



Sustainable Development through Environmental Management Accounting : A case study from a Sri Lankan manufacturing organization

Y. Neshaany

Department of Economics, Eastern University, Sri Lanka.

ABSTRACT

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This qualitative research explores the role of Environmental Management Accounting (EMA) in promoting sustainable development within a manufacturing organization in Sri Lanka. As industries worldwide face increasing pressure to adopt environmentally responsible practices, the integration of accounting tools that consider environmental impacts becomes crucial. This study focuses on a Sri Lankan manufacturing organization to understand how EMA contributes to sustainable development and environmental stewardship. The research employs a qualitative approach, utilizing in-depth interviews, document analysis, and observation methods to gather data. The study seeks to identify the key EMA practices implemented by the organization and assess their impact on sustainable development indicators. Additionally, the research aims to uncover challenges faced in the implementation process and propose potential solutions. Preliminary findings suggest that the organization's adoption of EMA has led to improved environmental performance, resource efficiency, and cost savings. Through the integration of environmental costs into decision-making processes, the organization has demonstrated a commitment to sustainable development. However, challenges such as data availability, employee awareness, and regulatory compliance have been identified as potential barriers to the effective implementation of EMA. The research contributes to the existing body of knowledge by offering insights into the practical application of EMA in a Sri Lankan manufacturing context. The findings are expected to inform policymakers, industry practitioners, and researchers on the potential benefits and challenges associated with integrating EMA into organizational practices, thereby promoting sustainable development within the manufacturing sector.

*Corresponding annyshayesu@gmail.com

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1. Introduction

Sustainable development (SD) is a goal that meets present needs without compromising future generations' ability to meet their own needs (World Commission on Environment and Development (WCED), 1987, p. 15). Organizations often prioritize shareholder wealth, causing them to use resources without considering the environment and society. To create a sustainable planet, businesses need to change their business practices. Financial accounting often fails to fully support SD due to specific rules. However, SD is a crucial factor for organizational success, and businesses have numerous opportunities to engage in sustainability practices and transform their businesses to contribute to SD (Schaltegger, Etxeberria, & Ortas, 2017). As Christophor (2014) states, SD is not a fashion but a necessity for businesses to create a sustainable planet.

Sustainable Development (SD) is a long-term human development strategy based on natural, ecological, and environmental assets. It aims to achieve beneficial outcomes for human exploration and society's growth (Maunder & Burritt, 1991). As SD is increasingly seen as a pathway to a good and desirable society, environmental concerns have increased (Holden, Linnerud, & Banister, 2014). Environmental Management Accounting (EMA) is a comprehensive approach to management accounting, focusing on costs related to wasted raw materials and other environmental issues (United Nations Division for Sustainable Development, 2003). According to Ramanathan (1976), social accounting, a part of sustainability accounting, involves selecting firm-level social performance variables, measures, and measurement procedures, developing information for performance evaluation, and communicating this information to concerned social groups.

Research on Environmental Management Accounting (EMA) in Sri Lanka is still in its early stages, with most studies focusing on its development and implementation. Lee and Gunarathne (2015) studied EMA and environmental management in the hotel sector, while Gunarathne & Yasanthi (2016) discussed the Sri Lankan experience. Moreover, Rajapakse and Imeshika (2014) discussed the adaptation of environmental management accounting to decision-making. Sri Lankan governments have concerns about EMA, as the National Green Reporting System promotes sustainability performance and environmental, social, and economic performance. However, the degree to which these practices are being implemented by organizations remains doubtful. Schaltegger (2018) suggests that accounting and EMA are important approaches to supporting corporate sustainability. This study aims to identify how contemporary EMA practices contribute to the sustainability of selected companies in Sri Lanka.

Research Questions

What are the current environmental management accounting practices in the selected company?

How environmental management accounting would contribute to sustainable development?

Objectives of the Study

To identify the current environmental management accounting practices in the selected company.

To examine how environmental management accounting would contribute to sustainable development.

Significance of the Study

The study highlights the challenge of environmental management accounting (EMA) in companies, which is the second least used strategic management accounting tool. EMA aims to optimize corporate environmental and economic performance using financial and non-financial information (Bennett & James, 2000). It can help identify methods for implementing these systems, process results, measurements, barriers, and non-implementation solutions. However, most organizations introduce EMA based on changing relative costs and benefits rather than "green" idealism. Financial indicators still permeate business thinking and drive actions, despite the encouragement for organizations to consider social, economic, and environmental impacts (Staniskis & Stasiskiene, 2006).

EMA can help companies improve environmental performance by recognizing the economic value of natural resources and the business and financial value of good environmental performance. The rapid increase in global population and industrialization, coupled with increased demand for resources, threatens a healthy ecosystem (Goosen, 2012, p. 6). Sustainable development (SD) can only be pursued if population size and growth align with the ecosystem's changing productive potential (Vijayaragunathan, 2016).

Environmental management (EMA) is crucial for environmental management decisions and routine activities like product design, cost allocation, and performance evaluation (Staniskis & Stasiskiene, 2006). It offers benefits like optimal resource use, innovation, cleaner production, and waste management (Wahyuni, 2009). Research studies should focus on practical applications to demonstrate EMA's contribution to sustainable development and encourage adoption.

