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	Page
Editorial	1
Feature article	
A Sustainable World – the Local in Terms of the Global: An Ecological Footprint Analysis Perspective <i>Don Clifton</i>	4
Environmental Management Accounting: An Empirical Investigation of Manufacturing Companies in Malaysia <i>Dayana Jalaludin, Maliah Sulaiman and Nik Nazli Nik Ahmad</i>	31
Environment Extra!	45
Call for Papers	49

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ENVIRONMENTAL MANAGEMENT ACCOUNTING: AN EMPIRICAL INVESTIGATION OF MANUFACTURING COMPANIES IN MALAYSIA

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Abstract

Environmental management practices and the implementation of environmental management systems (EMS) have spurred interest in the adoption of environmental management accounting (EMA). EMA integrates environmental information with economic information. Through EMA, the accounting systems will explicitly identify, generate, analyze and use financial and non-financial environmental related information. This paper offers a review of the literature regarding EMA adoption followed by a survey report. The study also explores the associations between EMA, environmental performance and economic performance. To test the proposed relationships, a survey questionnaire was administered to accountants and environmental managers of manufacturing companies in Malaysia. The results of correlation analyses support the hypothesized relationships.

Introduction

Of late, a great deal of interest has been focused on the relation between business activities and environmental issues (Christmann & Taylor 2001). As companies are now expected to be more environmentally responsible, an increasing number of companies worldwide are putting in place environmental management systems as part of their efforts towards better environmental management (Graff 1997; Melnyk, Sroufe & Calantone 2003). In 1996, the International Organization for Standardization (ISO) introduced the ISO14001 environmental management systems specification-certification standards to aid companies in developing and implementing the environmental management systems. By December 2008, the number of ISO14001 certificates issued worldwide had increased to 188,815, revealing a leap of 22 percent from the previous year (ISO 2008).

Accordingly, an adequate accounting system that considers both environmental and economic impacts is important in assisting companies' to fulfill their environmental management tasks (Burritt, Hahn & Schaltegger 2002). Thus, some companies have started to develop integrated and complete management accounting systems, specifically taking into account the environmental impacts of their activities. Environmental management accounting allows for a better integration of the environmental information into the existing accounting systems. As it explicitly treats environmental costs and tracks environmental information, EMA highlights hidden environmental costs and benefits (Votta, Kauffman & White 1998; Jasch 2003; De Palma & Csutora 2003; Jasch & Lavicka 2006; Staniskis & Stasiskiene 2006). Nevertheless, little is known about EMA

since the prior studies are dominantly prescriptive, often focusing on one specific EMA tool or managerial aspect of the organization. The purpose of this article is threefold: to introduce environmental management accounting (EMA), empirically examine the extent manufacturing companies in Malaysia implement EMA, and describe its benefits in terms of environmental and economic performance. The rest of the paper is structured as follows. The second section discusses the literature review while the third section focuses on the research method. The findings are then discussed in the results section.

1. Literature Review

EMA is an integral part of management accounting that assists in the accounting for environmentally-related management initiatives (Jasch 2006a). According to the International Federation of Accountants (IFAC 1998, para. 1):

EMA is the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some companies, environmental management accounting typically involves life-cycle costing, full-cost accounting, benefits assessment, and strategic planning for environmental management.

Information generated through EMA can either be in monetary or physical terms. Correspondingly, the United Nations Division for Sustainable Development (UNSD 2001, p. 1) states that:

The general use of EMA information is for internal organizational calculations and decision making. EMA procedures for internal decision making include both: physical procedures for material and energy consumption, flows and final disposal, and monetarized procedures for costs,

savings and revenues related to activities with a potential environmental impact.

Through EMA, both monetary and physical environment related information are identified, collected and analyzed for decision making and other purposes including external reporting (UNSD 2001; Deegan 2003; IFAC 2005). The financial procedures, known as monetary environmental management accounting (MEMA), reflect the environmental impact affecting the economic systems of the company and are measured in monetary value. While, the physical procedures, known as physical environmental management accounting (PEMA), reflect the impact of an organization's activity on the environmental systems and are measured in physical value (Burritt, Hahn & Schaltegger 2002). Both parts of the EMA (MEMA and PEMA) systems incorporate environmental information into various strategic and operational activities of the company (Schaltegger, Burritt & Petersen 2003) and support its internal management systems (Schaltegger & Burritt 2000).

Monetary Environmental Management Accounting (MEMA)

The MEMA systems are actually an extension of conventional management accounting systems. In the MEMA systems, management accounting tools are used to track, trace and treat costs and revenue incurred in relation to the company's impact on the environment (Schaltegger & Burritt, 2000). For example, in MEMA, product costing covers a broader scope, which involves the tracing of direct and indirect environmental costs such as costs of permits and fees and recycling of products. Another example of MEMA is the consideration of environmentally induced revenues such as profit contributions from producing greener products (Langfield-Smith, Thorne & Hilton 2009). In summary, MEMA provides the link between a company's environmental-related activities with its past, present and future financial stocks and flows. Through MEMA,

strategic and operational planning will include the environmental aspects of the company's activities. As a result, decision making will involve environmental related targets and achievements. Additionally, the MEMA systems also act as a control and accountability device (Schaltegger & Burritt 2000).

