groups of reporting extent. Among other things, the results showed that few corporations in Greece reported in 2007 on environmental issues.

Key words: Greece, Athens stock exchange, Greek corporations, protection of natural environment, environmental reporting, environmental expenditure.

INTRODUCTION

Greek companies have started the last decade to respond to international calls (Gray and Bebbington, 2001; Li, 2001; UNDSO, 2001; Rubenstein, 1994) for corporate environmental accountability. Some of them have formed the Hellenic Network for Corporate Social Responsibility (CSR) (Tsakarestou, 2005); some belong

to the centre of sustainability and excellence, and some to Eurocharity (Panayiotou et al., 2008). The implementation of an environmental management system (EMS) and the publication of external non-financial reports containing data about the protection of natural environment are also some activities towards this direction (Papaspyropoulos, 2005).

Still, though, Greece seems to be a laggard compared to other countries. This may result from the fact that in Greece, according to Halkos and Sepetis (2007), no governmental decision forces the corporations to invest in actions which would promote their environmental policy. However, according to the National Center for Environment and Sustainable Development (2009), the environmental legislation in Greece is strict and there are plenty of laws, decisions or fines which influence the operation of corporations. At the same time, this command and control strategy is the administrative approach by the Greek government which, according to Skouloudis et al. (2010), does not leave enough space to the corporations

*Corresponding author. E-mail: kodafype@for.auth.gr. Tel: +302310992341, +302310992697. Fax: +302310992695.

Abbreviations: ASE, Athens Stock Exchange market; ANOVA, analysis of variance; AR, annual report; BIC, Bayesian Information Criterion; CSR, corporate social responsibility; EMAS, eco-management and audit scheme; EMS, environmental management system; EPA, environmental performance aspect; EPI, environmental performance indicator; ER, environmental report; EU, European Union; GRI, Global Reporting Initiative; ISO, International Standardisation Organisation; PCA, principal component analysis.

in Greece in order to develop proactive actions for the benefit of natural environment.

On the other hand, in terms of environmental reporting, there is not a set of indicators for the disclosure of environmental related data created by a Greek Institution. Bithas et al. (2005) suggest a set of indicators for sustainable development, while Panayiotou et al. (2009) and Aravossis et al. (2006) suggest some methods for the evaluation of CSR and not in particular for corporate environmental policy; but all this methodology is not yet broadly implemented. Tsakarestou (2005) argues that it is the fact that 90% of all Greek companies are small and medium-sized enterprises which makes difficult the implementation of environmental responsible actions by their side.

However, there are few leaders in subjects that are related to corporate environmental responsibility. After the launch of eco-management and audit scheme (EMAS) in 1995 and international standardisation organisation (ISO) 14001 series in 1996 (Abeliotis, 2006), some Greek corporations started implementing them, trying to improve their environmental performance. Abeliotis (2006) mentions, that in March, 2005 six corporations were using EMAS. The author states that it was mostly the expectations for an improved image of the company that drove them to the implementation. Georgiadou and Tsiotras (1998) found out that the three critical factors for the implementation of ISO 14001 by Greek corporations were (i) the improved image of the company, (ii) the increase in quality and reduction of costs, and (iii) the protection of the environment. The ISO Survey (2009) showed that in December, 2008 there were 463 Greek companies having implemented ISO 14001. The implementation of these systems drove Greek corporations to the publication of CSR, environmental report (ER) and, most recently, sustainability reports following the example of their international counterparts. Although, the release of such reports takes place voluntarily, Karatzoglou (2006) mentions that some of the main factors which motivate the Greek corporations to publish sustainability reports are: (i) European Union (EU) recommendation 2001/453, (ii) the implementation of EMS like ISO 14001 and EMAS, (iii) Global Reporting Initiative (GRI) guidelines, (iv) the Greek Law 3016/2002 for the corporate governance, and (v) the implementation of white and green books adopted by the European commission.

By using these voluntary reports, together with other environmental information included in Greek corporate websites, the present research examines the extent of environmental reporting in Greece. More specifically the objectives of the present research are: (i) to examine if there are differences among Athens stock exchange market (ASE) company sectors in terms of environmental reporting, (ii) to test if the stated in the literature notion (Cho and Patten, 2007) that the environmentally sensitive sectors usually disclose more environment related data

compared to other sectors is confirmed in the Greek context, (iii) to seek on which environment related aspect tend the Greek companies to report on and (iv) to cluster them in groups according to their reporting extent.

