

Implementation of Environmental Management System in Construction Industry: A Review

Mahmoud. M Farouq¹, Umar. F Lawan², Nura Garba³, F.H Anwar⁴, Z.B. Baba⁵, M.S. Labbo⁶, D.S Aliyu⁷

^{1,4,5,6,7} Department of Civil Engineering, University of Science and Technology, Wudil

² HAG Engineering Nigerian Limited

³ Ministry Works and Housing, Kano State

Abstract: In now a days contribution of construction companies to environmental problems can clearly be stated as “thing speaks itself” meaning it generates significant impact to the environment. Comparing it to other industries, it is far behind in implementation of environmental management system. This paper aims to explore the benefits and the major barriers in the implementation of environmental management system in Construction Company. The study reviewed some of the research conducted on the implementation of EMS in Construction Company like USA, China, Hong Kong, Brazil, Spain and Ghana etc... From the review it was found that the major benefit of EMS implementation in construction are proactive environmental attitude, improvement in environmental performance, better access to sources of finance, improved corporate image, Lowering operating costs, Compliance with legislation and regulatory requirements on environmental protection, Improvement in the efficiency and effectiveness of existing management systems and the major barriers are Lack of customer support, Lack of government/legislative pressure, High costs for implementation of EMS, Complex documentation process, Lack of support from staff and No company in the construction sector takes the initiative.

Keywords: construction, environmental management, ISO 14000, benefits of environmental management systems (EMS)

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I. Introduction

An Environmental Management System (EMS) provides the needs of an organization on how to manage itself so as to reach its environmental, economic and social goals (USA Government 2005). In other way an environmental management system provides a framework that supports a company to achieve its environmental goals through reliable control of its operations. Therefore it is essential for any agency to establishing a policy that agencies can carry out its environmental, transportation, and energy related activities in a manner that is environmentally, economically and fiscally sound, integrated, continually improving, efficient, and sustainable[2]. Moreover, the developing interest in the study of environmental issues reveals the demand from enterprises to implement policies, procedures and techniques for managing the environmental impacts of their activities. Environmental issues cannot be addressed in separation, because they constitute a system that requires planning, implementation, monitoring and continuous improvement, which highlights the benefit of implementing Environmental Management Systems[3].

Construction projects contribute huge challenges to not only finished within an owner’s schedule and budget, but to also eradicate and minimize harmful impacts to the environment. Despite increasing efforts by the construction industry to reduce the environmental impact of its processes, construction sites are still a major source of pollution and have adverse impacts on the environment [4]. Hendrickson and Horvath (2000) pointed out that Construction has outstanding impacts on the natural environment. Even a minor impact, such as a small discharge or spill of a hazardous substance, can cause a health or environmental threat and lead to costly clean-up activities[5]. Construction activities are generally characterized as environmental disturbing business. They produce environmental nuisance in the form of muddy runoffs, noise, dust, bad odors, vibration, and chemical emissions of particles, toxic gases, solid waste and water pollution. The construction industry is categorized with high degree of fragmentation, with various individual participants each chasing his singular interests on a project-by-project basis[6]. Fragmentation within the industry and in the project delivery process has inhibited proper consideration of issues that have a direct bearing on the industry’s performance, such as construction safety and environmental performance. Facing the growing pressure of environmental protection, many large and famous construction firms have undertaken measures to reduce their damage to the environment [7].

Implementation of ISO 14001 EMS to any organization provides the basic systems to the organization which lead to effective environmental management. These systems can be combined with the other management requirements. However, the primary objective of ISO 14001 EMS is by aiding the industries to minimize their contribution to environmental problems through a systematic control system. Such systems can also help lessen product costs and enhance the competitiveness of products in the international market, and thus increase the profit margin of the company Griffith (2000) proposed that construction firms go beyond implementing an EMS. Griffith (2000) also noted that operating separate quality, environmental, and health and safety management programs lead to redundancy of tasks and information collection. He further suggested that an integrated management system that streamlines the policies, documentation, data collection, and auditing of quality, environmental, and health and safety management systems will help to share information, save time, and improve risk assessment. A notable example of possible integration is the ISO 14001 EMS standard, which resembles the ISO 9000 quality management standard in many ways.

