

Physical Environmental Management Accounting Disclosures with Special Reference to Energy, Water, Waste and Carbon Footprint: A Case Study of Top 30 Fortune 500 Companies

Dr. Ashish Porwal

*Faculty,
Department of Accountancy and Statistics,
Mohanlal Sukhadia University,
Udaipur (Rajasthan), India
Email: drashishporwal@gmail.com*

Dr. Sachin Gupta

*Assistant Professor,
Department of Business Administration,
Mohanlal Sukhadia University,
Udaipur (Rajasthan), India
Email: sachinguptabusadm@gmail.com*

ABSTRACT

Today the grave environmental crisis is the greatest danger facing mankind in its face. Man's insatiable need and greed has catapulted lacs and lacs of species of flora and fauna in the danger zone, with their chances of becoming extinct increasing by every passing day. Many developing countries have implemented policies and taken actions to implement environmental disclosures practices, at the national and local level, in the public and private sector. In present paper an attempt has been made to analyze that how EMA disclosures will enhance the image of the select Fortune 500 Companies. The EMA disclosures are verified on the basis of four aspects Energy, Waste, Water and Carbon Footprint. It can be inferred from the results that better EMA disclosures can help companies to earn higher profits and reduce costs.

Keywords: *Environmental Management Accounting, EMA Disclosures, Carbon Footprint, Physical EMA Disclosures*

- I. Introduction:** Environmental accounting is relatively a recent entrant in the domain of accounting. "Traditional accounting is limited when it comes to measuring natural wealth. Accountants measure assets, earnings; one year behind the times...Jet pilots don't use rear-view mirrors. If we want to account for the environment, we have to look forward. Accountants need to develop new ways to

account for natural resources."(Gupta, 2012) Environmental accounting is defined as the identification, compilation, estimation and analysis of environmental cost information for better decision-making within the firm. It can be defined as "The generation, analysis, and use of financial and non-financial information in order to optimize corporate, environmental and economic performance, achieving a sustainable business (Bennett and James, 1998) the ultimate objective of environmental accounting is to clearly indicate the environmental cost of each process, separating the non environmental costs from the environment costs.

Environmental Management Accounting is the identification, collection, analysis and use of two types of information for internal decision making:

- Physical information on the use, flows and destinies of energy, water and materials (industry wastes) and
- Monetary information on environment – related costs, earnings and savings.

In other words Environmental Management Accounting (EMA) includes both Physical Environmental Management Accounting (PEMA) and Monetary Environmental Management Accounting (MEMA) (UNSD, 2001). EMA serves business managers in making capital investment decisions, costing determinations, process/product design decisions, performance evaluation and a host of other forward-looking business decisions (UNSD, 2000). EMA approaches and information can be used not only to help assess particular investment projects, but also to help assess the environmental and related cost implications of particular types of materials and products.

II. Objectives:

Following are the main objectives of this paper:

1. To examine the disclosure practices regarding EMA in sample units.
2. To explore disclosure index model for EMA.

III. Literature Review

3.1. Olalekan & Jumoke (2017) in their study established the level of environmental management accounting practices among listed firms in Nigeria and South Africa, and identified the barriers limiting such practices. The study utilized primary data through the administration of structured questionnaire, and a total of 44 accountants (22 from each country) participated. Data collected were analyzed using descriptive statistics involving mean scores, frequencies, tables and

percentages. The study found that EMA practices are higher in South Africa than Nigeria given the number of EMA techniques applied by firms in South Africa (n=72) compared to Nigeria (n=41). This paper concluded that the government and other stakeholders in Nigeria should play active roles in making and enforcing environmental laws and regulations so as to curb complacency in relation to environmental issues among firms.

3.2. Jalil, Abar, & Dadashian (2016) suggested in their study that Environmental management system (EMS) is a useful approach for improving the environmental function of organizations. Since the main decisions of environmental management depends on the costs and benefits of the suggested changes in the environmental behavior of the firm, Environmental management accounting (EMA) seems to be an essential and fundamental step for establishing an efficient environmental management. EMA is unfortunately most likely ignored or not enough discussed in neither management nor environmental fields, especially in developing countries. Therefore, this research aims to implement the environmental management accounting in a leather factory of Iran. Furthermore, this practical research introduces a suitable and practical model for implementation of EMA in the mentioned industry. In the end a model for EMA implementation in leather industries was produced.