THEORETICAL FRAMEWORK - LITERATURE REVIEW

Generally about environmental reporting

The need to report on environmental issues has been recognized since the 1970s. According to Wiseman (1982), in 1973 the study group of financial statements in USA advised that a basic objective of the corporate reporting should be the disclosure of the activities undertaken by corporations for the protection of natural environment. According to Gray and Bebbington (2001), though, before the 1990s business was seeing environmental issues as peripheral to its core activities. It was in the 1990s and especially after the Rio de Janeiro Earth Summit in 1992 that the environmental issues started appearing more systematically in the business agenda (Etzion, 2007).

Corporate environmental reporting is an activity which can include (Gray and Bebbington, 2001, p. 241):

“outlines of the organization’s attitude to the environment, glossy pictures of ‘bits of the environment’, reference to EMS and environmental audit, tables showing selected data on the levels of emissions and wastes produced by the organization and suggestions about levels of environmental investment”.

In the academic literature the subject of environmental reporting has been researched from a theoretical point of view (Gray et al., 1995), in the context of the businesses of whole countries (Toms, 2000), in order to compare the reporting extent of environmental sensitive industries (Stray, 2008), or in order to examine it at the international level (Aerts et al., 2008; Montabon et al., 2007).

Most of this body of literature connects corporate environmental reporting to corporate environmental performance. Indeed, Gray and Bebbington (2001) believe that environmental reporting is an “essential component” for the improvement of the environmental performance of corporations. However, the connection of the two terms remains problematic.

The difficulties in connecting the concepts of environmental performance and environmental reporting (Toms, 2000) have been thoroughly discussed in the literature. Moreover, Ilinitch et al. (1998) give a variety of definitions for environmental performance, which show the difficulties in interpreting the real meaning of the term. Walden and Stagliano (2003) present the results of various researches which conclude that there is no relationship between environmental performance and environmental reporting. Cho and Patten (2007) refer to

the same difficulty; however, they present also researches that find a positive relationship between the two concepts for example, (Al-Tuwaijri et al., 2004). Clarkson et al. (2008) find a positive relationship between voluntary environmental reporting and environmental performance. Arimura et al. (2008), at the same time, believe that the publication of an organization's environmental report will reduce its negative impact on the environment in the long run.

If it is so complex to relate the two concepts, maybe, indirect ways of doing so are needed. For example, Clarkson et al. (2008) argue that if environmental reporting has been applied using the GRI's guidelines, then this is a good indication that the corporation performs better in environmental issues compared to non-GRI users, while White (2005) evaluates GRI environmental guidelines as a good measure to ensure that a company tries to reduce its negative environmental impacts.

Global reporting initiative and the environmental performance indicators

GRI is a multistakeholder network which was established with the help of the Coalition for environmentally responsible economies (CERES) and the United Nations Environment Program (UNEP) (Willis, 2003). Its main scope is to promote organizational accountability through the publication of sustainability reports (GRI, 2009), equivalent to that of financial reporting (Willis, 2003). Nowadays, there is a growing number of organizations which use GRI indicators (economic, social, environmental, human rights) and especially its third release (G3 3rd generation guidelines) published in 2006 (GRI, 2006) (<http://www.globalreporting.org>). According to Brown et al. (2009), G3 guidelines are "the best-known framework for voluntary reporting of environmental and social performance by business and other corporations worldwide". Jasch (2009) mentions that there is lately a shift by corporations in EU to present their reports according to GRI guidelines producing generic 'sustainability reports'. Ball et al. (2006), also, consider GRI guidelines as a praiseworthy attempt to promote sustainability reporting by corporations.

The GRI G3 environmental indicators are thirty in total shown in detail in Table 1, and they are grouped into nine aspects. These aspects are (i) materials, (ii) energy, (iii) water, (iv) biodiversity, (v) emissions, effluents and waste, (vi) products and services, (vii) compliance, (viii) transport and (ix) overall (expenditures for the environment). Seventeen out of the thirty indicators are considered core indicators, while the rest are considered additional indicators. Each indicator is coded with the letters "EN" and the corresponding number follows. GRI (2006) gives a detailed presentation of each indicator and how it has to be calculated.

GRI guidelines have been used in the literature for the examination of corporate environmental reporting (Clarkson

et al., 2008), or generally sustainability reporting in the Greek context (Skouloudis et al., 2007; Skouloudis et al., 2010), and they are used also in the present research as it will be presented in the 'Methodology'. It has to be mentioned, however, that there are also researchers who find some drawbacks in GRI guidelines in terms of sustainable development (Moneva et al., 2006).