2. Literature Review

Definition of Environmental Management Accounting and Evolution

According to Burrit (2004), organizations face challenges in sustainability due to insufficient financial accounting and inadequate environmental data. Conventional management accounting often neglects environmental information, leading to insufficient incorporation of environmental costs into business decision-making. Environmental Management Accounting (EMA) addresses these needs by providing accounting information for managers' activities affecting both the environment and the corporation. Organizations follow three stages of EMA: compliance, conservation, and leading edge, which contribute to superior environmental and economic performance (Gunarathne, Peiris, Edirisooriya, & Jayasinghe, 2015).

Sustainable Development and Evolution

Sustainable development (SD) emerged in the 1970s (Mauders & Burritt, 1991) as a concept synonymous with social responsibility and environmental management (Thornton, 2013). It was first used by the World

Commission on Sustainable Development in 1987 and expanded to include environmental, social inclusion, and economic aspects. This approach led to the adoption of the 17 SDGs and the 2030 Agenda.

Sustainable Development through Environmental Management Accounting

Maunder and Burritt (1991) investigated how traditional accounting is criticized for its limitations in providing sufficient information for enterprises' SD and highlighting special contributions. Sustainable accounting (EMA) is increasingly important for environmental management decisions, routine management activities, and measuring environmental performance. Companies using EMA as part of integrated management systems provide accurate and comprehensive information for measuring and reporting environmental performance. Bennett and James (2000) argue that despite relying heavily on non-financial information, EMA supports sustainable business decision-making.

Research Context

The research provides an overview of the cement manufacturing industry in Sri Lanka, highlighting its history dating back to Greece and Roman times. Cement is an essential commodity in infrastructure development and is the second most consumed material after water. The Sri Lankan cement industry began in the early 1950s with Kankasanthurai Cement Factory. Multinational companies (MNCs) play a crucial role in the global economy, influencing sustainable development (Ishak et al, 2017). SC Company, a leading cement manufacturer in Southeast Asia, is the only fully integrated cement manufacturer in Sri Lanka. With three key facilities in Puttalam, Galle, and Colombo, SC Company is the most preferred local cement manufacturer in Sri Lanka. The company's sustainable waste management arm, Eco-cycle, has co-processed over 600,000 MT of industrial waste with over 350 corporations and government institutions. SC Company is a leading market player in infrastructure, individual house builders, and industrial, commercial, and institutional sectors. They are the first certified 'Green Cement' in Sri Lanka and have proactively minimized environmental impact through product and process optimization. SC Company is also the first cement producer in Southeast Asia to introduce a waste heat recovery system.

3. Research Methodology

The research questions of this study examine how environmental management accounting would contribute to the SD of an organization. According to Yin (2003, p. 6) "how" and "why" questions are likely to favor the use of case studies, experiments, or histories". This type of question is concerned with interactions as well as processes. Therefore, as the purpose of this study is to investigate how EMA would contribute to the SD of an organization, I believe that employing the qualitative methodology was the most suitable methodology. Further, this study tries to explore how sustainable development happens by adopting EMA, and obviously, it is a complex process. Since achieving SD could not be quantified, the nature of the research questions in my study demanded a case study approach. The case study approach is "an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-world context" (Yin, 2014, p. 16). Robson (2002, p. 178) defines a case

study as 'a strategy for doing research that involves an empirical investigation of a particular contemporary phenomenon within its real-life context using multiple sources of evidence'. Further, the case study approach generates accurate findings as well as brings personal values to the study. According to Yin (2003), the case study is preferred in examining contemporary events, as relevant behaviors cannot be manipulated. Therefore, a case study approach will be the research design of my study.

Data Collection Method

Data will be collected using both primary and secondary data for the purpose of achieving the objectives of this study. The secondary data contributed to the formation of background information. As well as Primary data was collected through interviews and observations. Interviews can take many forms, but for the sake of argument, you may consider all of the forms to fall into either of two types: structured interviews or qualitative interviews. Further, interviews involve an interaction between an interviewer and a participant, and structured interviews carefully script the interaction (Yin, 2011). Additionally, the study by Collis and Hussey (2009) states that the use of multiple methods helps a researcher overcome the possibility of bias associated with a single method.

This study employed face-to-face, in-depth interviews as the main method of data collection, which is considered suitable for qualitative research, which involves an in-depth exploration of a phenomenon. Accordingly, an initial interview was conducted with key members of the operation divisions of the main manufacturing plant of the SC Company because they are responsible for practically adopting environmentally friendly practices. Thereafter, interviews were extended to other areas such as sustainability management, safety and environment, system compliance, process performance, as well as company communication and reputation management. Initial data revealed that key members of these areas are also involved in practicing environmentally friendly activities as well as the projects and processes of the organization. All the interviewees had more than three years of experience at EMA practices in relation to their respective fields. In the SC Company, each and every team member has individual KPIs in relation to the environment concept. In total, six interviews were conducted with key organizational members of the SC Company. The majority of the interview data was tape-recorded and transcribed verbatim, while for some interviews, detailed notes were taken during the interview.

