# ENVIRONMENTAL COSTS, SOCIAL RESPONSIBILITY AND CORPORATE FINANCIAL PERFORMANCE - A CLOSER EXAMINATION OF JAPANESE COMPANIES

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**ABSTRACT**

As one of the leading countries in the environmental conservation efforts, Japan has made much progress in recent decades. The role of environmental accounting (EA) within Japan is divided into internal and external functions. Internal functions deals with the management of environmental conservation costs and activities. It promotes effective environmental conservation activities through an adequate decision making process. External functions of the EA include public reporting of environmental costs and effects of a company. By disclosing a quantitative measurement of such activities, it opens up the company to further progress. These quantitative measures are environmental conservation costs referring to investment and expenses which help companies keep track the progress in the processes. The purpose of this paper is to provide a closer examination of the relationship between the companies reported environmental costs, corporate responsibility rating and their financial performance. To address the research questions in this study, environmental costs were collected from the Japanese company's Corporate Social Responsibility Report (CSR). From the analysis, we found empirical support for the view that companies' financial performance is positively related to average CSR rating and environmental conservation costs.

*Keywords*: Environmental accounting, Management accounting, Environmental costs, Corporate social responsibility report.

**Introduction**

The concept of environmental accounting was created in 1970 when the United States implemented the Environmental Protection Agency (EPA) in response to growing concerns over the conservation of the environment (Nixon, 1970). In 1972, the United Nations implemented the United Nations Environment Program (UNEP) to address the similar environment concerns. These efforts have been able to create progress in environmental safety, although at a slow pace.

According to the American Institute of Certified Public Accountants (AICPA), environmental accounting is "the identification, measurement, and allocation of environmental costs, the integration of these environmental costs into business decisions, and the subsequent communication of the information to a company's stakeholders," (Stanko et. al., 2006 p21). There are several environmental accounting methods that are used to account for environmental impact. Major methods include Emissions Accounting which identifies pollutant emissions by economic sectors and a structured matrix to monitor the impact. Countries such as Sweden, Netherlands, Japan, and Germany have implemented this type of reporting within their respective environmental accounting frameworks (Fornaro et. al., 2009). Conventional National Account is another method, which measures the flow of goods and services resulting from production as well as capital stock given under an assumption that company's production and service affect the environment. Conventional national accounts focus on tracking the effects within the production phase. The natural environment would be conceptualized as a stock of the natural capital and the usage of the environment would flow from the stock (Hecht, 1999). Some countries use Green GDP to measure environmental effect. This method tracks the environmental decline impacted by a company's goods and services, as well as measuring the impact of economic growth on the environment. The loss of biodiversity and the causes of climate change are monetized (Boyd, 2007). The Chinese government announced in 2004 that it would replace the Chinese GDP index with green GDP. Similarly, India implemented a green GDP method of environmental accounting in 2009 (Xiaohua, 2007, Bureau, 2009).

**Environmental Accounting in Japan**

Japan, as one of the leading countries in environmental conservation efforts, has made much progress in recent decades. Japan plans to reduce its emissions by 15% by the year 2020 compared to 1990's levels. On the other hand, the U.S. only plans to reduce its emissions by 4% by the year 2020 (Johnson, 2009). Additionally, unlike its European and American counterparts, Japan does not participate in purchasing emissions trading, which allows companies to buy and sell emissions credits amongst themselves. There is no limit as to how many credits companies can trade. Companies can keep buying credits from other companies that do not utilize them. Thus, this program may actually defeat the efforts of environmental conservation.

According to Japan's environmental accounting (EA) guidelines of 2005, EA "aims at achieving sustainable development maintaining a favorable relationship with the community, and pursuing effective and efficient environmental conservation activities," (Japan's Environmental Accounting Guidelines, 2005 p.3). The role of environmental accounting within Japan is divided into internal and external functions. Internal functions deals with the management of environmental conservation costs and activities. It promotes effective environmental conservation activities through an adequate decision making process. External functions of the EA include mandatory public reporting of environmental costs and effects of a company. By disclosing a quantitative measurement of such activities, it opens up the company to further progress. Quantitative measures are environmental conservation costs referring to investment and expenses. Such quantitative categories help companies keep track the progress in the processes.