METHODOLOGY

Content analysis and data collection

Content analysis (Krippendorff, 2004) has been used widely by various researchers who examined the environmental reporting of corporations (Montabon et al., 2007; Stray, 2008; Wiseman, 1982). According to Riffe et al. (2008, p. 25):

"Quantitative content analysis is the systematic and replicable examination of symbols of communication, which have been assigned numeric values according to valid measurement rules and the analysis of relationships involving those values using statistical methods, to describe the communication, draw inferences about its meaning, or infer from the communication to its context, both of production and consumption".

Stray (2008) mentions that content analysis, requires that one has a set of categories into which data is coded. A decision also has to be taken as to what the unit of analysis is to be such that it can be coded into the categories. For the present research, the set of categories was chosen to be the GRI environmental guidelines (G3 version) as they were previously presented and the unit of analysis was the firm, and particularly the corporations listed in the Greek Stock Market.

For the application of the methodology all the 270 corporations were chosen, which were listed in the three main categories (i) Big capitalization, (ii) Mid and small capitalization, (iii) Special features and 18 sectors of ASE in July, 2008. Aerts et al. (2008), Ponnun and Okoth (2009) have also worked with corporations that are listed in stock markets in order to examine corporate environmental and social responsibility disclosure respectively. Halkos and Sepetis (2007) have worked with corporations from ASE in order to examine the relationship between the stock values of corporations that implement or not implement an EMS.

Data were collected by exploring the internet websites of every organization. Patten and Crampton (2003) have also used data obtained by corporations' websites in order to examine for their environmental accountability. They did so since "most major corporations have taken advantage of the medium by creating company web pages that provide information about their firms". Besides, according to Rowbottom and Lymer (2009) there is a number of researchers who confirm that there is now more sustainability information on organization's website comparing to their traditional 'hard copy' reports.

The content analysis was performed by three researchers. The one was the first author of the present research and the other two were young researchers. No one of the three people had previous experience in content analysis. Milne and Adler (1999) suggest that for total disclosures analysis inexperienced coders can be relied on, and for more detailed analysis, training with 20 reports is adequate for the reliance of such coders. Therefore, for all the 270 corporations' websites, the three researchers worked separately, and discussed thoroughly the differences in their separate results, in order to come to common conclusions for each organization. After the first 30 corporations, the differences were negligible. Since all the coders examined all the 270 websites and then discussed

Table 1. GRI G3 environmental performance indicators.

Environmental performance Indicator (according to GRI – G3 environmental guidelines)	
Aspect: Materials	
EN1*	Materials used by weight or volume
EN2*	Percentage of materials used that are recycled input materials
Aspect: Energy	
EN3*	Direct energy consumption by primary energy source
EN4*	Indirect energy consumption by primary source
EN5	Energy saved due to conservation and efficiency improvements
EN6	Initiatives to provide energy-efficient or renewable energy-based products and services, and reductions in energy requirements as a result of these initiatives
EN7	Initiatives to reduce indirect energy consumption and reductions achieved
Aspect: Water	
EN8*	Total water withdrawal by source
EN9	Water sources significantly affected by withdrawal of water
EN10	Percentage and total volume of water recycled and reused
Aspect: Biodiversity	
EN11*	Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas
EN12*	Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas
EN13	Habitats protected or restored
EN14	Strategies, current actions, and future plans for managing impacts on biodiversity
EN15	Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk
Aspect: Emissions, effluents and waste	
EN16*	Total direct and indirect greenhouse gas emissions by weight
EN17*	Other relevant indirect greenhouse gas emissions by weight
EN18	Initiatives to reduce greenhouse gas emissions and reductions achieved
EN19*	Emissions of ozone-depleting substances by weight
EN20*	NO _x , SO _x , and other significant air emissions by type and weight
EN21*	Total water discharge by quality and destination
EN22*	Total weight of waste by type and disposal method
EN23*	Total number and volume of significant spills
EN24	Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally
EN25	Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the reporting organization's discharges of water and runoff
Aspect: Products and services	
EN26*	Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation

Table 1. Contd.

EN27*	Percentage of products sold and their packaging materials that are reclaimed by category
Aspect: Compliance	
EN28*	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations
Aspect: Transport	
EN29	Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce
Aspect: Overall	
EN30	Total environmental protection expenditures and investments by type

*Core indicators.

and corrected their differences, there was not a need to compute a measure of inter-coder reliability (Stray, 2008).