3.3. Joseph (2016) in his paper discussed about internal decision making tools in taking decisions regarding environment consideration. Environmental Management Accounting (EMA)'s implementation in corporate is the need of the day. Environmental Management Accounting is an important topic and it plays a vital role for the development of the economy. The corporate sector can get benefit by implementing this system. They can get actual cost of production of products, real and hidden costs and also helps them to fix proper price. They have a chance to make stake holders happy and can proudly talk about their eco friendly atmosphere and product they manufacture.

3.4. Nyide & Lekhanya (2016) discussed that the use of environmental management accounting (EMA) remains debated in South Africa and the literature reveals that EMA is still at an infancy stage in the emerging economies, including South Africa. Currently, there is limited existing research on environmental management

accounting practices available for use by the hotel sector in South Africa. The overall aim of this study was to investigate and describe the use of the environmental management accounting tools by the hotel sector in the 3-5 star categories in KwaZulu-Natal. The research was an exploratory study and qualitative in nature using a single case study with embedded units approach. It is envisaged that study will bridge the gap that exists in South Africa as far as environmental management accounting is concerned and it will also make the provision of meaningful results for policy decision making by the relevant stakeholders in the hotel industry. Moreover, it established factors that drive and/or hinder the implementation of EMA tools that would control and manage environmental costs and their root causes.

3.5. Doorasamy & Garbharran (2015) in their article on “Assessing the use of Environmental Management Accounting as a tool to Calculate Environmental Costs and their Impact on a Company’s Environmental Performance” elaborated that the study was limited to the steam generation process and focused mainly on the efficiency of the current coal-fired boilers used in the boiler plant. The research methodology used in the study was both quantitative and qualitative involving triangulation. The results of the study show that EMA can improve environmental and economic performance of an organization by providing to managers more accurate values of their environmental costs.

3.6. Gunarathne et al. (2015) in their book on EMA entitled “Environmental Management Accounting in Sri Lankan Enterprises” has elaborated EMA practices in different environmental domains such as energy, water, waste and carbon footprint. The industries were mainly selected on accessibility criteria and included a mix of industries in each chapter. As per the study some companies which followed noteworthy EMA practices have been largely influenced by the guidelines of their foreign parent companies. Some companies followed initiatives that are of a pure CSR nature and those projects do not have any relationship with the core businesses. So they ignored these EMA practices for which there is no business case. They interviewed several managers of each company in charge of these practices. Moreover, the study always referred to various other documents as a means of triangulation. They were surprised when some companies were not at

all hesitant to share their very confidential information with us to build our cases. While collecting data it was found that these companies were at different levels of the development stages of EMA. This phenomenon revealed that in some companies there were sophisticated EMA systems in certain environmental domains, while in others domain EMA was at primitive level. This book therefore attempts to bring to light as to who is in charge of EMA and what information is collected and communicated under the main environmental domains covered in this book are -energy, water, waste and carbon footprint (CFP).

3.7. Jamil et al. (2015) in their article on “Environmental Management Accounting Practices in Small Medium Manufacturing Firms” conducted a study about factors and barriers which influenced the practice of environmental management accounting. The study focused on small medium enterprises specifically, Malaysian small medium manufacturing firms. The results indicated that most firms have a budget allocation for environmental activities and practice i.e. physical EMA. The study argued that coercion was a dominant factor for practicing EMA and therefore, barriers to EMA development were required to be resolved by the Malaysian government and other authorities.