II. Impact of Construction Activities to Natural Environment

According to Zutshi, 2014 [8] some of the other impacts of construction activities on the natural environment include the following.

- Competition for land with other industries, such as, agriculture;
- Adverse effects on the ecological characteristics of developed land;
- Substantial consumption of both renewable and non-renewable resources;
- Production of substantial volumes of waste;
- Consumption of large amounts of energy during construction;
- Air pollution from the dust and substances including some toxic ones, which are released during the production and transportation of materials, and in some construction operations;
- Land use and land deterioration, resource depletion, waste generation, and;
- Disruption through traffic diversions, noise pollution and other factors.

III. Sustainable Development in Construction

The immense pressure on the world's environment means that measures must be taken today to safeguard natural resources for tomorrow. This is the challenge the construction industry faces. Research by international environmental organizations like the World Wildlife Fund for Nature (WWF) suggest that humans are using natural resources at a rate of 25 – 50% greater than the planet can replenish them. People in industrialized countries like the UK consume more natural resources than the global average and the WWF suggests that we should cut our consumption by two thirds. However, cutting down our use of natural resources does not mean we need lower our standard of living; we just need to use natural resources more wisely. For example, increasing energy efficiency, reducing waste and recycling, Cutting down on the use of natural resources whilst maintaining or increasing our standard of living is the real challenge of sustainable development[9].

IV. ISO 14001, Environmental Management System Standard

ISO 14001 is the foremost international reference for assessing environmental management processes, ISO 14001 provides guidelines by which corporations or other organizations design and implement an EMS that supports for the following aspects [10].

- Environmental policy of the corporation or organization;
- Environmental aspects related to their activities; and
- Environmental management programs with an open structure of responsibility for environmental management.

Furthermore, the ISO 14001 standard is a specification for an environmental management system that can be assessed by external bodies. Also the standard gives an umbrella for the rest of the ISO 14001 series, which covers a wide range of environmental management issues including auditing, levelling, life-cycle assessment etc. the use of ISO 14001 is not necessary, but is often mentioned as a requirement of commercial tendering process. ISO 14001 is based on a Deming Cycle (or PDCA cycle) with four steps [11].

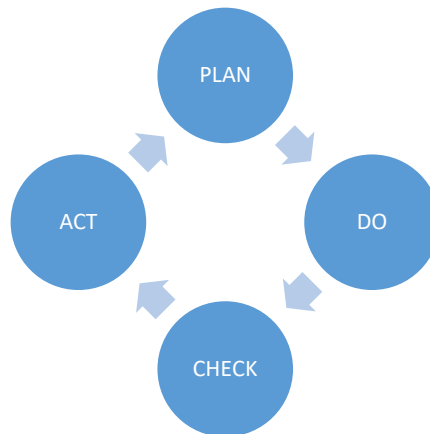
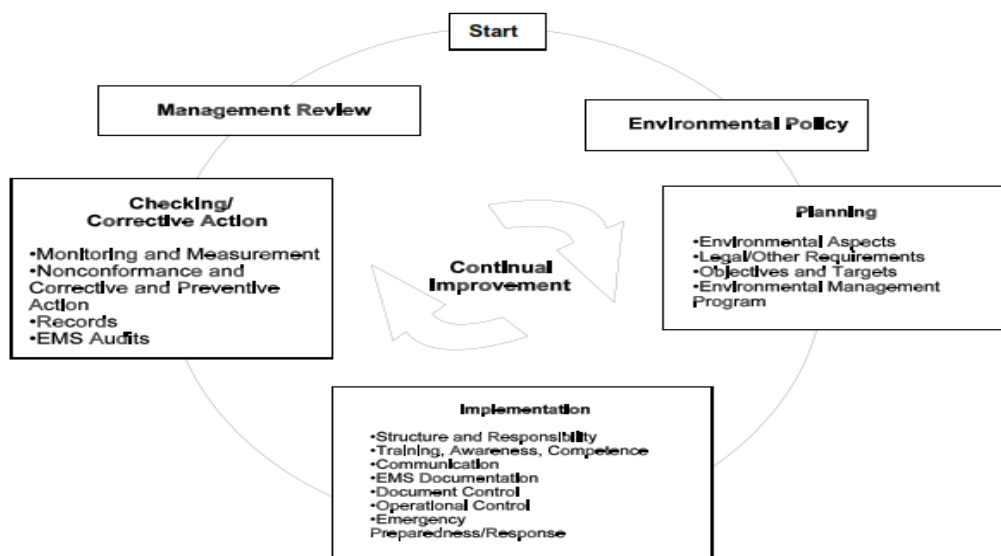