Theoretical Framework- Four Action Framework

The Four Actions Framework developed by W. Chan Kim and Renee Mauborgne is used to reconstruct buyer value elements in crafting a new value curve or strategic profile. Kim and Mauborgne's Four Actions Framework for BOS (2005) aims to create a new value curve by addressing four core questions: eliminating factors that are taken for granted, reducing them below business standards, raising industries for industry standards, and creating factors that have never been implemented. They also proposed an Eliminate-Reduce-Raise-Create grid as a supplementary analytic tool for crafting a new value curve. A company must consider eliminating factors that have long been competitive in an industry, determining if products or services have been overdesigned, identifying and eliminating compromises the industry forces customers to make, and discovering new sources of value for buyers. By pursuing these questions, companies can gain insight into how to drop their cost structure and create new demand, shifting the strategic pricing of the industry.

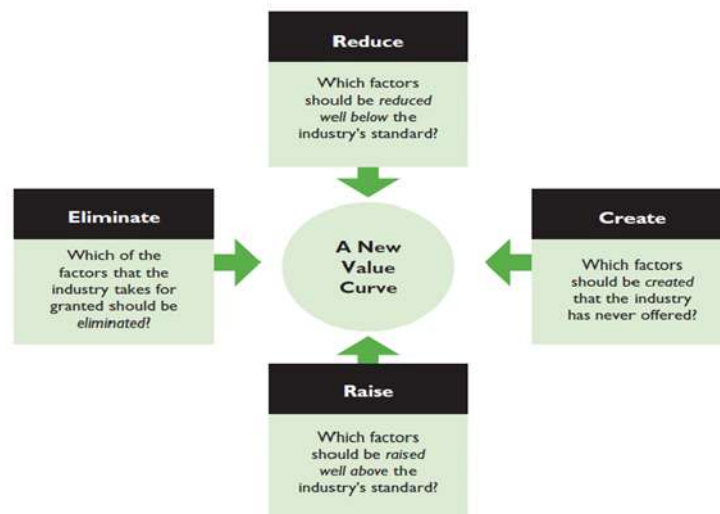


Figure 1: The four actions framework (Kim & Mauborgne, 2005, p.114)

4. Analysis and Discussion

Four Action Framework and EMA in SC Company

EMA is becoming increasingly important not only for environmental management decisions, but for all types of routine management activities, such as product and process design, cost allocation and control, capital budgeting, purchasing, product pricing and performance evaluation. Companies, which use EMA as a part of integrated management system, are provided with accurate and comprehensive information for the measurement and reporting of environmental performance. As environmental management in business has evolved, interest has grown in developing a better understanding of environment- related financial costs and benefits as an input to conventional management accounting. The main stimulus is growing evidence of the effect that environmental factors can have on the profitability and financial position of a business and the probability that these effects will increase in future through both public policy and market forces. They argue that even though environment-related management accounting relies heavily on non-financial information, the information is useful to support managers in ensuring sustainable business. These ideas can be validated through the findings of the study.

According to the explanation provided by the safety and environment manager, SC Company introduced environmental reporting in 1992 due to ownership changes and MNC acquisitions, as it was previously not focused on environmental issues.

“As Sri Lankan, we don’t have good concern regarding environment. But fortunately, acquisition did by this multinational company created the pathway to become where we are today. That’s why, in all we do, we strive to go above and beyond the call of duty, harnessing our every strength towards building a sustainable Nation.”

Also, he mentioned that, after the acquisition, they had to follow whatever the standards, guidelines followed by the parent company and they played a major role to become this much environmentally friendly organization in the country.

Eliminating Factor

The first factor standard discusses eliminating factors that no longer add value to an organization and negatively impact resource consumption. Companies must consider eliminating factors that they have long competed on, as they may detract from value. The study is focused on a cement manufacturing organization in an environmentally sensitive industry.

According to the collected data, as the environment and CSR manager stated,

"I am happy to say that, we have been started to eliminate non value adding activities, also can mention as activities which seriously impact negatively to the society, from our office itself. It was just the beginning. First, we tried to stop the generation of waste. We started to use glass water bottles instead of plastic water bottles aligned with that we restricted to bring polythene inside the factory which are below 20 microns. Similarly, we started a new practice to dispose day to day waste (especially leavings) directly to the dustbin instead of putting a polythene bag inside to the dustbin. All waste is managed under the provisions of the current National Environmental Protection Act and operates with all necessary permits to handle the overall waste management."

The organization has successfully minimized waste generation from its main operation, including its cement manufacturing process, providing the best solution to waste generated by other industries in the country. Further, he mentioned that,

"We are the premium industrial waste management solutions provider in Sri Lanka, utilizing co-processing technology to eliminate over 700,000 MT of waste to-date for a portfolio of 600 top corporates across the country. We are the only company to be actively engaged in providing a sustainable solution towards addressing the serious waste problem in Sri Lanka. As the pioneer in sustainable industrial waste management in Sri Lanka, Eco-cycle has been responsible for eliminating over 700,000 MT of industrial waste over the last 15 years."

The SC Company's eco-cycle business model involves handling hazardous waste, which can have severe environmental and human consequences. They use this waste for cement manufacturing, ensuring it aligns with their Zero Impact Policy. They also monitor employee health to prevent any negative impact on their health during waste handling. This approach ensures the quality of finished products.

Jasch (2003) stated that EMA is a method that integrates financial accounting, cost accounting, and material flow balances to enhance efficiency, reduce environmental impact, and lower environmental protection costs. Life-cycle assessment is a holistic approach that identifies environmental consequences in four stages: raw material acquisition, manufacturing, consumer use/reuse/maintenance, and recycling/waste management. CS Company ensures the life cycle assessment of production processes through waste management.