Physical Environmental Management Accounting (PEMA)

The PEMA systems account for the ecological impact pertaining to a company's activities in physical units such as kilowatt hours, decibels, kilograms and tonnes. In the PEMA systems, consideration is given to information regarding the use, flows and destinations of energy, water, materials and wastes (Langfield-Smith, Thorne & Hilton 2009). Similar to the MEMA systems, PEMA boosts ecological sustainability by highlighting environmental related information. Through PEMA, the ecological strengths and weaknesses of the company are clearly highlighted. Consequently, this will lead to better measurement and control of environmental quality and consequences. Furthermore, information provided by the PEMA systems promotes transparency, specifically on the environmental related activities of the company (Schaltegger & Burritt, 2000).

EMA, Environmental Performance, Economic Performance

There are various environmental and economic benefits that come with EMA adoption. EMA generates more precise information on environmental impact (Staniskis & Stasiskiene, 2006). Staniskis and Stasiskiene (2006), when examining the current state of EMA in 150 companies in Lithuania, found that material and energy tracking for product costs and waste streams is essential in supporting the implementation of environmental management systems and cleaner production (CP) innovations. Information gathered from the tracking enables companies to integrate material intensities in the decision making processes,

and consequently conduct appropriate cost allocation, capital investment, and process/product design. Through EMA, a more accurate evaluation on the effectiveness of proposed or implemented environmental related actions can be obtained (Staniskis & Stasiskiene 2006).

EMA provides measurements on the logical consequence of change relative to costs and benefits of environmental actions. By linking material purchase value to non-product output (Jasch 2003), EMA provides the much needed financial view of environmental impact. For example, the material flow accounting monitors and associates the flow of energy, water and materials with the generation of waste, emission and sold products (Jasch 2006b). Here, the impact of business activities on the environmental systems and economic conditions of the company is explicitly recognized.

When there is a clearer link between business activities and environmental costs, the management will be able to identify potential cost savings from environmental abatement activities (Schaltegger & Figge 2000). In terms of bottom line, EMA justifies the link between environmental impacts and financial statements. Information on environmental costs provided by the accountants can function as a starting point for environmental managers to shape the environmental measurement systems, provide the foundation for environmental reporting and suggest options to improve material efficiency (Jasch & Lavicka 2006). Similarly, the accountants, when faced with difficulties while dissecting environmental information, may use the information provided by the environmental managers to assist in their financial analysis (Jasch & Lavicka 2006).

Furthermore, EMA highlights hidden environmental costs by revealing its source and location (Jasch 2003). Such exposure will bring about improvement in terms of environmental cost control and investment (DePalma & Csutora 2003). For instance, a case study by Votta, Kauffman and White

(1998) found that the exposure of hidden environmental costs stimulates more efficient cost management where the company is able to reduce scrap costs, inventory turnover time and purchase order cycle time.

The abovementioned literature suggests that EMA adoption can be linked to better environmental and economic performance. Nevertheless, these studies are dominantly prescriptive, concentrating on the implementation and development of a particular type of EMA tool. In the present study, EMA adoption is examined via a questionnaire survey, taking into consideration a broad array of MEMA and PEMA tools. As such, the following hypotheses are developed:

Hypothesis 1. There is a positive relationship between the level of EMA (MEMA and PEMA) adoption and environmental performance.

Hypothesis 2. There is a positive relationship between the level of EMA (MEMA and PEMA) adoption and economic performance.

2. Research Method

Study Sample

Data was collected using a mail questionnaire survey sent to 1,069 manufacturing companies randomly selected from the Federation of Malaysian Manufacturers Directory 2006 (FMM 2006). Two sets of questionnaires were prepared. The first focuses on MEMA while the second set focuses on PEMA. Set I was sent to accountants, given that they have a responsibility for environmental-related financial measures of the company's activities. Meanwhile environmental managers were chosen as respondents for questionnaire set II because of their role concerning the company's impact on the environment (Schaltegger, Burritt & Petersen 2003).

Of the 1,069 questionnaires distributed to each group of respondents, 86 were received

from accountants and 104 from environmental managers (a response rate of 8 percent and 9.7 percent, respectively). The low response rate is inevitable since EMA, despite being a relevant research area, is an emerging issue in Malaysia. Twelve accountants and 5 environmental managers did not complete the questionnaire. Additionally, 11 sets of responses (environmental managers) were identified as outliers. Thus, 74 and 88 responses were used in the data analysis. Next, the 'time-trend extrapolation test' was carried out to ensure that the responses are free from non-response bias.

Table 1 illustrates the background information of the companies that have participated in the survey including their sectors, ownership, EMS certification, allocation of budget for research and development (R&D) on environmental matters.