The coders searched for (i) availability of CSR reports, which may contain environmental information, (ii) availability of ER, (iii) available environmental data in the AR, (iv) data available only on the html pages of the websites. The reports had to refer to 2007 otherwise the last available report was analyzed. The researchers recorded those corporations that used an EMS (either v) ISO14001, or (vi) EMAS), and those that were using (vii) GRI guidelines. All these were the 7 categorical (dichotomous) variables of the analysis. Those that revealed financial information about their expenditure on environment related actions were also recorded. For every organization it was recorded how many of the thirty environmental performance indicator (EPI) were disclosed in their website available reports, or simply in their website, and to which environmental performance aspect (EPA) was corresponded. Although, many researchers have used different approaches in order to test the quantity and quality of the available information, that is a 5-point scale (Van Staden and Hooks, 2007), the number of sentences (Hughes et al., 2009), or the number of words (Neu et al., 1998), in the present research only the presence or absence of each indicator was examined.

In order to credit an EPI to the organization, the disclosure had to be fully under the GRI guidelines. For example, if an organization revealed only that it recycles paper, it was not credited an EPI. If it revealed that it recycled x tons of paper in 2007, it was credited an EPI. So, by this condition, when a core GRI, EPI (coreEPI_i) was present, the Greek organization was granted one point. When an additional GRI, EPI (addEPI_j) was present, the organization was granted 0.5 point. The EPI score (EPIScore) then was estimated by Equation 1.

$$EPIScore = \sum_{i=1}^{17} coreEPI_i + \sum_{j=1}^{13} addEPI_j \quad (1)$$

Thus, the total EPI score that a Greek organization could have achieved was 23.5 points. Equation 1 was also used for the estimation of EPA score. The EPI from every aspect were aggregated in order to extract the EPA score. EPI score and the nine EPA scores were the continuous variables of the analysis. Analogous work has been conducted by Freedman et al. (2003),

who were looking if each indicator of their index was mentioned in disclosures or not. They additionally weighted each indicator according to its importance with a maximum score of 15 points. Finally, it has to be mentioned that for the corporations that had already an assured GRI sustainability report, where it was indicated which EPI were disclosed, EPI score was estimated straight from this source and no content analysis was performed.

Statistical analysis

The collected data were analyzed firstly by means of descriptive statistics (Bradley, 2007) in order to check for general attributes and common practices of environmental policy. Then, a multiple response sets analysis was conducted (Kinnear and Gray, 2008; Jann, 2005), in order to estimate how many corporations disclose each EPI. The non-parametric tests Kruskal-Wallis H and Mann-Whitney U and the parametric Z-test (Kinnear and Gray, 2008) were used to test for differences of environmental reporting among the three main categories and the 18 sectors of corporations in ASE in terms of GRI EPA. They were preferred to one way ANOVA and independent samples t-test, because variables included less than 30 counts and they didn't present the assumption of normality (Kinnear and Gray, 2008).

Principal component analysis (PCA) (Hair et al., 2006) was then used to test which the main EPAs that Greek corporations usually disclose are. PCA extracts less new variables (components) comparing to the old ones, which represent most of the information contained in the data (Papaspypopoulos et al., 2008). The components are uncorrelated among themselves which is actually a prerequisite for the use of the two step cluster analysis. The latter was applied in order to form clusters which would reveal the best corporations in terms of environmental reporting in Greece. The two step cluster method is a scalable cluster analysis algorithm designed to handle both continuous and categorical variables and to extract the optimum number of clusters (Norusis, 2007). This number is decided on the basis of Schwarz BIC (Okazaki, 2006).

After forming the clusters and examining the contribution of each component and each dichotomous variable in the clustering procedure, ANOVA and post hoc tests were used in order to examine how well the clusters discriminate from each other (Ross-Davis and Broussard, 2007). All the statistical analysis was conducted with the use of the statistical software SPSS 16.0 and

Table 2. ASE capitalization category and its environmental reporting policy.

ASE categories	Total	Environmental reporting	%	CSR report	ER	AR	Html pages
Big	82	45	54.9	12	6	11	33
Mid and small	163	36	22.1	3	4	16	27
Special features	25	9	36.0	1	0	5	4
Total	270	90	33.3	16	10	32	64

Table 3. EMS and GRI implementation by ASE corporations.

ASE categories	ISO14001	%	EMAS	%	GRI	%
Big	21	22.0	7	9.8	9	11.0
Mid and small	19	11.0	6	3.1	0	0.0
Special features	2	8.0	0	0.0	0	0.0

the significance level was set at $p=5\%$.