System compliance manager stated that,

“As a policy our plants do not discharge water or wastewater to the ground and all water used in our operations is treated in sewage or effluent treatment and Reverse Osmosis Plants and used for dust suppression, gardening and other purposes.”

The environment and safety manager emphasizes safety as a fundamental right, aiming for zero harm to all stakeholders. They follow "Fatality Prevention Elements (FPE)" procedures to eliminate operational risks at each site. Environmental sustainability aims to minimize the negative impacts of human actions and conserve natural resources (Jovane, Westkamper, & Williams, 2009). SC Company has minimized the negative impacts of their production process to achieve sustainability.

Reducing Factor

The second factor in the four-action framework is reducing factors. Companies should eliminate factors that they have long competed for and consider factors that should be reduced below business standards. Organizations are working to reduce activities that negatively impact the environment and society. Corporate carbon accounting is crucial for external stakeholders to understand an organization's carbon footprint and emissions reduction efforts (Schaltegger & Csutora, 2012). Society must find ways to reduce greenhouse gas emissions, particularly carbon dioxide, to prevent global warming and ensure inter-generational equity in environmental quality.

As the Company Communication and Reputation Manager commented,

“We focus on minimizing our business risks by working to reduce the negative impacts of our activities on the environment, where we emphasis biodiversity conservation as a key priority. We also remain committed to bring about broader social change across our country by investing in our own people, as well as working for the betterment of underprivileged communities in and around our cement plants.”

She further stated that,

“Our relentless efforts to minimize environmental damage through focused process optimization strategies and by investing in progressive technology and expertise to reduce carbon emission levels that result from different facets of our manufacturing operation continue to yield good results. As a result of the aforementioned initiatives, we have succeeded in achieving the lowest recorded emissions among local cement producers in 2018. Moreover, our evolution from manufacturing traditional cement products to enhanced blended cement variants led us to meet our production targets with a 34% reduction in the sourcing of coal, the only manufacturing operation in Sri Lanka to achieve this feat.”

The company is committed to reducing its GHG footprint and environmental impacts, aligning with its group strategies. They have started using alternative fuels in cement kilns and promoting clinker-substituted material in Sri Lanka. According to Turkenburg (1997), to reduce CO₂ emissions, they aim to improve energy efficiency by 50–90% and develop a sustainable energy supply system with low or no CO₂ emissions. Low-carbon growth

is seen as a productive, efficient, and attractive route to overcome world poverty, making it the only sustainable route.

Similarly, process performance engineer stated that,

“We have launched the superior blended cement range to the local market is one such industry-leading initiative that reflects our innovative spirit. Another significant development that demonstrates our deep-seated desire to innovate was the new alternative energy solution provided under the Eco-cycle waste management initiative, which has been responsible for a 34% reduction in our non-renewable energy usage.”

As Safety and Environmental manager commented,

“We have separate business unit called, eco cycle and this entirely focus on waste management in the Sri Lanka. We are taking waste from main industries in Sri Lanka and disposing them through our Kiln. Kiln generated 34% thermal energy from industrial wastes collected and pre-processed from more than 450 companies in Sri Lanka. This reduced the non-renewable energy consumption immensely, saving 11.6% of Thermal Substitution Rate over the last 10 years.”

Sustainability report published by the company shows percentage that company has reduced energy consumption over years.

Energy Consumption	Year		Saving
	2011	2021	
Specific Thermal Energy Consumption (STEC)	3860	3789	-71 MJ/t Clinker
Specific Electrical Energy Consumption (SEEC)	105.35	94.3	-11.1KWh/tCement
TSR% Thermal Substitution Rate	22.36%	33.94%	11.60%

Further he mentioned that,

“We took the first major step towards reducing the dependency on fossil fuels especially coal, we have begun conducting research on the use of greener fuels. Leveraging on the expertise of our Eco cycle initiative, we have invested in a waste-processing facility to channel non-hazardous industrial waste-products from other industries in order to produce bio fuel for our Cement Plant kiln. Using only nonhazardous waste such as fabric waste, wood waste as well as commercial waste such as paper, cardboard, packaging and some plastics, the facility currently meets approximately 34% of the energy requirements for the Cement Plant kiln. Ongoing improvements continue to be made in line with our energy security plan, which targets to increase the proportion of alternative fuels in the fuel mix to 45% by 2020. While reducing coal consumption, our bio fuel project is also a net contributor towards the national waste disposal program. Increasingly we have also begun focusing on developing low carbon content products, specifically looking at reducing the proportion of clinker in our cement in order to improve our clinker factor. Following years of research, we began adopting a new clinker base that requires approximately 30% lower combustion temperatures than conventional clinker. This led us to launch of the Superior blended cement range in 2018, marking a significant step in our efforts to migrate to low-carbon content products.”

Environment and CSR manager stated that,

“Cement production, which requires the burning limestone at high temperatures to create clinker has been responsible for large amounts of combustion-related Co₂ emissions. Amidst this backdrop, we have for many years been diligently striving to reduce Co₂ emissions.”

In addition to above mentioned activities, following activities also have been reduced by the SC Company. As system compliance manager commented,

“We have reduced the Co₂ emission through the road and sea transportation also. Since most of our raw materials are imported from foreign countries, we use ships to bring those to the country. Earlier we imported materials from many small ships from loading country to Sri Lanka. Those huge amounts of small ships emit high amount of Co₂ percentage to the environment. As a solution to this we have initiated to import raw materials from huge ship from loading country and once they reach near the terminal, distribute raw materials from that ship to few small ships. This procedure reduces the high amount of Co₂ emission.”