Table 1 - Demographic profile of respondents

Description	Range	*Cos *Set I	*Cos *Set II
		Freq (%)	Freq (%)
Sector of operation	Chemical/ wood	14 (18.9)	22 (25)
	Plastic, rubber/ metal	16 (21.6)	11 (12.5)
	Electrical/ electronics	6 (8.1)	21 (24)
	Automotive/ machinery	5 (6.8)	4 (4.5)
	Building materials	4 (5.4)	8 (9)
	Food/ tobacco	8 (10.8)	4 (4.5)
	Others	15 (20.3)	11 (12.5)
	No information	6 (8.1)	7 (8)
	Total	74 (100)	88 (100)
	Ownership	Malaysian	42 (56.8)
Non-Malaysian		24 (32.4)	32 (36.3)
Joint ownership		7 (9.5)	38 (43.2)
Missing		1 (1.4)	18 (20.5)
Total		74 (100)	88 (100)

EMS certification	Yes	25 (33.8)	46 (52.3)
	No	44 (59.5)	25 (28.4)
	Planning to have	5 (6.8)	16 (18.2)
	Missing	0 (0)	1 (1.1)
	Total	74 (100)	88 (100)
Budget for R&D on specifically environmental related matters	Yes	15 (20.3)	25 (28.4)
	No	59 (79.7)	61 (69.3)
	Missing	0 (0)	2 (2.3)
	Total	74 (100)	88 (100)

*Cos- companies, ; *Questionnaire Set I *Questionnaire Set II

Measurements

EMA

Similar to Frost and Wilmshurst (2000), and Burritt, Hahn and Schaltegger (2002), the present study measures EMA adoption from a broad perspective. Based on Burritt, Hahn and Schaltegger's (2002) comprehensive EMA framework, a checklist of EMA tools was prepared to gather information on EMA adoption. For each of the thirteen MEMA items (as listed in Table 2) the respondents were asked to indicate their agreement, on a scale of 1 (none at all) to 5 (very much), on the undertaking of the respective MEMA tools in their organization.

Table 2 - MEMA items

• environmental cost accounting
• environmentally induced capital expenditure and revenue
• post assessment of relevant environmental costing decisions
• environmental lifecycle costing
• environmental target costing
• post investment of individual environmental projects
• monetary environmental operational budgeting
• monetary environmental capital budgeting
• environmental long-term financial planning
• relevant environmental costing
• monetary environmental project investment appraisal
• environmental lifecycle budgeting
• environmental lifecycle target pricing

Similarly, for each of the 11 PEMA items (as listed in Table 3), the respondents were asked

to indicate their agreement, on a scale of 1 (none at all) to 5 (very much), on the undertaking of the respective PEMA tools in their organization.

Table 3 - PEMA items

• material flow assessment
• energy flow assessment
• environmental capital impact assessment
• post assessment of short-term environmental impact
• lifecycle inventories
• post investment assessment of physical environmental investment appraisal
• physical environmental budgeting
• long-term physical environmental planning,
• relevant environmental impacts
• physical environmental investment appraisal,
• lifecycle analysis

Environmental performance

The present study identifies environmental performance from the scope of pollution control efficiency. This approach is similar to the approach taken by Spicer (1978); Jaggi and Freedman (1992); Stanwick and Stanwick (1998); Wagner et al., (2002); Al-Tuwaijri, and Wagner and Schaltegger (2004). Environmental performance is defined as the achievement in terms of environmental related company impact (Wagner & Schaltegger 2004). On a scale of 1(no) to 5(very much), and following Wagner and Schaltegger (2004), the respondents were asked to evaluate parts of their company's environmental performance as listed in Table 4.

Table 4 - Environmental performance items

• reduction in the use of water
• reduction in the use of energy
• reduction in the use of non-renewable resources
• reduction in the use of toxic inputs
• reduction of solid waste
• reduction of soil contamination
• reduction in waste water emissions
• reduction in emissions to air
• reduction of noise
• reduction of smell/odour emissions
• reduction of landscape damage
• reduction in the risk of severe accidents

Economic performance

The present study views economic performance from the scope of environmental competitiveness.

Environmental competitiveness refers to that part of overall corporate competitiveness and economic performance of the company, which is created and influenced by environmental management (Wagner & Schaltegger 2004). Consistent with Wagner and Schaltegger (2004), sixteen items (as listed in Table 5) were initially used to represent economic performance. The respondents were requested to evaluate these items, in relation to their company's recent performance, on a scale of 1(very low) to 5(very high).

Table 5 Economic performance items

-
- competitive advantage
 - corporate image
 - product image
 - sales
 - market share
 - new market opportunities
 - short-term profit
 - long-term profit
 - cost savings
 - productivity
 - insurance conditions
 - access to bank loans
 - owner/shareholder satisfaction
 - management satisfaction
 - worker satisfaction
 - recruitment and staff retention
-

3. Results

Reliability and validity test

The present study employs factor analysis via principal component analysis (PCA) to estimate construct validity. Next, the Cronbach's alpha reliability estimates were performed on the items extracted from the PCA.