RESULTS

Attributes of environmental reporting in ASE

Table 2 shows the distribution of Greek corporations in ASE according to their capitalization, how many of them disclosed data about the protection of natural environment, and which medium they used in order to do so. The 33.3% (90 out of 270) of them revealed information about actions for the protection of natural environment, including those which revealed just minor information. Most of them used the html pages of their websites to publish this information, instead of CSR reports or ER, showing that in 2007 there was a small trend for issuing reports with data concerning natural environment. The chi-square value 26.487 ($df=2$) was significant beyond the 0.001 level revealing differences in reporting practices among organizations. The Z-tests showed that the proportion of big capitalization corporations which report about environmental issues is significantly larger in the 0.05 level compared to the proportion of mid and small capitalization, in which the trend was not to report on environmental issues. The special features group did not show differences with the two other categories implying that the proportion of corporations which report on environmental issues is the same compared to big, mid and small capitalization corporations.

Table 2 indicates a generally low extent in terms of environmental reporting in Greece. This is confirmed also by Table 3, which shows how many of the ASE organizations implemented an EMS, which can be a determinant for issuing an environmental report (as it was discussed in introduction). It also shows how many of them reported according to GRI guidelines. There was an explicit preference in ISO 14001 comparing to EMAS,

however, only 45 out of 270 corporations used an EMS (10 out of 45 use both ISO14001 and EMAS). There was also a low GRI implementation which might serve as an indication that ASE corporations were not aware of this reporting scheme. The investigation of which EPI the corporations disclose showed that only 39 out of 270 corporations could receive a GRI EPI score. Table 4 shows the distribution of these 39 corporations to each GRI EPI.

Greek corporations reveal mostly data for the EN22 indicator. This is the indicator which includes materials recycling, and this is one of the most common actions undertaken by them. The rest of the analysis was continued with these 39 corporations that were credited an EPI. This means that their EPI score was at least half point according to Equation 1. Table 5 shows the descriptive statistics of the EPI score by ASE category. Table 5 reveals low EPI scores by Greek corporations (lower than 6 points out of 23.5). The 75% of the corporations in both categories have an EPI score lower than 7 points. Special features corporations did not receive an EPI score. The application of the Mann-Whitney U test revealed that there is no difference in reporting levels between big, mid and small capitalization categories in ASE. The test statistic is 144.0 ($df = 1$) and its p -value = 0.754 > 0.05. Consistent with this result, also, is the fact that no significant difference was revealed for the mean expenditures the big, mid and small capitalization corporations make for the protection of natural environment, although, someone could have expected the opposite. Mann-Whitney U test statistic was 30 ($df = 1$) and p -value = 0.85 > 0.05. Table 6 shows that Greek corporations have spent almost 590 millions €. It has to be mentioned, though, that it was not clear whether all these amounts of money were spent in 2007 or earlier, and that they are the expenditures that ASE corporations disclosed on the websites when they were discussing environmental issues. Table 7 shows the EPI scores that ASE sectors received.

It is observed that only two sectors, Oil and Gas, Food and

Table 4. Quantity of Greek corporations revealing each GRI EPI (max 39 out of 270).

EPI	ASE corporations	EPI	ASE corporations	EPI	ASE corporations
EN1	14	EN11	2	EN21	11
EN2	8	EN12	2	EN22	24
EN3	14	EN13	4	EN23	12
EN4	11	EN14	11	EN24	4
EN5	7	EN15	1	EN25	2
EN6	13	EN16	9	EN26	5
EN7	9	EN17	4	EN27	2
EN8	16	EN18	11	EN28	4
EN9	3	EN19	5	EN29	2
EN10	3	EN20	11	EN30	20

Table 5. Score of Greek corporations revealing GRI EPIs by capitalization category (max 23.5).

ASE categories	Corporations granted an EPI	Mean EPI score	SD	Max EPI score
Big	28	5.54	5.94	20.50
Mid and small	11	4.00	3.16	8.50
Special features	0	-	-	-
Total	39			

Table 6. ASE corporations' expenditure for environmental actions (million €).

ASE categories	Cost of environmental actions				
	N	Mean	SD	Max	Sum
Big	16	34.24	58.58	184.00	547.89
Mid and small	4	11.64	8.41	20.00	46.56
Special features	0	-	-	-	-

and Beverage, received an EPI score higher than 10, while there are five sectors, Health Care, Media, Insurance, Real Estate and Technology which did not receive an EPI score. The companies in these sectors, however, are mostly service companies that produce low expectations and visibility. The application of the Kruskal-Wallis H test did not reveal any differences among the ASE sectors in terms of reporting extent. The chi-square value of the test was 7.035 (df = 9) and its p-value 0.633 > 0.05, showing that in general there is the same reporting extent by ASE sectors about environmental issues. Table 8 shows the mean EPA score for the two ASE categories.