To accomplish the goal established by the EA guidelines, companies are required to report six general categories of environmental costs under EA systems. These six categories of costs reflect various aspects of costs related to environment ranging from prevention to damage recovery. The cost of controlling environmental impacts within a business area entail costs associated with environmental conservation to control environmental impacts resulting from key operations within the business area. Cost of controlling environmental impacts in the upper or lower stream of a business chain are those resulting from purchasing, recycling, recovery, or disposal of products and packaging. Administration costs, also known as management costs, include environmental education of employees, monitoring environmental impacts, and other personnel related expenses. Research and development costs consist of expenses associated with the planning and designing of conservation technologies and environmental control. Social activity costs consist of those related to environmental improvement activities, financial support of environmental groups, and social activities, such as financially supporting a local community's environmental conservation activities. Lastly, environmental remediation costs include those costs allocated for the restoration of the natural environment, costs to recover degradation suits, and provisions to cover degradation of the environment.

The purpose of this paper is to provide a closer examination of the relationship between the companies' six categories of environmental costs, corporate responsibility rating and their financial performance.

**Literature Review**

Many studies have provided insights into the relationship between environmental variables and financial performance. Fujii et al. (2013) find a significant positive relationship between financial performance measured by return on assets and environmental performance based on $CO_2$ emissions. Similarly, Hatakeda et al. (2012) analyze the relationship between a firm's greenhouse gas (GHG) emissions and its profitability in Japanese manufacturing industry. The analysis indicates that firms with low firm-specific uncertainty, high financial flexibility, and a

high proportion of large shareholders tend to have a nonnegative net benefit, leading to a positive relationship between their GHG emissions and profitability. The environmental performance of a listed firm could affect its level of investment in pollution prevention and its access to financial markets. Kagata (2005) also examined the relationship between environmental performance (EP) and financial performance (FP) of Japanese firms in the manufacturing industry for a five-years period. The results showed that firms classified as high EP and high FP had higher financial performance and lower financial risk than firms classified as low EP and high FP. This meant that positively working on environmental problems had already become a necessary requirement for firms to maintain high financial performance. Kimbara (2010) find the relationship between environmental and economic performance constitutes an inverted-U type, implying that efforts to improve environmental performance are accompanied by increasing economic benefits at the onset, but beyond a certain point, the relationship turns into one of trade-off. The results of analysis also indicate differences between the chemical and electrical equipment industries.

Previous studies using Tobin's q that explore market response to environmental performance do not distinguish between the impact of performance on investment and market response, which may lead to misleading conclusions. To overcome this problem, Hibiki and Managi (2010) simultaneously estimated the functions of intangible assets, replacement costs, and toxic chemical risks. They find that the Japanese financial market does not value risk associated with toxic chemical releases. Nevertheless, even without market valuation, firms increase investment to reduce pollution. Regarding the relationship between social responsibility and firms' intangible assets, Managi and Yagi (2008) find positive correlation with compliance of the law, firms' culture, rules of organizations, transportation, and sustainable management. Nishitani et al., (2011a) examine the effect of the reduction of GHG emissions on firm value. Using data on 641 Japanese manufacturing firms in the period 2006–2008, the random effect instrumental variable estimate supports the view that firms with strong market discipline imposed by stockholders/investors are more likely to reduce GHG emissions and, consequently, firms that reduce more GHG emissions are more likely to enhance firm value. Chujo (2006) found that the amount of environmental accounting information significantly reduces the cost of equity capital, after controlling for market beta, firm size, growth and profitability measures.

Yamaguchi (2008) examines how the corporate environmental performance of a firm, evaluated by the Nikkei Environmental Management Ranking survey, affects the ranked firms' stock price, using a market model that accounts for Generalized Autoregressive Conditional Heteroscedasticity (GARCH) effects. The obtained results indicate that the stock prices of firms ranked above thirty in Nikkei Environmental Management Ranking have risen, fallen, or remained constant on the event day. The findings based on the analysis by the period of eight years suggests that market reaction to corporate environmental performance has a positive effect for the higher frequency of ranking and a negative effect for the lower frequency of ranking.