EMA

Table 6 shows that the PCA resulted in the identification of only one construct of MEMA explaining 79.138 percent of the variance. The Cronbach's Alpha is 0.978. The PCA

also resulted in the identification of only one construct of PEMA explaining 75.128 percent of the variance. The Cronbach's Alpha is 0.967.

Environmental performance

For the first set of questionnaires (for the accountants), the PCA identified two components as the constructs that measure environmental performance. The first component was named 'reduction of negative environmental impact' and the second component was termed 'reduction in usage of natural resources'. Both components, as listed in Table 7, explain 73.379 percent of the variance for the variable, environmental performance. One item (reduction in risk of severe accidents) was dropped from the analysis because of low factor loading and cross loading problems. The Cronbach's Alpha values for reduction of negative environmental impact and reduction in usage of natural resources are 0.946 and 0.807, respectively.

For the second set of questionnaires (for the environmental managers), the PCA (as presented in table 7) identify two components as the constructs that measure environmental performance. The first component is called 'reduction of negative environmental impact' and the second component 'reduction in usage of natural resources'. The components explain 63.568 percent of the variance for the variable environmental performance. The Cronbach's Alpha values for reduction of negative environmental impact and reduction in usage of natural resources are 0.911 and 0.803, respectively.

Economic performance

For the first set of questionnaires (for the accountants), the PCA (as presented in Table 8) results in identification of three factors of economic performance. The first component is named 'internal stakeholders' satisfaction' since it mainly reflects the satisfaction of the corporate internal party. The second component is termed 'business benefits' since it relates to benefits concerning business

activities. The third component is termed 'future benefits'. These three components explain 65.4 percent of the variance for variable economic performance. Six items (market share, short-term profit, cost savings, productivity, improved insurance conditions, better access to bank loans) were dropped

from the analysis because of low factor loading and cross loading problems. The Cronbach's Alpha values for internal stakeholders' satisfaction, business benefits and future benefits are 0.793, 0.790 and 0.560, respectively.

Table 6 - PCA on EMA

QUESTIONNAIRE SURVEY I – MEMA		QUESTIONNAIRE SURVEY II – PEMA	
Items and description	1 MEMA	Items and description	1 PEMA
Relevant environmental costing.	0.950	Post assessment of short-term environmental impact (e.g. of a site or product).	0.904
Environmental lifecycle budgeting.	0.940	Environmental (or natural) capital impact assessment.	0.887
Monetary environmental project investment appraisal.	0.925	Post investment assessment of physical environmental investment appraisal.	0.883
Environmental long-term financial planning.	0.914	Physical environmental investment appraisal.	0.874
Environmental lifecycle costing.	0.907	Material flow assessment (short-term impact on the environment, i.e. product, site, division, and company levels).	0.874
Environmental lifecycle target pricing.	0.901	Energy flow assessment (short-term impact on the environment, i.e. product, site, division, and company levels).	0.872
Environmental target costing.	0.901	Lifecycle analysis of specific project.	0.861
Monetary environmental capital budgeting.	0.898	Relevant environmental impacts (e.g. given short run constraints on activities).	0.856
Monetary environmental operational budgeting.	0.896	Long-term physical environmental planning.	0.844
Post assessment of relevant environmental costing decisions.	0.892	Lifecycle inventories.	0.843
Post investment assessment of individual projects.	0.858	Physical environmental budgeting (flows and stocks) (e.g. material and energy flow activity based budgeting).	0.829
Environmentally induced capital expenditure and revenue.	0.800		
Environmental cost accounting.	0.763		

For the second set of questionnaires (for the environmental managers), the PCA (as shown in table 8) resulted in the identification of three factors of economic performance labelled as ‘security’ (component 1), ‘business benefits’ (component 2) and ‘reputation’ (component 3). These three components explain 55.248 percent of the variance for variable economic performance. Three items (management satisfaction, owner satisfaction and sales) were dropped from the analysis due to low factor loading and cross loading

problems. The Cronbach’s Alpha values for security, business benefits and reputation are 0.793, 0.724 and 0.676, respectively.

Adoption of MEMA

The results in table 9 show that the MEMA adoption level is low (mean score 2.329). It seems that the role of accounting is not perceived as important in supporting the environmental management systems of the companies, particularly in ensuring environmental related efficiency (Wilmshurst & Frost 2001).

Table 7 PCA on Environmental Performance

QUESTIONNAIRE SURVEY I (MEMA) - ENVIRONMENTAL PERFORMANCE			QUESTIONNAIRE SURVEY II (PEMA) - ENVIRONMENTAL PERFORMANCE		
Items and description	1 Reduction of negative environmental impacts	2 Reduction in use of non-renewable resources	Items and description	1 Reduction of negative environmental impacts	2 Reduction in use of non-renewable resources
Reduction of soil contamination	0.892		Reduction in wastewater emissions	0.849	
Reduction in wastewater emissions	0.886		Reduction in emissions to air	0.827	
Reduction in emissions to air	0.884		Reduction of smell/odour emissions	0.818	
Reduction of smell/odour emissions	0.861		Reduction of noise	0.800	
Reduction of solid waste	0.781		Reduction of soil contamination	0.794	
Reduction of landscape damage	0.780		Reduction in the risk of severe accidents	0.760	
Reduction of noise	0.755		Reduction of landscape damage	0.729	
Reduction in use of toxic inputs	0.665		Reduction in use of toxic inputs	0.613	
Reduction in use of non-renewable resources		0.871	Reduction of solid waste	0.560	
Reduction in use of energy		0.841	Reduction in use of energy		0.877
Reduction in use of water		0.713	Reduction in use of water		0.855
			Reduction in use of non-renewable resources		0.746