3.8. Poll (2015) in his article on “Facilitating a greener environment through Management Accounting” revealed that Management accounting improves decision-making as it communicates decision-relevant insight and analysis to every decision-maker in a company, focussing on their social and environmental duties. In this the annual statements on the websites of the Top 10 South African companies in 2014 were analysed and compared to 2012, 2008, and 2003. A “Word cloud” was created for each year, based on sixteen key words to determine whether awareness grew with regard to sustainability and the environment. This paper is conceptual and exploratory in nature as it highlights the demand on natural resources as well as the steps that can be taken to minimise the impact on natural resources. Companies seem to become more aware of what they do to the environment and would like to take action wherever they can in order to be acceptable to investors. In the early 1980s companies did what is referred to as call “green washing” to comply with legalities. However, it seems that this has now changed to a true awareness and “green” companies are becoming more and

more competitive due to their truly environmentally friendly activities. In order to assist companies to become even more aware of waste and their environmental responsibility, they may need to be made more aware of the use of management accounting tools such as Activity Based Costing (ABC) and Material Flow Cost Accounting (MFCA) simultaneously.

3.9. Abiola & Ashamu (2014) in their article entitled “Environmental Management Accounting Practice in Nigeria includes a case study of the Nigeria National Petroleum Corporation (NNPC) as an Environmental sensitive sector” elaborate the assessment of NNPC’s practice of environmental management accounting (EMA) by investigating how the NNPC manages, account for and report its environmental risk performance? The study designed is mainly survey method, using questionnaires to collect data from managers in both the financial and environmental disciplines within the branches and strategic business units of the NNPC with specific case study of Abuja head office and branches in Port Harcourt and Lagos. The result of the study showed that NNPC managers are aware of environmental Accounting practices and the same is actively being used in practice. The findings of the study are to further equip NNPC managers and similar policy makers to understand how it accounts for, manages, and reports on environmental cost information.

3.10. Debnath (2014) in his article elaborated that environmental management accounting (EMA) methodologies, material flow cost accounting (MFCA) has been successful in changing traditional attitudes of corporate organizations towards material wastes from production activities and supporting management with information to improve resource utilizations and material yields. However, EMA has not been able to expand beyond itself material wastes and cover Greenhouse Gas (GHG) emissions. On the contrary, GHG accounting has institutionalized itself as an independent framework to capture and report greenhouse gases from organizational activities and help firms manage its GHG related risks. He proposes an experimental construct to integrate these two frameworks, based on their complementarity and commonality of organizational processes, and validates the construct with the help of a case example. The author believes that the proposed unification would help EMA to cover major

environmental risks of businesses within single framework, help management with better information flow, and support environmentally-conscious decision-making.

3.11. Jankovic & Krivacic (2014) in their paper, “Environmental Accounting As Perspective For Hotel Sustainability: Literature Review”, provides an overview of current research in the field of hotel environmental accounting and reporting, which is based on established knowledge about hotel environmental responsibility. Contemporary trends in the hotel industry require hotels for changes in their business policy and strategy. Those changes are necessary for implementing environmentally sustainable practices such as environmental accounting. It is possible to develop environmental accounting if management commitment for environmental issues is incorporated in corporate environmental policy and if business practices incorporate environmental management. Hotels have to detect, measure, record and analyze environmental costs in order to optimize them. Information about environmental costs and other environmental performance indicators have to be communicated to stakeholders. Some positive trends are demonstrated by those hotels that are based on their environmental practice on the principles of corporate social responsibility and have implemented the certified environmental management systems. Croatian hotels lag behind in environmental practice development, and those hotels that consider themselves environmentally responsible fall behind from the leaders on the global level. Previous research has demonstrated that the improvement of environmental responsibility, i.e. the development of environmental accounting and environmental reporting are the issues which hotels have to consider, resolve and use in order to accomplish a competitive advantage and long term business sustainability.

IV. Research Methodology

4.1. Scope of Study

The period of study is limited to one year (2016-17). This study has been conducted on data taken from the corporate social responsibility reports, environmental reports or any other reports related to environment downloaded from the website of selected companies.

Top 30 companies are selected from Fortune 500 Global companies list ranked on the basis of revenues for the year 2016. Data related to four aspects viz. Energy, Water, Waste and Carbon Footprint are taken into consideration

Score is given to companies on the basis of 5 point scale as follows:

- (i) 1 for no disclosure
- (ii) 2 if one sentence disclosure is made
- (iii) 3 if more than one sentence disclosures are made
- (iv) 4 if one figure is disclosed
- (v) 5 if more than one figures are disclosed

The scores are given on the basis of disclosures on Physical EMA considering the four aspects i.e. Energy, Water, Waste and Carbon Footprint.