These are the subjects that ASE corporations are used to report on. Both in big, mid and small capitalization, corporations mostly report on the aspect emissions, effluents and waste, with energy aspect following. Both categories, though, are far from the maximum score that they could have received in both aspects. The application of the Mann-Whitney U test revealed that there is no significant difference between the two ASE categories. Both report on the same aspects and receive similar

EPAscores.

Environmental reporting clusters in ASE

In order to form clusters according to the extent of environmental reporting in ASE, two step cluster analysis had to be applied. Thus, PCA was needed so as to extract new uncorrelated continuous variables out of the nine EPA variables. The application of the PCA extracted three components with an eigenvalue of 4.696, 1.348, and 1.013 respectively, which explained the 78.41% of the total variance of the nine GRI EPA scores. This is a generally acceptable percentage (Hair et al., 2006). After the rotation of the components loadings, Table 9 was extracted, which shows the EPAs that are related to each component.

The first component has very high loadings with the GRI, EPAs water, energy, emissions, materials, and transport. This reflects a tendency of the Greek corporations to reveal mostly data about these environment related aspects. The three components from the PCA

Table 7. Score of Greek corporations revealing GRI EPIs by sector (max 23.5).

ASE sector	Total	Environmental disclosure	Environmental disclosure with EPI	Mean EPI score	Max EPI score	Min EPI score
Oil and gas	3	3	2	13.00	19.00	7.00
Chemicals	9	4	3	4.33	6.50	0.50
Basic resources	16	11	6	3.42	9.00	1.00
Construction and materials	26	8	3	9.00	20.50	0.50
Industrial goods and services	28	10	5	3.50	8.00	1.00
Food and beverage	28	12	2	10.50	20.00	1.00
Personal and household goods	38	10	2	4.50	8.50	0.50
Health care	8	2	0	-	-	-
Retail	14	3	1	1.50	1.50	1.50
Media	13	0	0	-	-	-
Travel and leisure	16	5	3	3.67	7.00	0.50
Telecommunications	2	2	1	7.00	7.00	7.00
Utilities	5	4	1	6.00	6.00	6.00
Banks	15	8	6	6.00	13.50	1.00
Insurance	4	0	0	-	-	-
Real estate	9	3	1	0.50	0.50	0.50
Financial services	13	2	2	0.75	1.00	0.50
Technology	23	3	1	1.50	1.50	1.50
Total	270	90	39	5.10		

Table 8. Mean score of Greek corporations at every GRI EPA.

EPA	Capitalization		Mann-Whitney U test
	Big	Mid and small	
	Mean	Mean	p-value
Materials (2)*	0.61	0.45	0.620 ^{ns}
Energy (3.5)*	1.07	0.86	0.595 ^{ns}
Water (2)*	0.48	0.50	0.888 ^{ns}
Biodiversity (3.5)*	0.38	0.14	0.545 ^{ns}
Emissions, effluents, and waste (8.5)*	2.32	1.77	0.962 ^{ns}
Products and services (2)*	0.21	0.09	0.629 ^{ns}
Compliance (1)*	0.14	0.00	0.191 ^{ns}
Transport (0.5)*	0.04	0.00	0.369 ^{ns}
Overall (0.5)*	0.29	0.18	0.249 ^{ns}
Total mean score (23.5)*	5.54	4.00	

*parenthesis indicates the maximum EPA score, ns: not significant difference in p=0.05.

application were then manipulated as the new scale continuous variables of the analysis and, together with the seven categorical (dichotomous, 1: Yes, 0: No) variables, they were applied in the two step cluster analysis. The latter indicated that a four-cluster solution was the best model, because it minimized the BIC value and the change in the BIC value between adjacent numbers of clusters (BIC = 183.73; BIC change = -2.79).

The resulting clusters A, B, C, and D contained 8, 8, 8, and 15 corporations, which corresponded to 20.5, 20.5, 20.5, and 38.5%, respectively. All the 39 corporations

were grouped. Six out of the 10 variables were found to have a significant result to the form of the clusters. These variables were CSR report, ER, EMAS, GRI, and the first two components. In Table 10 the attributes of each cluster in terms of the significant variables is presented. The components are presented in terms of the initial variables that they are correlated to.

Cluster A included the corporations which reported most on environmental issues. They were the corporations that implemented the GRI guidelines for the preparation of their sustainability reports. They implemented

Table 9. Component loadings for each EPA*.