Nevertheless, the accountants do feel that their companies are performing moderately in terms of environmental performance (reduction of negative environmental impact – mean score 3.433; and reduction in usage of natural resources – mean score 3.225). The accountants also believe that their companies are performing well in terms of economic performance (internal stakeholders’ satisfaction – moderate mean score 3.432; business benefits – high mean score 3.776; and future benefits – high mean score 3.574). Pearson correlation analysis was used to assess the relationships among critical variables. The correlation results (see Table 11) show that there is a significant positive relationship between MEMA adoption and environmental performance (reduction of negative environmental impact, reduction in

usage of natural resources). The relationship between MEMA adoption and economic performance (business benefits, future benefits) are also significant and positive.

Adoption of PEMA

The mean score for PEMA (i.e. 3.056 see Table 10) suggests that the respondents believe their PEMA adoption level is moderate. Thus, there appears to be a moderate involvement of environmental managers in supporting the management accounting systems of the organization. As indicated by their mean scores, the respondents feel that they are doing well in reducing their negative environmental impact (mean score high at 3.610) and usage of natural resources (mean score moderate at 3.314).

Table 8 PCA on Economic Performance

QUESTIONNAIRE SURVEY I (MEMA) - ECONOMIC PERFORMANCE				QUESTIONNAIRE SURVEY II (PEMA) - ECONOMIC PERFORMANCE			
Items and description	1	2	3	Items and description	1	2	3
	Internal stakeholders ' satisfaction	Business benefits	Future benefits		Security	Business benefits	Reputatio n
Owner/ shareholder satisfaction	0.805			Improved insurance conditions	0.772		
Recruitment & staff retention	0.761			Better access to bank loans	0.698		
Management satisfaction	0.739			Productivity	0.681		
Worker satisfaction	0.736			Recruitment & staff retention	0.679		
Product image		0.834		Worker satisfaction	0.605		
Corporate image		0.832		Long-term profit		0.819	
Competitive advantage		0.681		Market share		0.682	
Sales		0.565		Competitive advantage		0.628	
Long-term profit			0.834	New market opportunities		0.606	
New market opportunities			0.751	Short-term profit		0.568	
				Corporate image			0.818
				Product image			0.756
				Cost savings			0.603

Similarly, the respondents also perceive that their recent performance is good in terms of security (mean score high at 3.531), business benefits (mean score high at 3.564) and reputation (mean score high at 3.792).

Next, the correlation analysis (see Table 12) shows that there is a significant positive relationship between PEMA adoption and environmental performance (reduction of negative environmental impact, and reduction in usage of natural resources). The

relationship between PEMA adoption and economic performance (security, business benefits, reputation) is also significant and positive. Therefore, if the level of EMA (MEMA and PEMA) adoption increases, based on the sample of companies examined, environmental performance also increases. Similarly, if the level of EMA (MEMA and PEMA) adoption increases, environmental performance also increases. The correlation results support hypotheses 1 and 2.

Table 9 Descriptive statistics- questionnaire survey set I

Variables	Actual Range		Mean	Med	S.D.
	Min	Max			
MEMA	1.00	5.00	2.329	2.308	1.014
Environmental Performance:					
Reduction of negative environmental impact	1.00	5.00	3.433	3.375	0.886
Reduction in usage of natural resources	1.67	5.00	3.225	3.333	0.769
Economic performance:					
Internal stakeholders' satisfaction	2.00	5.00	3.432	3.500	0.624
Business benefits	2.50	5.00	3.776	3.750	0.605
Future benefits	2.00	5.00	3.574	3.500	0.706

Med= Median

Table 10 Descriptive statistics- questionnaire survey set II

Variables	Actual Range		Mean	Med	S.D.
	Min	Max			
PEMA	1.00	5.00	3.056	3.182	0.969
Environmental Performance:					
Reduction of negative environmental impact	1.22	5.00	3.610	3.722	0.789
Reduction in usage of natural resources	1.33	5.00	3.314	3.333	0.671
Economic performance:					
Security	2.00	5.00	3.531	3.600	0.557
Businessbenefits	2.20	5.00	3.564	3.600	0.525
Reputation	2.67	5.00	3.792	3.667	0.526

Med= Median

Conclusion

This study describes EMA (MEMA and PEMA) adoption among manufacturing companies in Malaysia. At present, there is still a paucity of EMA research in developing countries such as Malaysia. The results suggest that the adoption of EMA is not at an encouraging level. The low adoption of

MEMA and the moderate adoption level of PEMA signal the likelihood that the manufacturing companies in Malaysia may view EMA as a less significant aspect of their internal management system. Additionally, the accountants, when compared with the environmental managers, seem to be more

reluctant in incorporating EMA as part of the organizations' management systems.