In addition, Ishikawa and Kosuge (2005) examined the information content of the environmental accounting information. They found that the environmental effects, the environmental expenses, and difference between the two amounts, are not statistically significant as a component of net income. Iwata et al. (2011) utilize many financial performance indices reflecting various types market evaluations. The results show that waste emissions do not generally have significant effects on financial performance. On the other hand, greenhouse gas reduction leads to an increase in financial performance in the whole sample and clean industries, although reduction does not have significant effect on financial performance in dirty industries. Furthermore, as the firm growth rate increases, the partial effects of waste emissions on financial performance decrease, whereas the partial effects of greenhouse gas emissions on financial performance increase. Related to the information content of CSR reports, Kagata (2009) proposes the method of QAQF (Quantitative Analysis for Qualitative Factors) to analyze the relationship between CSR and corporate profitability. The results showed that corporations classified as positively working on CSR did not necessarily obtain high profitability, but did impact the child-care leave acquisition rate and the female employee ratio.

Kotha et al. (1995) examined the roles played by the environment and realized strategies on firm-level performance in the Japanese machine tool industry. The results indicate that both firm strategies and the environment play significant roles in influencing profitability and growth. More specifically, whereas both strategy and environmental variables are significantly related to firm profitability, only environmental variables are associated with firm growth. Additionally, in contrast to U.S. based studies, the study finds that capital expenditures and technological change are not negatively associated with profitability. Rather technological change has a positive impact on firm growth.

Kuo et al. (2010) find a positive and significant correlation of a firm's environmental conservation cost, net income and the economic benefit of environmental conservation in three Japanese industries. In addition, the relationship among a firm's environmental conservation cost, CO2 emission reduction and total CO2 emission are positively, but not significantly, correlated. In particular, business operational efficiency, integrating social responsibility for anti-global warming initiatives (=total CO2 emission level), could be applied to distinguish differences in terms of operational efficiency among industries. By a statistical causality analysis, using data from 1999 to 2003, Nakao et al., (2007b) have shown that a positive effect of corporate environmental activities on financial performance. However, Tsuboi and Takahashi (2008) analyzed the relationship between financial performance and JEPIX and LIME, integrated index of environmental pollutants emissions. The results indicate that impact on the economic performance of environmental performance based on JEPIX and LIME vary widely by company.

**Hypotheses**

As reviewed from the previous section, prior studies show mixed results on how the environment reservation efforts tie to company's financial performance using different research methods and measurements in different industries. Prior studies measured the impact of environment efforts on financial performance in different terms, such as return on assets, stock

return changes, financial risk, market response, intangible assets, stock price and firm value. Some studies provide results that show environmental performance positively related to financial performance, under certain conditions. While other studies found that corporations, classified as positively working on CSR, did not necessarily obtain high profitability. Further analysis is necessary to clarify relationships within a specific industry and assess reasons for any such relationships.

Studies have attempted to integrate sustainability reporting with traditional financial reporting. From an external perspective and with the availability of information, analysts may not be able to fully capture the benefits of companies' environment conservation efforts. However, investors in the market may perceive that companies with more environmental efforts are more socially responsible, which will be reflected in firm value, consistent with prior research. Based on this notion, it is expected that companies that are more financial viable (i.e. higher profitability) are more willing to invest more resources in environmental reservation activities. Accordingly, the companies that have higher environmental-related investment and costs will help to reduce more of the waste, pollution and CO2 emission, resulting in higher corporate social responsibility ratings (CSR). These relationships can be stated in the following hypothesis:

H1: Environmental conservation costs have a positive impact on Japanese company financial performance in the electronics industry.
H2: Waste, Carbon, and Chemical emission reduction costs have a positive impact on Japanese company financial performance in the electronics industry.
H3: CSR ratings have a positive impact on Japanese company financial performance in the electronics industry.

This paper seeks to address a similar question regarding how companies' financial performance may relate to its environment efforts in term of costs and CSR ratings. This study differs from prior studies by looking into more detail at environmental costs with six categories of environmental costs. In addition, companies' environmental outcomes are measured with more detailed information based on ten dimensions of CRS assessment.

**Methodology and Statistical Analysis**

Environmental accounting practice is voluntary for companies in Japan. Filing the Corporate Social Responsibility (CSR) is one of the major initiatives of Japan's environmental accounting.

This study uses information collected from 2005-2011 CSR reports of 105 Japanese companies that filed CSR reports voluntarily in the electronic industry. Many data items were collected from the reports including CRS environmental ratings, six categories of environmental costs, environmental waste and emission (CO2, chemical and waste emissions), and environmental protection economic effect. Companies' financial measures, pretax income and net income, were also measured.