The tables are prepared on the basis of total score on the four aspects for Physical EMA. Like for Walmart the score for Physical EMA disclosure is calculated as in respect of Energy 5, Water 4, Waste 4 and Carbon Footprint 5, the total is 18. Likewise the scores of other companies are calculated.

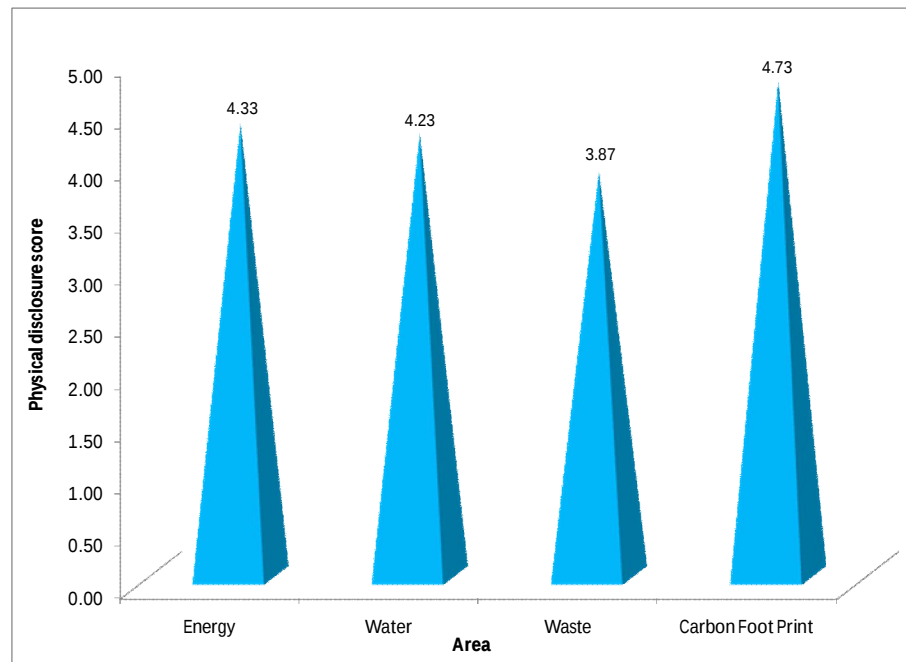
4.2. Hypothesis of the Study:

- (i) **H₀:** There is no significant difference in the level of disclosures in different areas under Physical EMA.

Physical disclosures (Table 4.2.1)

Area	N	Mean	SD	F	df	Result
Energy	30	4.33	1.30	2.172	3, 116	NS
Water	30	4.23	1.38			
Waste	30	3.87	1.55			
Carbon Foot Print	30	4.73	1.01			

Figure 4.2.1



The Figure 4.2.1 indicates shows the Test results comparison between the four areas i.e. Energy, Water, Waste and Carbon Footprint. It shows that Physical EMA Disclosures are almost same in all the Companies in respect of each category.

Test result given above shows area wise comparison of Physical EMA disclosures by selected 30 companies. Test result shows non-significant difference in the physical disclosures in different areas viz. energy, water, waste and carbon foot print ($F = 2.172$, $p > 0.05$). On the observation of table it was found that average disclosure score in each area is near to 3 and does not differ significantly. However the maximum disclosures score was in the area of carbon foot print and least was in the area of waste. **Hence null hypothesis is accepted that “There is non-significant difference in the level of disclosures in different areas under physical EMA”.**

V. Suggested Framework

Environmental protection is inevitable. Environment Pollution has posed a serious threat to the existence of the existing world society for both present and future generations. It is argued that businesses are the main source of environmental problems and are subjected to pressures from various parties who demand them to be environmentally responsible. In order to face this challenge, it is imperative that organizations incorporate environmental agenda

into their corporate strategy. This can be done through adoption of Physical Environmental Management Accounting disclosure practices. It is true that, the companies are making some sort of Physical EMA disclosures. However, following changes are recommended in general accounting of the companies:

1. Overhead accounts should be reviewed to identify the types of environmental costs which are hidden in these accounts. It is suggested that all significant environmental costs and impacts be traced to the responsible activity or process, as opposed to the use of overhead accounts. Material tracking should be used for material costs and other related product costs, such as energy, water and waste streams. Material tracking will assist in highlighting material losses and uncover unexplained waste streams.
2. A category for environment should be created and linked to all identified environmental sub-categories and environmental cost codes.
3. Physical units must be clearly identified and linked to the relevant cost codes. These units must be consistently linked.
4. All environmental codes should be flagged to assist gathering environmental information for disclosure purposes.
5. The environmental costs should be expressed as a percentage of total operating costs for decision making purposes. Environmental cost will receive managerial attention if they represent a significant amount, as a rule of thumb that is 5% or more of operating costs.