Nonetheless, the results also show that there are significant positive correlations between the EMA adoption level and environmental performance. Positive correlations are also observed between the EMA adoption level and economic performance. Therefore, it is suggested that the adoption of EMA improves environmental and economic performance. Although the adoption level of both MEMA and PEMA is still disheartening, both the accountants and environmental managers do relate EMA adoption with better environmental performance and economic

performance. This point reflects the awareness of both parties of the potential role of EMA in bringing about better performance.

As a newly developed area, empirical investigation on EMA is still understandably sparse. The present study offers a more comprehensive study of EMA by taking into account the two distinct dimensions of EMA, which are MEMA and PEMA. Such an approach is advantageous as it allows for better identification concerning the engagement of both the accountants and environmental managers in their company's EMA adoption.

Table 11 - Correlation matrix- questionnaire survey set

	MEMA	Red in neg env impact	Red in usage of nat res	Internal s/holder satisfactn	Bus benefits	Future benefits
MEMA	1.000					
Reduction of negative environmental impact	0.329**	1.000				
Reduction in usage of natural resources	0.406**	0.539**	1.000			
Internal stakeholders satisfaction	0.158	0.294**	0.446**	1.000		
Business benefits	0.409**	0.408**	0.410**	0.492**	1.000	
Future benefits	0.206*	0.225*	0.221*	0.377**	0.393**	1.000

**significant at 0.01 level (2-tailed)

*significant at 0.05 level (2-tailed)

Table 12 - Correlation matrix- questionnaire survey set II

	PEMA	Red in neg env impact	Red in usage of nat res	Security	Bus benefits	Reputatn
PEMA	1.000					
Reduction of negative environmental impact	0.399**	1.000				
Reduction in usage of natural resources	0.232*	0.409**	1.000			
Security	0.352**	0.479**	0.186**	1.000		
Business benefits	0.259**	0.315**	0.320**	0.449**	1.000	
Reputation	0.343*	0.458*	0.369*	0.519**	0.385**	1.000

**significant at 0.01 level (2-tailed)

*significant at 0.05 level (2-tailed)

Accountants play a major role in the development of the company's management accounting systems while the environmental managers carry the responsibility concerning the environmental management systems of the company.

Furthermore, the findings provide some evidence concerning the impact of EMA in enhancing both environmental and economic performance. In other words, EMA demonstrates great potential for eco-efficiency. As companies worldwide are now facing the increasing challenge to align their businesses' core values and competencies with corporate responsibility (Othman 2009, p. 23 (cited in Arshad et. al. 2009)), both accountants and environmental managers may want to move forward by optimizing the utilization of EMA.

Future research may consider a case study based assessment of EMA adoption. Through case studies, the researcher will be able to achieve a more in-depth exploration by closely examining the link between EMA adoption, environmental and economic performance. Another research avenue is the investigation concerning communication between the accountants and environmental managers, particularly in relation to the MEMA and PEMA information tools.

Finally, the results of this study must be interpreted with some caution. As the research variables were measured through the perceptions of the respondents, it is likely that there will be some leniency error (higher mean values in the observed score). This is consistent with human nature and that is to overemphasize the positive quality or performance of the organization that they represent. Objective measures of performance such as return on investment and return on assets may capture performance more accurately (Gul, 1991). Further, because of time and cost constraints, the data gathered was collected at a single point of time, inheriting the usual limitations of cross-sectional data.

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ENVIRONMENT EXTRA!

Biodiversity threat to business is bigger than climate change

The threat from the decline in biodiversity should be viewed as larger and more urgent to business than climate change.

That is one of the conclusions made by professional services firm PricewaterhouseCoopers (PwC), which has contributed to the business perceptions of the risk posed by **biodiversity** loss to a major UN study launched in London today.

PwC analysis shows less than one in five companies, including many UK household names, see biodiversity as an important business issue.

The Economics of Ecosystems and Biodiversity (TEEB) is a two-year study led by the UN Environment Programme and funded by the European Commission and Governments including Germany, Norway and the UK. It examines the economics of biodiversity and ecosystem loss for business arguing that businesses have an economic interest in protecting nature and, in some cases, should see it as opportunity for new activity.

The UN defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems".

Biodiversity is decreasing at an alarming rate, however. Since 1970, 30 per cent of the animal population has become extinct, while the coverage of living corals has reduced by 40 per cent.

The global economic impact of biodiversity loss is estimated at between £1-3 trillion annually or up to 7.5 per cent of global GDP.

"Nature biting back"

Speaking at the first Global Business of Biodiversity symposium in London, where today's report was launched, PwC said UK business needed to prepare for "nature biting back".

"Current business strategies and plans in the UK are biting the hand that feeds stable consumer prices, business prospects and long term investor security and returns," said Malcolm Preston, CEO, sustainability and climate change, PwC.