According to the guidelines or environmental report issued by the Ministry of Environment (MOE) of Japan, environmental costs are classified into six categories as defined as follows (Kokubu, K. and Nashioka,2001):

1) Environmental conservation cost to control environmental impact from a business area by production and service activities (business area cost)
2) Environmental cost to control environmental impact, upstream or downstream, as a result of production and service activities (Upstream/Downstream cost)
3) Environmental cost from management activities (management activity cost)
4) Environmental cost from research and development activities (abbreviated research and development cost)
5) Environmental cost from social activities (abbreviated as social activity cost)
6) Environmental costs corresponding to environmental damages (abbreviated as environmental damage costs)

Appendix 1 documents the factor loadings for the factors extracted based on the six categories described above with each of the six categories represented by an expense variable and an investment variable. The first factor, composed of 8 items accounted for 56% of the variance extracted. All factor loadings exceeded .8. These items were included in the Environmental Conservation cost (Env.Con.) variable. The reliability score (Chronbach alpha) score was .765, exceeding the .7 standard suggested by Nunnaly (1978). Env.mgmt.Invt. and Env.mgt.Exp. (Environmental cost from management activities) loaded onto a second factor, which explained 17% of the variance. Env.Socact.Invt and Env.Soact.Exp (Environmental cost from social activities) loaded onto a third factor, which explained 12% of the variance,

Factor analysis revealed that carbon emission reduction costs and waste emission cost loaded onto one factor, with loadings exceeding .8, while the chemical variable needed to be treated separately in regression models. Carbon and Waste were significantly correlated (.65, $p<.01$). Env.viol.pol.avg.05.10 (average for years 2005-2010 environmental violation for incidents of pollution) and Env.viol.cplt.05.10 (average for years 2005-2010 environmental violation- just complaint) formed one factor, with loadings over .8 and were significantly correlated at a level of .82 ($p< .001$).

There are eight dimensions of CSR rating in both environmental and financial measures. It is appropriate to reduce the CSR measures to a set of variables that measure the same construct. As indicated in Appendix 1, 4 CSR ratings (CSR.social, CSR.env., CSR.hr., and CSR.bus.) had loadings over .8 on a factor accounting for 49% of extracted variance, while Env.viol. variables formed the other factor, accounting for 25% of extracted variance. The reliability score (Chronbach alpha) score for the 4 CSR variables was .91, exceeding the .7 standard suggested by Nunnaly (1978).

Likewise, there are six categories of environmental costs in both expenses and investment terms, resulting in 12 sets of environmental cost measures:

- Cost of controlling environmental impacts,
- Cost of controlling environmental impacts in the upper or lower stream of a business chain,
- Administration costs, also known as management costs,
- Research and development costs,
- Social activity costs,
- Environmental remediation costs.

The following models were created to examine the relationships stated in the hypotheses. Multiple regression (Ordinary Least Squared) was used to test the model. A control variable (Number of employees) was added to the models to account for the impact of the size of firm on profitability.

H1: (Financial Performance) = $\beta_0 + \beta_1$ (environmental conservation costs) + $\beta_2$ (number of employees)
H2: (Financial Performance) = $\beta_0 + \beta_1$ (Waste/Carbon conservation costs) + $\beta_2$ (Chemical conservation costs) + $\beta_3$ (number of employees)
H3: (Financial Performance) = $\beta_0 + \beta_1$ (CSR rating) + $\beta_2$ (number of employees)

Causal relationships were determined by measuring whether the outcome variable (financial performance) in a later year (2011) is influenced by the average of measures for the independent variables in previous years (2005-2010) values. Using the average of previous, rather than usage of data from one year, provides more confidence in the results. This is a more powerful method of testing causality, compared to reliance on cross-sectional and correlations to infer causality. Number of employees is used as a control variable to account for the influence on performance by company size. Bivariate correlations of the environment costs and financial performance were also analyzed to determine the consistency the relationships.

**Results**

This study filled the research gap by examining the impact on corporate performance from environmental activities using more detailed environmental measures, compared to previous studies. Specifically, six categories of environmental costs in terms of expenses and investments (total twelve dimensions), and CSR assessment in terms of ten aspects of ratings on company's social substantiality were analyzed to examine whether they relate to company's financial performance expressed in term of net income and pretax income.