As they are engaging in cement manufacturing, dust emission and the noise have become serious issues as Co₂ emission. Accordingly, they have taken proactive approach to ensure each business unit remains fully engaged in reducing dust emissions and improving energy efficiency at their respective sites. As safety and environment manager commented,

“Our primary focus in terms of waste management concerns the kiln dust that is a by-product of clinker production. Several dust suppression initiatives have been implemented at our Cement Plants, while dust emissions and ambient air quality at both plants are continuously monitored to ensure they remain within the Central Environment Authority’s baseline standards. More recently we have also begun exploring the possibility of channeling kiln dust as an alternative raw material in cement production, thereby improving our environmental efficiency.”

The speaker discusses various waste management methods, including filtering systems, dry fogging, road watering, covering, and closed yards, to reduce dust. They also mention the use of high-speed fans to absorb noise. Dry fogging is a new decontamination technology that uses liquid disinfectant and compressed air to produce ultrafine droplets that prevent dust particles from falling onto surfaces, making it ideal for space and area decontamination.

The most effective air purifiers use HEPA filters, which can remove up to 99.97% of airborne particles, effectively controlling and reducing dust in factories. Energy efficiency is a key objective in energy policies, aiming to reduce energy resource reductions and carbon emissions. Implementing carbon offset strategies can mitigate climate change impacts. Confirming this idea (Houghton et al., 1996), states' energy-related carbon emission practices have the most influence on climate change. Energy efficiency is a cost-effective and commanding method for sustainable economic growth, reducing non-renewable energy use, and alleviating energy poverty.

Energy efficiency is crucial for sustainable emancipation, reducing carbon emissions, mitigating climate change, and addressing energy poverty. However, non-exhaustible energy sources must be used responsibly without damaging existing environments (Ganda & Ngwakwe, 2014). Inefficient energy technology and weak energy policies contribute to unsustainability, even with renewable sources. SC Company has made efforts to address energy consumption matters, ensuring a sustainable future with clear monitoring and regulatory frameworks.

Raising Factor

In this section, the extent to which the company use raising factor of the four-action framework will be discussed. What are the factors that they raise well above the industry norms in order to build sustainable nation.

Process performance engineer mentioned that,

“Regardless of the fact that the dry process of cement production uses minimum water, we remain conscious of water-efficiency in other areas of our plant operations. Hence our water resource management efforts focus on the careful use of water, setting up of rainwater harvesting infrastructure and investing in effluent treatment plants.”

The organization raises their commitment toward water efficiency in their operation plants. In addition to that they have focused on more activities in order to create a sustainable nation.

System compliance manager state that,

“If we increase the quality of raw materials which need to prepare cement, especially quality of the coal, it reduced the Co₂ emission from cement manufacturing process. Simply higher the quality of coal lowers the negative impact to the environment”

Further he mentioned that, since they have their own quarry, they can extract quality materials to production process by own.

Safety and environment manager mentioned that,

“Once upon a time we tried to fully move to green procurement, but it was not implemented unfortunately. But when we are doing huge projects which consume above 2.5 million, also named as CAPEX projects, project manager needs to take environmental consent from the environmental manager. He gives design parameters to be considered when procure materials for the project. Those are added to the procurement agreement as well as adding general clauses.”

Further he added,

“Compliance is seen as one of the fundamental pillars that enable us to maintain our leadership status. Hence, we exercise a zero-tolerance approach towards non-compliance with all laws, rules, regulations, including laws pertaining to anti-competitive behavior. To ensure a 100% compliance record in all relevant economic, social and environmental areas, we have in place an integrated Plan- Do-Check-Act cycle. Meanwhile to promote a

mindset of continuous improvement we have appointed compliance champions at site level. As part of their duties, compliance champions are required to seek employee inputs for formulation of policies and effective implementation of compliance programs for Quality, Environmental, Occupational Health and Safety and Energy programs in their line of work.”

In addition to that he mentions that, the company has increased the level of compliance since compliance is utmost important factor to them. They have increased the number of annual compliance audit conducted per year. Currently they run the business by complying government, environmental rules and regulations above the level that they need to be.

Compliance track record of the SC Company for the year 2021

Compliance track	Score
Incidents of non-compliance regarding anticompetitive behavior and violations of anti-trust and monopoly legislation	Zero
Incidents of non-compliance regarding noncompliance with regulations and/or voluntary codes concerning product and service information and labeling	Zero
Significant fines and non-monetary sanctions for non-compliance with laws and/or regulations in the social and economic area	None
Significant fines and non-monetary sanctions for non-compliance with environmental laws and/or regulations	None

The company has increased its annual environmental training programs in waste, water, and energy management, aiming to build a sustainable nation. These programs focus on efficient use of electricity and water, as well as effective waste segregation.

Creating Factor

The SC Company has significantly improved its activities, procedures, and processes, surpassing industry standards and demonstrating superior technology for environmental friendliness and sustainability, setting it apart from other organizations.