PwC warned no UK sector or business will escape unaffected by changes and availability of biodiversity and ecosystem 'services'. Such services include water used in food and drink production, timber for packaging, furniture and paper, productive land for fruit and vegetables, and fibres for clothes.

Asset base

Jon Williams, partner, sustainability and climate change at PwC, said businesses should start viewing ecosystems as "an extension of their asset base" as the scrutiny of big business and its impacts on the world's 'natural capital' is likely to intensify as better evaluations and assessments come to the fore.

"The UK's access to, and use of environmental resources in locations from local farms in Suffolk to rainforests in south America, is like an international warehouse of assets that no-one has priced or got an inventory for," he said.

Blind spots

PwC highlights five blind spots' for UK businesses to focus on when it comes to biodiversity. These include corporate reporting to reflect changes to how resources are considered for the business's future; unpredictability in supply chain pricing and

availability; greater awareness among consumers about biodiversity loss, leading to changes in consumer preferences and purchasing decisions; investors factoring in more value for resources that supply and sustain businesses and funds they are investing in, and new environmental regulation, tax and subsidy reforms taking into account biodiversity.

Source 13th July 2010 Greenwise Business: <http://www.greenwisebusiness.co.uk/accounting.aspx>

International Integrated Reporting Committee (IIRC) formed to pursue sustainability accounting framework

The Prince of Wales's Accounting for Sustainability Project (A4S) and the Global Reporting Initiative (GRI) have announced the formation of the International Integrated Reporting Committee (IIRC). The IIRC aims to create a globally accepted framework for accounting for sustainability, bringing together financial, environmental, social and governance information an "integrated" format.

Purpose of the IIRC

The IIRC is being created to respond to the need for a concise, clear, comprehensive and comparable integrated reporting framework structured around the organisation's strategic objectives, its governance and business model and integrating both material financial and non-financial information.

The objectives for an integrated reporting framework are to:

- support the information needs of long-term investors, by showing the broader and longer-term consequences of decision-making
- reflect the interconnections between environmental, social, governance and

financial factors in decisions that affect long-term performance and condition, making clear the link between sustainability and economic value

- provide the necessary framework for environmental and social factors to be taken into account systematically in reporting and decision-making
- rebalance performance metrics away from an undue emphasis on short-term financial performance, and
- bring reporting closer to the information used by management to run the business on a day-to-day basis.

Role of the IIRC

The role of the IIRC is to:

- raise awareness of this issue and develop a consensus among governments, listing authorities, business, investors, accounting bodies and standard setters for the best way to address it
- develop an overarching integrated reporting framework setting out the scope of integrated reporting and its key components
- identify priority areas where additional work is needed and provide a plan for development
- consider whether standards in this area should be voluntary or mandatory and facilitate collaboration between standard-setters and convergence in the standards needed to underpin integrated reporting and promote the adoption of integrated reporting by relevant regulators and report preparers.

The IIRC brings together a cross section of representatives from civil society and the corporate, accounting, securities, regulatory, NGO, IGO and standard-setting sectors.

Source: 3rd August 2010 Integrated Reporting: www.integratedreporting.org

UK's largest companies still not measuring carbon footprint

Despite the threat of increased legislation, most of the UK's largest companies do not currently measure their carbon footprint, a survey has found.

Three quarters (74 per cent) of finance heads from UK companies with more than 500 employees said their companies have not yet measured their carbon footprint in a poll published by the Carbon Trust.

Nearly half (48 per cent) did not have a clear corporate target for carbon reduction and a further 16 per cent did not know if their company had a target.

This is despite the fact that most of the 200 finance heads surveyed said they anticipated all businesses will be required to measure their carbon footprint (72 per cent) and pay a price for the carbon they emit (76 per cent) within the next decade (59 per cent).

The findings were published just weeks before the registration deadline for the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme, the Government's cap and trade scheme designed to improve the energy efficiency in large, low energy-intensive organisations not already covered by the UK Climate Change Agreements and the European Union Emissions Trading System. Around 5,000 large public and private sector organisations, such as supermarkets, water companies, banks and local authorities, will need to purchase carbon allowances to cover their emissions from April 2011 under the scheme. However, Government figures show that less than half of those organisations required to register for the scheme, have so far done so.

"The debate about whether or not carbon footprinting and payment will become mandatory for business appears to be over as far as finance heads are concerned," commented Harry Morrison, general manager of the Carbon Trust Standard

Company, which offers independent certification for businesses that measure, manage and reduce their carbon emissions. "Yet only a minority have taken action so far and these early movers have a clear advantage. Building carbon management into the DNA of the business now not only ensures preparedness for future compliance requirements but also brings immediate cost and efficiency benefits and competitive edge."

The survey was conducted among finance decision-makers in six key sectors – retail, professional services, financial services, technology and communications, fast moving consumer goods (FMCG) and leisure and entertainment.

Low carbon opportunities

While more than a third (43 per cent) of those interviewed believed the low carbon economy provided an opportunity for their business, there were marked differences in outlook between industries. The majority of technology and communications organisations (88 per cent) and FMCG companies (63 per cent) viewing the low carbon economy as an opportunity. However that figure was much lower among professional services (22 per cent) financial services (30 per cent) and retailers (31 per cent).