Because Environment Conservation Cost was strongly correlated with Chemical (.56, $p < .05$) and CSR (64, $p < .01$) a separate regression model was run for this variable. When net income of was used as dependent variable in the regression model (see table 1), the company's Environment Conservation Cost was found to have a significant and positive impact on net income (1.22, $p < 0.01$) as well as pretax income (.94, $p < 0.05$). Therefore, H1 can't be rejected. The Model F

levels indicated that both models were significant (p, .01). The $R^2$levels of the models are .52 and .59 respectively. To confirm this finding, bivariate correlations with profit were examined for all the components of Environment Conservation Cost for all years from 2005to 2010. Appendix 3 provides these correlations. For the eight variables composing Environment Conservation Cost over the six years (48 correlations), only two correlations were non-significant, providing confidence in the acceptance of Hypothesis 1. The two variables representing environmental cost from social activities (not included in the Environment Conservation Cost factor) were also significantly correlated with profit for all six years. The Env.Mgt.Exp variable (Environmental cost from management activities) was significantly correlated to profit in five of the six years, but the Env.Mgmt.Invt variable was not significantly correlated to profit in any of the six years.

*Table 1. Model Results for H1 (n=17)*

| Variables | Net income | Pretax income |
|---|---|---|
| Environment conservation costs (standardized coefficient) | 1.222** | .94* |
| No. of employees (standardized coefficient) | -.541 | -0.156 |
| $R^2$ | .581 | .64 |
| Adjusted $R^2$ | 0.525 | 0.59 |
| Model F | 10.40** | 13.36 *** |

Notes: * = p< .05, ** p< .01, *** P < .001, n.s. = not significant

The regression model results indicated that the Chemical Pollution beta coefficients in the net income and pretax income models were not significant. Similarly, results indicated that the Waste/Carbon beta coefficients in the net income and pretax income models were not significant. Thus, the results don't support H2. However, as indicated in Appendix 2 the Waste/Carbon combined variable is positively and significantly correlated with net profit (43, p< .01) and pretax profit (.36, p< 01) As indicated in Appendix 3 the Carbon variable was significantly correlated with profit in five of the six years and the waste variable was significantly correlated with profit in four of the six years, lending some support to the positive relationships between those variables and profit.

*Table 2. Model Results for H2 (n=42)*

| Variables | Net income | Pretax income |
|---|---|---|
| Waste/carbon | -0.44 n.s. | .031 n.s. |
| Chemical pollution (standardized coefficient) | -0.004 n.s | 0.001 n.s. |
| No. of employees (standardized coefficient) | 0.001 n.s. | .647*** |
| $R^2$ | .286 | .440 |
| Adjusted $R^2$ | 0.231 | 0.396 |
| Model F | 5.195** | 10.194** |

Notes: * = p< .05, ** p< .01, *** P < .001, n.s. = not significant

Because of the strong correlations between CSR ratings and Environment Conservation (.64, p< .001) and Waste/Carbon (.62, p< .001) a separate regression model was run. As indicated in Table 3, the beta coefficients for CSR ratings were positive and significant in both the net profit and pretax profit models (.57, p< .05; .51, p< .05). Thus, H3 cannot be rejected. As indicated in Appendix 3, the reliability of this conclusion is enhanced by the consistency in correlations with profit. Of the twenty 4 correlations between the four CSR variables and profit over the six years, only one was not significant.

*Table 3. Model Results for H3 (n=27)*

| **Variables** | **Net income** | **Pretax Income** |
|---|---|---|
| CSR ratings(standardized coefficient) | .566 * | .507* |
| No. of employees (standardized coefficient) | 0.042 | .239 |
| $R^2$ | .356 | .48 |
| Adjusted $R^2$ | 0.304 | 0..44 |
| Model F | 6.904** | 11.72*** |

Notes: * = p< .05, ** p< .01, *** P < .001, n.s. = not significant

In sum, the regression results suggested that company's environmental conservation costs and CSR ratings positively impact corporate financial performance, in terms of net income and pretax income in the Japanese electronics industry. However, Chemical Pollution and Waste were not found to have a significant and positive impact on financial performance in regression models.