Figure 1 Deming cycle for EMS process [12][13]

- Plan what you're going to do;
- Do what you planned to do;
- Check to ensure that you did what you planned; and
- Act to make improvements.

Pataki George. E and Crotty Erin. M further explain that an EMS standard, the “plan”, “do”, “check” and “act” steps have been expanded into the following five steps: 1) environmental policy, 2) planning, 3) implementation, 4) checking/corrective action and 5) Management review, as shown in the following diagram below.



Source: [14]

V. ISO 14001 Environmental Management System in Construction

Construction companies now days implement ISO 14001, which contains: an environmental management system (EMS), environmental auditing, environmental labeling, environmental performance evaluation and life-cycle assessment. The ISO 14001 is not necessary for any organization to practice it, but it has its own advantage, it enables the organization to control the impact of their activities on the environment). It comprises 17 key elements grouped into five areas: environmental policy; planning; implementation and operation; checking and corrective action; and management review. The initial requirement is to comply with applicable environmentally related legislation and regulations and to implement a continual environmentally related improvement process in the company [15]

5.1 Benefits of ISO 14001 Ems to Construction Industry

Below are some of the benefit of implementing ISO 14001 extracted from literatures [16][8][7][17][14].

- A proactive environmental attitude helps the firm improve its relationship with the environmental regulators.
- The improvement in environmental performance in terms of a reduction in air emissions, waste and the use of resources (water, energy and materials) is an important benefit.
- An important benefit is better access to sources of finance.
- Competing for projects based on their track record of emphasis on environmental concerns resulting in an improved corporate image
- Demonstration of higher levels of environmental compliance when bidding for international contractors or expanding domestically to accommodate new business
- Lowering operating costs (and, consequently, lower tender prices) because of having waste minimisation processes in place
- Improving employee involvement, and awareness of their company's environmental impact
- Compliance with legislation and regulatory requirements on environmental protection, pollution prevention and waste reduction, resulting in reduction of fines and improved industry/government and community relations
- Improvement in the efficiency and effectiveness of existing management systems by integrating the ISO 14001 elements and procedures with the ISO 9001 standard
- Encouraging the department and contractors to focus on the environmental issues and maintain sustainable working environments and quality of life
- Reducing the use of materials and techniques that could have harmful effects on the environment

5.2 Barriers in Implementation of EMS in Construction Industry

The listed points below are the main barriers for implementation of environmental management system in construction extracted from different authors. It is important for all companies to evaluate the importance of each barrier from the least important to the most important for making control of the obstacle. [3], [4],[18], [8]

1. Lack of customer support
2. Lack of government/legislative pressure
3. High costs for implementation of EMS especially for a small size company to implement it due to an extra cost and difficult to apply.
4. Sub-contracting creates problems for implementing an EMS
5. Technology conditions for environmentally friendly or resource-efficient construction.
6. Inadequacy of patterns (different interpretations in the construction industry)
7. Complex documentation process
8. Lack of support from staff
9. Weak environmental culture among competitors
10. The project is separated from execution
11. No company in the construction sector takes the initiative.