Low carbon drivers

When asked what the drivers were for their companies' switchover to a low carbon economy, most of those surveyed cited increased efficiency and reduced costs by reducing energy use (97 per cent), complying with carbon legislation (95 per cent), meeting customer (78 per cent) and employee expectations (76 per cent) and protecting corporate reputation (74 per cent). Less than half (48 per cent) believed it would create new market opportunities or win business. Meanwhile, less than half (45 per cent) of all respondents cited investor expectation as important, but this figure almost doubled among finance heads at technology and

communications companies (88 per cent).

"About half of businesses appear to be on the front foot, seeing the business development opportunities in the low carbon economy rather than simply reacting to legislative requirements and cost incentives," said Morrison.

Rachel Sinha, sustainability manager, Institute of Chartered Accountants of England and Wales (ICAEW) said it was

important for finance heads to play a role in "guiding" their organisations' carbon management strategy. "They, therefore, need to be prepared to provide the evidence base and framework for their organisations to be able to turn this time of change into a competitive advantage."

Source 16th August Greenwise Business: <http://www.greenwisebusiness.co.uk/accounting.aspx>

CALLS FOR PAPERS

Forthcoming for 2011

The **8th Spanish Conference on Social and Environmental Accounting Research**: University of Burgos, Spain, 2011.

Discussions also underway for a **joint EMAN/CSEAR conference in Northern Europe/Scandinavia** during 2011.

The 1st French CSEAR conference will be held between June 13th - 14th in 2011 and the venue will be the Université Paris Dauphine in Paris. Further details to come.

Source: CSEAR website, St Andrews University: <http://www.st-andrews.ac.uk/~csearweb/conferencesnews/other-csear.html>

Climate and Environmental Governance Network (CEGNet):

Governance for Green Growth?

25 February 2011

Expression of interest/proposed title:

30 September 2010

Abstract: 30 October 2010

Full Papers: 30 January 2011

The current structure of the global economic system lies at the heart of many debates about environmental sustainability. Decades of impressive economic growth have left their marks on the Earth's oceans, landscapes, rivers and atmosphere, raising the question of whether recent trends are sustainable.

One response to this question, arising in the aftermath of the Global Financial Crisis (GFC), is the suggestion that the tension between economic growth and environmental sustainability can be resolved through "Green Growth".

According to proponents of the concept, Green Growth emphasizes environmentally sustainable economic progress to foster low-carbon and socially inclusive development. For example, the 2009 OECD Declaration on Green Growth stated that "a number of well targeted policy instruments can be used to encourage green investment in order to simultaneously contribute to economic recovery in the short-term, and help to build the environmentally friendly infrastructure required for a green economy in the long-term". Other observers agree that more investment in green sectors is needed and that such investment can boost employment; however, they question the continued emphasis on 'growth', at least in developed economies.

A move towards Green Growth (or, more radically, to 'steady state' economics) will not be achieved without reforms and innovations in governance at the local, national and global level. This workshop aims to explore the institutions and regulatory strategies that have been proposed or have emerged in recent years to facilitate the transition to a green economy.

The workshop will bring together researchers from Australia and New Zealand who will present formal papers and contribute to informal discussions. We are negotiating for a selection of the papers to be published as a Special Issue of *Environmental Policy and Governance* (ERA level B journal). Financial support will be made available to speakers coming from inter-state.

We would like to invite paper proposals that fit within one of the following three themes:

1. Global governance for green growth?

This session will explore the institutions and regulatory strategies for green growth that have been proposed or have emerged at the global level. For example, the United Nations Environment Programme (UNEP) has put forward a proposal for a global ‘Green New Deal’ which includes recommendations for reforming the governance of international trade, aid and finance. What is the potential for international cooperation in these areas, particularly post-Copenhagen? Which global forum is most suitable for fostering such cooperation – the UN, G8, G20?

2. National and local governance for green growth?

This session will explore the institutions and regulatory strategies for green growth that have been proposed or have emerged at the national and local levels. For example, in the wake of the GFC many governments, particularly in developed countries, introduced Keynesian stimulus packages that had a strong emphasis on ‘green’ measures that simultaneously tackled unemployment and issues such as energy efficiency. How successful have such initiatives been? Is there anything distinctive about government strategies in

Australia, New Zealand or other countries in Asia and the Pacific? To what extent can local governments and communities play a role in the transition to a green economy?

3. Private governance for green growth?

This session will explore the institutions and regulatory strategies for green growth that have been proposed or have emerged in the private sector. The business community clearly has a strong interest in how a green economy would be governed. What role do public-private partnerships, co- and self-regulation and corporate social responsibility play in governance for green growth?

To submit a proposed title or abstract please email

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For other enquiries please email

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** This workshop is endorsed by the Earth System Governance project (www.earthsystemgovernance.org) and has received financial support from the College of Asia and Pacific, Australian National University.*