In order to implement the effective EMA disclosure system, the companies must follow the following norms:

1. Gain support from top management.
2. Define the boundaries of the proposed system.
3. Determine the company's significant environmental impacts.
4. Determine how, if at all, environmental impacts are accounted for.
5. Determine the composition of the EMA team.
6. Review existing accounting systems.

7. Also collect EMA related information from the suppliers which has impact on their business.

The economic and environmental issues typically considered together under environmental accounting are only two of the three pillars of sustainable development. The concept of sustainability requires recognition that humanity must live within the limits of the planet's overall resources and carrying capacity. Sustainable development is defined as dealing with economic, environmental and social issues such as employment, education and cultural issues in a way that meet both present and future human needs without compromising the viability of the natural earth systems on which mankind depends. Accounting research and practices must include the economic and environmental components of environmental accounting and the social issues essential to the overall sustainability. Most EMA initiatives today do not cover social aspects. This needs to be looked into for future. Therefore, by being environmentally responsible, not only the environment can be preserved for the sake of present and future generations, but also will help organizations to realize the benefits in order to sustain their position in the market for longer period.

The most important role of the Physical disclosure of environmental management accounting is to demonstrate that environmental activities are not a burden for the company, but aids to achieve financial benefits. This can improve the view of external stakeholders of the company. It would also focus the attention of the employees on the environmental issues and pollution prevention measures would be easily achieved.

The Companies must follow the matrix shown in Table 5.1 for making EMA disclosures. This matrix is important to track the material flow. Identifying cost and revenue items in monetary EMA matrix and comparing the information with the Physical EMA matrix will help companies to disclose environmental issues.

FRAMEWORK FOR PHYSICAL EMA DISCLOSURES (Table 5.1)

1. Energy	Consumed	Generated/Produced	Consumption compared to last year (%)	Generation compared to last year (%)
(a) Renewable Sources				
(b) Non-Renewable Sources				
2. Water	Consumed	Waste Water Treated	Consumption Compared to last year (%)	Waste Water treatment compared to last year (%)
3. Waste	Generated	Recycled	Generated Compared to last year (%)	Recycled compared to last year (%)
(a) Hazardous Waste				
(b) Non-hazardous Waste				
4. Carbon Footprint (CFP)	Emissions	Emissions Reduced	Emissions compared to last year (%)	Emissions Reduced compared to last year (%)
(a) Carbon Dioxide (CO₂)				
(b) Methane (CH₄)				
(c) Nitrous Oxide (N₂O)				

VI. Conclusion

As governments around the globe are placing greater emphasis on environmental issues, and many initiatives have been formulated to increase the level of environmental awareness (Gadenne et al. 2009). If companies will disclose Monetary EMA disclosures properly it would help them to earn high profits and also majority of stakeholders will develop faith in company which will help in raising investments easily. It will help company to calculate environmental cost, savings and environmental revenues which can be earned from the sale of waste. It makes a significant difference, when companies report about how much they

spent on environmental protection, whether this spending incurred for traditional end of pipe technologies and fines for polluting, or for staff training on EMS (Environmental Management System) and nature conservation sponsorship or whether the costs of non-product output have been included. That's why the cost categories are distinctly separated and should be disclosed separately (Jasch, 2003). Management accountants tend to be constrained to thinking within the existing chart of accounts, and pay less attention to environmental costs (Chang, 2007). Due to this break in communication, opportunities for reducing environmental costs remain unidentified. Like Physical EMA Disclosures, Monetary information must also be disclosed by the companies to determine the true and fair picture of its financial statements.

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