Rotated component matrix	Component		
	1	2	3
waterEPA	0.934		
energyEPA	0.848		
emissionsEPA	0.817		
materialsEPA	0.817		
transportEPA	0.934		
complianceEPA		0.864	
productsEPA		0.851	
overallEPA		0.637	0.767
biodiversityEPA			0.680

Extraction method: Principal component analysis, Rotation method: Varimax with Kaiser normalization. *Shown only loadings > 0.6.

Table 10. Clusters of Greek corporations according to their environmental reporting.

Environmental reporting	Clusters of Greek corporations			
	A (n=8)	B (n=8)	C (n=8)	D (n=15)
CSR report	8	0	7	0
ER	0	7	3	0
EMAS	2	8	0	0
GRI	8	0	1	0
MaterialsEPA (2)*	1.25 ^D	0.75	0.38	0.20
energyEPA (3.5)*	2.25 ^{C,D}	1.50	0.56	0.33
waterepa (2)*	1.12 ^{C,D}	0.81 ^{C,D}	0.19	0.13
EmissionsEPA (8.5)*	4.38 ^{C,D}	3.19 ^D	1.62	0.73
ProductsEPA (2)*	0.63 ^{B,D}	0.00	0.25	0.00
ComplianceEPA (1)*	0.50 ^{B,C,D}	0.00	0.00	0.00
TransportEPA (0.5)*	0.13 ^D	0.00	0.00	0.00

*indicates the maximum EPA score, ^{B,C,D}: indicate significant difference of clusters B,C,D with cluster A at p=5% (Tukey's post hoc tests).

an EMS (five use ISO 14001 and two EMAS) and they scored higher than the others in most of the EPA. Four corporations from the service and four from the manufacturing sector were included in this cluster.

Cluster B included ASE corporations that did not use GRI guidelines, but all of them used the EMAS EMS (five of them used both EMAS and ISO14001) and published an ER. They had lower scores in terms of EPA, but they were not significantly different to Cluster A at p=5%. This may be an indication for the strictness that EMAS has as an EMS, and it maybe a reason why it was not so popular among Greek corporations.

Cluster C included corporations which, although they published CSR reports and ER, they scored significantly low at EPA, comparing to Cluster A and B. They did not implement EMAS, but seven out of eight implemented ISO14001. This may confirm that ISO14001 is not such a strict EMS as EMAS, and thus it is preferred by Greek corporations which want to upgrade their environmental

performance. This preference is also proved by Lagodimos et al. (2007), and is supported by the research of Delmas (2002) which showed that in Europe "governments have encouraged the adoption of environmental management standards by setting up a rusted certification system and providing technical assistance to potential adopters". Finally, cluster D included the corporations which reported the less in terms of environmental information. They did not publish reports, nor used EMAS (seven out of 15 use, though, ISO 14001), and they had very low EPA scores, although, they were not statistically different compared to cluster C implying that they reported the same extent in terms of GRI environmental aspects through their websites. Apart from the previous four clusters which were extracted with the two step cluster analysis, two more clusters have to be mentioned. The first one is the one with the 51 corporations that disclosed minor information about the environment, but did not receive an

EPIscore. These corporations usually mentioned in their websites either that they just use an EMS (not naming it), or that they try to use environmental friendly technologies (without further explaining). The second one includes the rest 180 corporations (more than 65% of ASE corporations) of the analysis which made no reference to environmental related issues.

DISCUSSION

The present research found a relative low extent of environmental reporting by ASE corporations. This may result from the fact that CSR or ER seem to be still an emerging task for them. Indeed, from the content analysis it was found that the maximum years of publishing CSR reports by an ASE corporation was 7 years, while the maximum years for ER was 5 years. This result is also consistent with the research by Skouloudis et al. (2010) who found out a significant low extent of reporting on environmental issues when they examined the reports of sixteen leading corporations in Greece in terms of CSR reports for the year of 2005. It is confirmed, too, by the research of Gjolberg (2009) who tested the CSR reporting practices, which usually include references to environmental actions, by 20 nations and found out that Greece is among the laggards.

According to Skouloudis et al. (2010), Floropoulos (2004) found out that less than ten out of 351 ASE corporations (2.85%) provided environmental information during the period 2000-2004 in their financial statements. The present research, however, shows that this picture had slightly increased in 2007. At least 32 ASE corporations out of 270 (11.85%) had included environmental information in their annual reports, while there were 90 which were discussing such issues at least at one of four media (CSR report, ER, AR, html pages).

The proportion of big capitalization corporations which report on environmental issues is statistically greater compared to the proportion of the mid and small capitalization corporations. This is consistent with the finding of Etzion (2007) that "small firms are understood to face lesser external pressure, to be less knowledgeable about environmental issues, and to be concerned with other matters more central to their very survival".