Company Communication and Reputation Manager commented

“To further demonstrate our support towards the broader context of sustainability, we have more recently looked to sharpen its alignment with the United Nations Sustainability Development Goals that were put forth as part of the UN’s 2030 agenda for Sustainable Development. Our purpose is to make a meaningful contribution towards building the nation for the benefit of the present and future generations of Sri Lankans. To bring this commitment to life, we focus on five key pivots; passion for quality, desire to innovate, commitment to health and safety, upholding green ethics and enriching our people and community.”

The system compliance manager mentioned the creation of a risk management framework called Hazard Identification Risk Assessment Control (HIRAC), prioritizing environmental aspects. This framework motivates the development of better products and increases process effectiveness to safeguard the business in the long term.

He mentioned,

“Our Sustainability Risk Framework is designed to mitigate the potentially negative effects of our business and also to identify potential opportunities to improve environmental and social practices. Through this process we undertake to evaluate our operations in relation to areas that are not seen as typical business risks, such as anti-corruption practices, human rights practices, energy consumption, emission of GHG, waste management, alternative fuels, biodiversity, etc.”

Process performance engineer stated that,

“Innovation plays a major role in advancing our green ethics. Over the years we have made a concerted effort to seek out new and more innovative products and solutions to minimize INSEE’s carbon footprint as well as to promote mainstream green ethics among the end-user. To achieve those objectives, we have built two centers called innovation and application center and eco-cycle pre-processing facility for further experiments.”

Further he added,

“Our cement invests heavily on research and innovation initiatives, keeping pace with global industry developments to produce sustainable and innovative solutions, addressing today’s demanding construction needs. A dedicated Innovation and Application Centre at our plant operated by a highly-skilled technical team realizes paradigm-shifting ideas each day, proactively engaging with industry partners to ensure a holistic approach in building sustainable, high-performance living structures and infrastructures.”

SC Company shifted from a prescriptive approach to a performance-based approach in 2021 to enhance its contribution to sustainable construction. This change led to the launch of the Innovation and Application Center (I &A), a unique open space for innovation and collaboration among industry experts and stakeholders. The I &A provides a platform for developing cement and aggregates to support Sri Lanka's need for sustainable construction solutions, demonstrating the importance of R&D in delivering customer value propositions.

ISO 14001 is a standard aimed at achieving sustainable development goals by improving efficiency and energy efficiency. It helps organizations build legitimacy with overseas stakeholders, expand their product market, and demonstrate environmental stewardship to global customers. SC Company uses ISO 14001 EMS to achieve UN SD goals. The four actions frame work creates new value for the company, allowing it to adapt its activities and allocate resources effectively. This competitive environment motivates the company to seek, develop, and protect new markets, creating a new competitive advantage. By implementing these actions, SC Company has become the leading cement manufacturer in Sri Lanka, creating new value compared to competitors. SC Company has implemented numerous corporate social responsibility programs, focusing on triple bottom line concepts and sustainable development, in addition to their existing activities.

Corporate Social Responsibility Programs

Environment and CSR manger mentioned that,

“Our Corporate Social Responsibility (CSR) is not limited only to our business processes and direct impact, but goes beyond to serve the interests of society. Being part of a wider group, our focus on CSR is unique. We are trained to “think globally and act locally” and see how we can use our business as a platform to find solutions for some of the gravest social issues in Sri Lanka today.”

Alignment with Sustainable Development Goals

Alignment with Sustainable Development Goals

Gender equality	<ul style="list-style-type: none"> • Promoting women in the workplace. • Zero-tolerance policy towards all forms of violence and sexual harassment. • Ensuring all workers – women and men have an equal voice in workplace, including grievance mechanisms.
Clean water & sanitation	<ul style="list-style-type: none"> • Community access to clean water. • Minimizing negative impact on water quality through water treatment, reuse/recycling and zero discharge
Affordable & clean Energy	<ul style="list-style-type: none"> • Co-processing technology to generate alternative energy
Decent work & economic growth	<ul style="list-style-type: none"> • Direct economic value generated and distributed to employees, suppliers and shareholders. • Taxes and customs duties paid to the government. • No to child labor, forced labor, modern slavery and human trafficking in operations. • Indirect employment opportunities.
Industry, innovation & infrastructure	<ul style="list-style-type: none"> • Investments in industry-leading infrastructure to improve downstream efficiency. • Research and development to produce sustainable construction material with a low carbon footprint. • Use of technology to develop ground-breaking waste management solutions.
Reducing inequalities	<ul style="list-style-type: none"> • Equal remuneration for men and women. • Equal opportunities for all employees to receive training and career development.
Sustainable cities and communities	<ul style="list-style-type: none"> • Supporting the development of sustainable construction material. • Focus on road safety. • Local sourcing.
Responsible consumption & production	<ul style="list-style-type: none"> • Implementing circular business models by using waste to generate renewable, bio-fuel. • Reporting of sustainability and impacts. • Product life-cycle assessment in order to support ongoing efficiency improvements.
Climate actions	<ul style="list-style-type: none"> • Aligning with all environmental compliance regulations. • Disclosing GHG emissions (Scope-1), energy consumption, climate risks and opportunities. • Establishing GHG reduction targets in line with the goals of the Paris Climate Agreement.