**Discussion and Conclusion**

This study's results finding a causal relationship between environmental conservation costs and financial performance is consistent with the study by Kuo et al. (2010) which found a significant and positive correlation between a firm's net income and economic benefit of environmental conservation. This study also supports a causal relationship between the company's CSR rating and financial performance. This study's regression results (but not correlation results) are also consistent with the results in a study by Iwata et al. (2011), finding that waste emissions do not generally have significant effects on financial performance.

Although the relationship between a firm's environmental performance, in terms of amount of chemical pollution and waste, and financial performance are not supported by the regression results from this study, the results offer an encouraging conclusion about the ongoing transition toward more environmental related reporting and a sustainable market economy. From the recent experience of environmental policies in Japan, the findings may provide extra evidence for the positive consequences of a firm's environmental behavior and sustainable development.

**Limitation and Future Research**

Despite this study's measurement of environmental spending prior to the measures of financial performance, another interpretation of this study's results might be that financially viable

companies may be more willing to spend their funds on social and environmental activities. This is suggested but the positive and significant correlations (Appendix 2) between size of the firm (as measured by the number of employees) and Environmental Conservation costs (.91, p< .001) and Waste/Carbon (.51, p<.0010.

This study relied only on the data from one industry (electronics) in one country. Therefore, the results are not generalizable across all Japanese industries or across countries. Future study may consider using more comprehensive longitudinal data set that involves different industries across different countries to provide more generalizable conclusions. Lack of significance may have been influenced by small sample sizes, partially influenced by missing observations in some years for some variables (with samples ranging from 18-62). Future studies should attempt to secure larger samples.

**Appendix 1 - Factor Analysis Loadings**
**Principal Component Extraction for Environmental Conservation Cost**

| Variable | Component 1 | Component 2 | Component 3 |
|---|---|---|---|
| **1.Social.Con.avg.05.10** | **.833** | -.046 | -.265 |
| **2.Env.Bus.Invt.avg.05.10** | **.919** | .118 | .223 |
| **3.Env.up.Exp.avg.05.10** | **.936** | .054 | -.124 |
| **3.Env.up.Invt.avg.05.10** | **.917** | .084 | -.195 |
| 4.Env.mgmt.Invt.avg.05.10 | -.149 | **.981** | .079 |
| 4.Env.mgt.Exp.avg.05.10 | -.149 | **.981** | .079 |
| **5.Env.RD.Invt.avg.05.10** | **.857** | -.057 | -.291 |
| **5. Env.RD.Exp.avg.05.10** | **.975** | .030 | .-.038 |
| 6.Env.Socact.Invt.avg.05.10 | .091 | -.222 | **.614** |
| 6.Env.Soact.Exp.avg.05.10 | .310 | -.109 | **.842** |
| **7.Env.dmg.Invt.avg.05.10** | **.974** | .132 | .091 |
| **7. Env.dmg.Exp.avg.05.10** | **.855** | .113 | .248 |
| **Eigenvalue/% variance** | 6.786/56.5% | 2.045/17.0% | 1.428/11.9% |

Chronbach Alpha (7 items from Component 1) = .765 (n= 18)

*Notes:*

1) Social contribution spending/donations are as part of efforts contributing to environment conservation.
2) Environmental conservation cost to control environmental impact from a business area by production and service activities (business area cost); investment and expense
3) Environmental cost to control environmental impact, upstream or downstream, as a result of production and service activities (Upstream/Downstream cost); investment and expense
4) Environmental cost from management activities (management activity cost); investment and expense
5) Environmental cost from research and development activities (abbreviated research and development cost); investment and expense
6) Environmental cost from social activities (abbreviated as social activity cost); investment and expense
7) Environmental costs corresponding to environmental damages (abbreviated as environmental damage costs); investment and expense

**Appendix 1 (Continued) - Factor Analysis Loadings**
**Principal Component Extraction for Waste and Chemical Pollution Cost**

| Variable | Component 1 | Component 2 (Waste) | Component 3 (Chemical) |
|---|---|---|---|
| Carbon.avg.05.10 | -.225 | **.891** | -.005 |
| Chemical.avg.05.10 | -.058 | -.092 | **.789** |
| Waste.avg.05.10 | -231 | **.884** | -.020 |
| Env.viol.reg.avg.05.10 | .340 | .202 | **.597** |
| Env.viol.pol.avg.05.10 | **.946** | .213 | .006 |
| Env.viol.cplt.05.10 | **.897** | .145 | -.190 |
| **Eigenvalue/% variance** | 1.905/31.7% | 1.691/28.27% | 1.015/16.9% |