However, the extent of environmental reporting was not found different across the capitalization categories or the different sectors in ASE. The similarity was confirmed statistically both in monetary and non-monetary reporting. Although, one would expect at least big capitalization corporations would report more expenditure compared to their mid and small counterparts, this proved not to be the case. This, also, may result from the fact that, as noted in the introduction section, almost 90% of the Greek corporations belong to the mid and small sector, which, as shown by Etzion (2007) usually do not concern with environmental issues.

ASE corporations disclose data mainly about their

amounts of waste and their disposal method, followed by data about water use, materials and energy use and initiatives for more efficient operation. However, in total they are less than 25 who report on these issues, less than 10% of all the ASE corporations. This is consistent with Skouloudis et al. (2010) research who found that there is a low extent of reporting on the above issues generally by Greek corporations.

Big, mid and small capitalization categories report mostly on the GRI, EPA "emissions, effluents and waste", but this is because in this aspect, materials' recycling is included. This action is quite popular among ASE corporations, as it was previously mentioned, however, it does show that there is not a tendency for establishment of new technologies or practices which could potentially reduce or make more efficient the materials and energy used for their operation. This is in contrast with recent literature which believes that the next step for sustainability will be the road to a zero-waste society (Ball et al., 2006).

As shown in literature review, it is not clear whether environmental reporting is positively or negatively correlated, to environmental performance, or the two concepts are uncorrelated. Thus, no conclusion can be drawn by the evaluation of the ASE corporations' environmental reporting. However, the fact that corporation in Cluster A report according to GRI guidelines is an indication of good environmental performance. Clarkson et al. (2008) state that the voluntary decisions by corporations to prepare a CSR report according to GRI guidelines means that "the firm has opted for a format (the GRI format) that, by the intent of the GRI guidelines, will result in hard disclosures not easily mimicked by the poor environmental performers". The application of two step cluster analysis allowed discrimination among ASE corporations to be revealed. The eight corporations in cluster A, coming from service and manufacturing sectors, reported significantly more especially in terms of the GRI aspects products and compliance, issues that all the other Clusters did almost not discuss.

Cho and Patten (2007) proved that monetary reporting is higher in environmentally sensitive industries. In the Greek context, this conclusion could not be confirmed, since both capitalization categories spend statistically equal amounts for natural environment. This is the case also for the non-monetary environmental reporting. Cho and Patten (2007) proved that the environmentally sensitive industries disclose more environmental information compared to other sectors. The analysis in the present research showed that there is an equal extent of non-monetary environmental reporting which cannot either confirm or not confirm the above finding in the Greek context. ASE corporations both in terms of capitalization and in terms of sectors disclose the same amount of data. It has to be mentioned that Cho and Patten (2007) draw their results on the basis that corporations use environmental report as a tool for legitimacy, but this hypothesis has to be tested in another research regarding

the legitimizing practices of Greek corporations.

Another possible future research could deal with the assurance of the ASE environmental reports. External assurance of such reports is very important in order to increase the confidence of report users concerning the reliability of the disclosed environmental data (O'Dwyer and Owen, 2005; Owen, 2007). The present research did not examine in detail the assurance practices of ASE corporations, something which is a limitation of the study; however, a general finding was that the only corporations mentioning the subject were those that used the GRI, EPI in order to disclose their environmental information.

Conclusions

The present research evaluated ASE corporations about their reporting for their behavior towards the protection of natural environment. By using a content analysis framework, all ASE listed corporations, and the GRI, EPI (G3); it was proved that there is a low extent of environmental reporting by Greek corporations. More than 65% of the population does not report on implementation of EMS or other environmental actions. The 20% of the rest ASE corporations report just minor information related to environmental issues. The proportion of big capitalization corporations which report on environmental issues is statistically greater than mid and small capitalization corporations, but no difference was found for the extent of environmental reporting between capitalization categories and sectors in ASE. There was, also, no difference in terms of the GRI environmental aspect that was disclosed by the corporations. Although, four clusters were created by the application of two step cluster analysis, they were discriminated mostly in terms of the medium of reporting that they use and less in terms of the extent of their reporting. However, Cluster A with corporations from service and manufacturing sector seemed to be the one with the higher extent of reporting. Maybe this is because this cluster uses GRI guidelines for the publication of its reports. An additional conclusion of the research is also that the corporations that implement EMAS report relatively more environmental data compared to those which use ISO 14001. Future work should compare these findings, which are for the fiscal year 2007, with the reports from the following years in order to find out whether more Greek corporations have augmented their environmental accountability, and whether or not they assure the reliability of their environmental reports.

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