	<ul style="list-style-type: none"> • Raising awareness among stakeholders through community- based environment projects.
Life below water	<ul style="list-style-type: none"> • Complying with all environmental regulations pertaining to the protection of marine life and coast conservation. • Raise awareness among local communities. • CSR initiatives to restore marine ecosystems
Life on land	<ul style="list-style-type: none"> • Rehabilitating lands impacted by business operations. • Protecting natural habitats and biodiversity through land re- mediation and rehabilitation, habitat protection and restoration. • Engaging the community in environmental conservation activities.
Peace, justice & strong institution	<ul style="list-style-type: none"> • No anti-competitive behavior. • Support for human rights, including freedom of expression. • Continuous and ongoing stakeholder engagement.
Partnership for the goal	<ul style="list-style-type: none"> • Adoption of globally-accepted best practices for sustainable development. • Collaborating with the government, local authorities, non-governmental organizations and the private sector to carry out joint development initiatives.

The case study company focuses on setting SD goals aligned with the UN General Assembly's global goals, primarily focusing on environmental issues. They design separate goals for each global goal, except zero hunger, to achieve a sustainable future. They support eliminating poverty through job creation, fair remuneration, and a safe work environment. They prioritize health and well-being through community wellness, awareness training, road safety, and GHG/air emissions reduction targets. SC Company supports education quality through programs like children's access, vocational training, community internships, employee education, and partnerships with educational institutions, aligning with sustainable development goals. SC Company aligned with the balanced sustainable development goals as shown in the below table.

5. Conclusion

This study examines the current Environmental Management Accounting practices in the SC Company and examine how those Environmental Management Accounting practices would contribute to sustainable development. Hence, to create a sustainable planet, businesses need to radically change the way that they are doing business. Furthermore, Christophor (2014) mentions, SD is a hot issue facing corporation since, financial accounting ended up with incomplete capturing and presentation of the environment due to the specific accounting rules, financial accounting could not fully support SD.

The study followed a qualitative style case study approach and was carried out in a leading cement manufacturing organization in Sri Lanka, SC Company. Data gathered from the organization was analyzed and presented in relation to uses of four actions framework introduced by Kim and Mauborgne. The study demonstrates SC Company's adoption of eco-management approaches and their integration into business processes, demonstrating how EMA can contribute to corporate sustainable development by improving environmental and economic performance (Bennett, Rikhardsson, & Schaltegger, 2003, p. 1). EMA optimizes corporate environmental and economic performance using financial and non-financial information, improving

decision-making by integrating environment and economics principles and identifying implementation methods, process results, and barriers (Bennett & James, 2000). SC Company addresses environmental concerns by implementing EMA practices, which combine financial accounting, cost accounting, and material flow balances. This approach increases efficiency, reduces environmental impact, and costs of environmental protection, thereby reducing negative activities and enhancing societal benefits (Jasch, 2003).

SC Company has implemented efficient procedures to reduce carbon emissions and waste management, utilizing EMA and ISO 14001 standards to achieve sustainable development goals. These initiatives offer cost savings, energy efficiencies, and legitimacy to overseas stakeholders, thereby expanding the company's product market and attracting global customers (Darnall & Carmin, 2005).

In light of the important role of ISO 14001 EMS in helping to achieve more sustainable production and consumption practices. SC Company has aligned with the SD goals in order to create sustainable nation.

Gray and Milne (2002) proposed that enterprise sustainable accounting emphasizes ecological justice, efficiency, and effectiveness while coordinating economic growth with environmental responsibility. EMA, which integrates the environment and economics, improves decision-making. Bennett and James (2000) emphasize the use of non-financial environmental information in business decision-making. This study demonstrates how SC companies have adopted eco-management approaches and integrated environmental aspects into business processes, achieving corporate sustainable development.

A 2009 survey by CIMA found that Environmental Management Accounting (EMA) is the second least used strategic management accounting tool, primarily used by large companies adhering to strict regulations. EMA aims to optimize corporate environmental and economic performance using financial and non-financial information. However, financial indicators still drive business actions, despite the importance of environmental and social impacts (Bennett & James, 2000). The study suggests that EMA can aid in improving environmental performance in companies by incorporating information on material flows and related costs, as decisions are increasingly influenced by environmental costs.

Limitations of the Study and Directions for Future Research

This study examines the validity and capability of Environmental Management Accounting (EMA) application in manufacturing business organizations, focusing on a Sri Lankan cement manufacturing organization. It acknowledges limitations like generalizability and subjective bias views. Future research could investigate EMA application in service sector entities or industries with high environmental impact, considering the nature of different environmental management accounting techniques in other industries. While I have focused on the uses of four actions frame work, future research could be carried out using different theoretical frameworks to investigate how environmental management would contribute to sustainable development. Similarly, this study was done as a single case study. However, the study could be further developed by taking different industries and carrying out a study using multiple case studies. This would be an area of interest for future researchers.

Competing Interests:

The author declare that there are no competing interests related to this study.