Correlation: Env.viol.pol.avg.05.10 and Env.viol.cplt.05.10 = .82 (p< .001), n= 58
Correlation: Carbon.avg.05.10 and Waste.avg.05.10 = .65 (p<.01), n = 68
Correlation: Chemical.avg.05.10 and Env.viol.reg.avg.05.10 (p< .001), n = 66

*Notes:*

1. Environmental violation on regulation (env.viol.reg)
2. Environmental violation for incidents of pollution (env.viol.pol)
3. Environmental violation- just complaint (env.viol.cplt)

**Principal Component Extraction for CSR Ratings**

| Variable | Component 1 (CSR Ratings) | Component 2 |
|---|---|---|
| CSR.social.avg | **.850** | .374 |
| CSR.env.avg. | **.843** | .395 |
| CSR.hr.avg. | **.818** | .108 |
| CSR.bus.avg. | **.869** | -.007 |
| Env.viol.reg.avg.05.10 | -.366 | -.071 |
| Env.viol.pol.avg.05.10 | -.508 | **.807** |
| Env.viol.cplt.05.10 | -.395 | **.833** |
| **Eigenvalue/% variance** | 3.406/48.65% | 1.744/24.9% |

Chronbach Alpha (4 items from Component 1-CSR) = ..91 (n= 28)

**Appendix 2 - Bivariate Correlations Composite Variables**

| Variable | Pretax 2011 | Net Income 2011 | Env.Con. | Factor 1 (Env.viol) | Waste |
|---|---|---|---|---|---|
| Pretax 2011 | 1.00 | | | | |
| Net Income 2011 | .976*** (n =430) | 1.00 | | | |
| Env.Con. | .80** (n=18) | .73** (n=18) | 1.00 | | |
| Factor 1 (Env.viol) | -.01 n.s. (n=53) | .01 n.s. (n=53) | -.14n.s. (n=18) | 1.00 | |
| Waste/Carbon | .43** (n=62) | .36** (n=62) | .31 n.s. (n=18) | -.05 n.s. (n=58) | 1.00 |
| Chemical Pollution | .01 n.s. (n=62) | .02 n.s. (n=62) | .56* (n=18) | -.02 n.s. (n=58) | -.02 n.s. (n=68) |

| | Chemical | CSR.all.avg | No.empl.avg.05.10 |
|---|---|---|---|
| Chemical Pollution | 1.00 | | |
| CSR.all.avg. | -.07 n.s. (n=28) | 1.00 | |
| No.empl.avg.05.10 | | | 1.00 |
| Pretax 2011 | .01 n.s. (n=62) | .674*** (n=28) | .671*** (n=46) |
| Net Income 2011 | .02 n.s. (n=62) | .596 *** (n=28) | .545*** (n=46) |
| Env.Con. | .56* (n=18) | .643*** (n=15) | .911*** (n=18 |
| Factor 1 (Env.viol) | -.02 n.s. (n=58) | -.15 n.s. (n=28) | -.006 n.s. (n=38) |
| Waste | -.02 n.s. (n=68) | .62*** (n=28) | .51 *** (n=46) |
| Chemical Pollution | | | .03 n.s. (n=46) |