VI. Case Study

The case study conducted utilized data available in existing literatures, [19], [7], [20], [21], [22] and [23] As no single construction project could provide all the data needed in this study. It is necessary to note that the main objective of this case study is to explore the pro and con of implementing of environmental management system in construction firms.

VII. Discussion

In a study on EMSs in construction firms in Hong Kong, Lui et al 2012, [22] found that the implementation of EMS can 1.reduce construction cost by recycling of resource, saving energy and reducing occupational accident 2. It can achieve much better environmental sustainability in terms of reduction in C&D materials, electricity consumption, water consumption, accident rate and defects 3. Better site management and working environment of the EMS contractors enhance performance 4. Time predictability of the contractors with EMS is lower than those without EMS 5. Performance on projects carryout by those contractors implementing EMS is better in terms of two of the project management criteria both cost and quality. Another research conducted by Christini et al, 2004 [24] suggested that, a properly implemented EMS will help to control environmental impact, improve environmental performance, improve training, improve communication, and improve data collection. There is also the potential for an EMS to save money through process change or product selection. Additionally, an EMS could help to reduce risks. Furthermore, Raymond, 2001[7] in his study

on implementation of EMS in construction company in Hong Kong listed some benefit of implementation of ISO 14000 EMS in construction, which are 1. Saves money in areas such as energy efficiency and waste minimisation 2. Encourages healthy competition 3. Reduces the amount of chemicals and hazardous waste on-site 4. Reduces insurance premium due to the lower environmental liability and risk involved 5. Improve upper management attention.

Investigation of organizations' motivations to implement environmental management in Spain, particularly through ISO 14001 certification, Gonzalez-Benito and Gonzalez-Benito (2005), examine ethical, competitive and relational motivations. Ethical motivations relate to perceptions of ecological responsibility, competitive motivations concern seeking competitive advantage over others, and relational motivations involve desires for better relations with stakeholders and desires for legitimacy. They found that initiation of the process is driven by ethical and commercial motivations whereas actual certification is in response to ethical and competitive, especially operational (costs and productivity) motivations.

Raymond Y. C. 2001 also found that the major obstacles for implementing ISO 14001 standards were: lack of government pressure, lack of client requirements or support, expensive implementation costs, and incompatible subcontracting systems. [21] added that The Key barriers inhibiting environmental management system in construction firm in African countries like Ghana are implementation cost, quality of consultants, too difficult to understand, seems not too beneficial, lack of human resources, effect on the existing organizational structures, cost of certification a bit too high, too much paper work involved in the process, time involved is a bit too high and sometimes exposes the organization environmental weakness to regulatory bodies. From the above discussion it can be examined that implementation of EMS to construction is of important and beneficial policy to be implemented in any construction company.

VIII. Conclusion

From the study carried out it is clearly shows that implementation of environmental management system in construction company has significantly lighted up a positive impact to many construction companies. Though the concept of environmental management system is relatively new even in developed countries like USA, China etc. as cited by [23]. But still it is recommended for at least major companies in USA, UK, and other developing countries to obtained ISO 14001 certificate, so by getting that, Construction Company will establish comprehensive policies and regulations and self-guard the implementation of environmental management within the context of construction management. In more open implementation of Environmental management system will reduce construction cost, enhance sustainable environment at the construction site, enhance workers performance, reduced time predictability and performance in both cost quality and so on. However, EMS may lead to a less efficient production and relatively low productivity due to the added activities like clearance of site, special cleaning etc., limited opportunities for product variation, a strong and direct connection with the government which creates less privilege to construction company's owners. Though every policy enforced has its pro and con, but the pro foe EMS implementation is widely higher than its cons therefore it is advisable for every construction company to implement this policy.

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