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References

- Bennett, M. and James, P., 2017. The green bottom line. In *The green bottom line* (pp. 30-60). Routledge.
- Bennett, M., Rikhardsson, P. and Schaltegger, S., 2003. Adopting environmental management accounting: EMA as a value-adding activity. *Environmental management accounting Purpose and Progress*, pp.1-14.
- Burritt, R.L., 2004. Environmental management accounting: Roadblocks on the way to the green and pleasant land. *Business Strategy and the Environment*, Vol.13 No.01, pp.13-32 .
- Tsui, C.S., 2014. A literature review on environmental management accounting (EMA) adoption. *Web Journal of Chinese Management Review*, Vol.17 No.03, pp.1-19.
- Collis, J. and Hussey, R., 2009. *Business research: A practical guide for undergraduate and postgraduate students*. Palgrave macmillan.
- Darnall, N. and Carmin, J., 2005. Greener and cleaner? The signaling accuracy of US voluntary environmental programs. *Policy sciences*, Vol.38 No.02, pp.71-90.
- Ganda, F. and Ngwakwe, C.C., 2014. Role of energy efficiency on sustainable development. *Environmental Economics*, Vol.5 No.01, pp.86-99.
- Goosen, M.F., 2012. Environmental management and sustainable development. *Procedia Engineering*, Vol. 33, pp.6-13.
- Gray, R., 2010. Is accounting for sustainability actually accounting for sustainability... and how would we know? An exploration of narratives of organisations and the planet. *Accounting, organizations and society*, Vol.35 No.1, pp.47-62.
- Gunarathne, A.N. and Alahakoon, Y., 2016. Environmental management accounting practices and their diffusion: The Sri Lankan experience.
- Gunarathne, N., Peiris, S., Edirisooriya, K. and Jayasinghe, R., 2015. Environmental management accounting in Sri Lankan enterprises. *Department of Accounting, University of Sri Jayewardenepura, Nugegoda*.
- Ishak, M.I.S., Ishak, N.F.A., Hassan, M.S., Amran, A.Z.L.A.N., Jaafar, M.H. and Samsurijan, M.S., 2017. The role of multinational companies for world sustainable development agenda. *J. Sustain. Sci. Manag*, 12, pp.228-252.
- Jasch, C., 2003. The use of Environmental Management Accounting (EMA) for identifying environmental costs. *Journal of Cleaner production*, Vol. 11 No.06, pp.667-676.
- Kim, W.C., 2005. Blue ocean strategy: from theory to practice. *California management review*, Vol. 47 No.3, pp.105-121.

- Lee, K.H., Gunarathne, N. and Herold, D.M., 2017. The usefulness of Environmental and Sustainability Management Accounting (EMA) for corporate sustainability management in developed and developing countries: a comparative study between Australia and Sri Lanka. In *Proceedings of the 21th Conference of the Environmental and Sustainability Management Accounting Network (EMAN), Liege*.
- Maunder, K.T. and Burritt, R.L., 1991. Accounting and ecological crisis. *Accounting, Auditing & Accountability Journal*, Vol. 4 No.03, pp.1-139.
- Rajapaksha, S. and Rajapakse, B., 2017. Organizational engagement in sustainability practices and its contribution to sustainable development: A case from Sri Lanka.
- Ramanathan, K.V., 1976. Toward a theory of corporate social accounting. *The accounting review*, Vol. 51 No.3, pp.516-528.
- Robson, C.A. and Vanlerberghe, G.C., 2002. Transgenic plant cells lacking mitochondrial alternative oxidase have increased susceptibility to mitochondria-dependent and-independent pathways of programmed cell death. *Plant physiology*, Vol.129 No.04, pp.1908-1920.
- Schaltegger, S., 2018. Linking environmental management accounting: A reflection on (missing) links to sustainability and planetary boundaries. *Social and Environmental Accountability Journal*, Vol. 38 No.1, pp.19-29.
- Schaltegger, S. and Csutora, M., 2012. Carbon accounting for sustainability and management. Status quo and challenges. *Journal of Cleaner Production*, 36, pp.1-16.
- Schaltegger, S., Etxeberria, I.Á. and Ortas, E., 2017. Innovating corporate accounting and reporting for sustainability—attributes and challenges. *Sustainable Development*, Vol.25 No.2, pp.113-122.
- Staniskis, J.K. and Stasiskiene, Z., 2006. Environmental management accounting in Lithuania: exploratory study of current practices, opportunities and strategic intents. *Journal of Cleaner Production*, Vol.14 No.14, pp.1252-1261.
- Thornton, D.B., 2013. Green accounting and green eyeshades twenty years later. *Critical Perspectives on Accounting*, Vol. 24 No.06, pp.438-442.
- Turkenburg, W.C., 1997. Sustainable development, climate change, and carbon dioxide removal (CDR). *Energy Conversion and Management*, 38, pp.S3-S12. United Nations Division for Sustainable Development (UNSD), (2003).
- Redclift, M., 2005. Sustainable development (1987–2005): an oxymoron comes of age. *Sustainable development*, Vol.13 No.4, pp.212-227.
- Vijayaragunathan, S., 2016, December. Sustainability practices for competitive advantage in Sri Lankan construction industry. In *The 7th International Conference on Sustainable Built Environment, Kandy* pp. 16-18.
- Wahyuni, D., 2009. Environmental management accounting: Techniques and benefits. *Jurnal Akuntansi Universitas Jember*, Vol.7 No.1, pp.23-35.
- WCED, S.W.S., 1987. World commission on environment and development. *Our common future*, Vol. 17 No.01, pp.1-91.
- Yin, R.K., 2009. *Case study research: Design and methods* (Vol. 5). sage.
- Yin, R.K., 2015. *Qualitative research from start to finish*. Guilford publications.
- Yin, R.K., 2014. *Case study research: Design and methods (applied social research methods)* pp. 312. Thousand Oaks, CA: Sage publications.