*Notes:* * = p< .05; ** p< .01; *** P < .001; n.s. = not significant

**Appendix 3 - Bivariate Correlations with Pretax Profit 2011**
**Individual Environmental Conservation Cost Variables**

| Variable | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| **Social.con** | .726** | .586** | .604** | .761** | .407** | .615** |
| | (n=41) | (n=47) | (n=52) | (n=48 | (n=55) | (n=56) |
| **Env.Bus.Invt** | .560** | .703** | .476** | .450** | .397* | .414** |
| | (n=31) | (n=36) | (n=38) | (n=41) | (n=40) | (n=42) |
| Env.Bus.Exp | .682** | .702** | .708** | .701** | .266 n.s. | .633 ** |
| | (n=32) | (n=37) | (n=39) | (n=42) | (n=41) | (n=43) |
| **Env.up.Invt.** | .552** | .349 * | .235 n.s. | .134 n.s. | .289 n.s. | .148 n.s. |
| | (n=27) | (n=31) | (n=34) | (n=35) | (n-35) | (n=38) |
| **Env.up.Exp** | .590** | .482 | .476** | .498** | .503** | .373* |
| | (n=32) | (n=37) | (n=37) | (n=42) | (n=41) | (n=43) |
| Env.Mgmt.Invt | .094 n.s. | .100 n.s. | .056 n.s. | .038 n.s. | .029 n.s. | .125 n.s. |
| | (n=64) | (n=64) | (n=64) | (n=64) | (n=64) | (n=64) |
| Env.Mgt.Exp | .150** | .142* | .159** | .159** | .111 n.s. | .364** |
| | (N=318) | (n=281) | (n=312) | (n=284) | (n=311) | (n=317) |
| **Env.RD.Invt** | | | | .293** | .240** | .140** |
| | | | | (n=278) | (n=383) | (n=385) |
| **Env.RD.Exp** | .438** | .615** | .601** | .605** | .533** | .560** |
| | (n=62) | (n=62) | (n=63) | (n=63) | (n=63) | (n=63) |
| Env.Socact.Invt | .561** | .467** | .283* | .181 n.s. | .078 n.s. | .506 ** |
| | (n=62) | (n=62) | (n=62) | (n=62) | (n=62) | (n=62) |
| Env.Socact.Exp | .308* | .279* | .266* | .321* | .447** | .572** |
| | (n=62) | (n=62) | (n=62) | (n=62) | (n=62) | (n=62) |
| **Env.dmg.Invt.** | .448** | .535** | .703** | .512** | .524** | .041 |
| | (n=620 | (n=62) | (n=62) | (n=62) | (n=62) | (n=62) |
| **Env.dmg.Exp** | .337** | .677** (n= | .687** | .729** | .722** | -.017 n.s. |
| | (n=62) | 62) | (n=62) | (n=62) | (n=62) | (n=620) |

*Notes:* * = p< .05, ** p< .01, *** P < .001, n.s. = not significant; Variables in bold joined together as one variable in regression model

**Appendix 3 (Continued) - Bivariate Correlations with Pretax Profit 2011**
**Individual Carbon, Waste, Chemical , and CSR Variables**

| Variable | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|
| Carbon | .281* (n=62) | .518** (n=62) | .201 n.s. (n=62) | .438** (n=62) | .458** (n=62) | .460** (n=62) |
| Waste | .256* (n=62) | .329** (n=62) | .210 n.s. (n=62) | .257* (n=62) | .198 n.s. (n=62 | .396** (n=62) |
| Chemical | .11 n.s. (n=62) | .411** (n=62) | .395** (n=62) | .570** (n=62) | .511** (n=62) | .542** (n=62) |
| Env.viol.reg | .105 n.s. (n=60) | -.037 n.s. (n=60) | -.107 n.s. (n=60) | .369** (n=60) | .105 n.s. (n=60) | .110 n.s. (n=60) |
| Env.viol.pol | .214 n.s. (n=60) | -.002 n.s. (n=60) | .047 n.s. (n=60) | .158 n.s. (n=60) | .039 n.s. (n=60) | .018 n.s. (n=60) |
| Env.viol.cplt | .299* (n=57) | .227 n.s. (n=56) | -.011 n.s. (n=55) | -.010 n.s (n=54) | -.010 n.s. (n=54) | -.015 (n=53) |
| **Csr.hr** | .2283 n.s. (n=370 | .544** (n=37) | .532** (n-52) | .484** (n=56) | .488 ** (n=60) | .476 ** (n= 56) |
| **Csr.env** | .597** (n=36) | .471 ** (n=45) | .476** (n=51) | .512** (n=56) | .398** (n=60) | .544** (n=59) |
| **Csr.bus** | .334** (n=36) | .467** (n=44) | .469** (n=48) | .464* (n=53) | .501** (n=60) | .535** (n=57) |
| **Csr.social** | .60** (n=38) | .551** (n=47) | .523** (n=56) | .573** (n=56) | .591** (n=61) | .521** (n=60) |

*Notes:* * = p< .05, ** p< .01, *** P < .001, n.s. = not significant; Carbon and Waste joined together as one variable in regression model; Chemical and Env.viol.reg joined together as one variable in regression model; all 4 Csr variables joined together as one variable in regression model

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