*Available online at http://www.journalcra.com*

*International Journal of Current Research*
*Vol. 7, Issue, 04, pp.14446-14450, April, 2015*

**INTERNATIONAL JOURNAL OF CURRENT RESEARCH**

**ISSN: 0975-833X**

**REVIEW ARTICLE**

# A REVIEW ON BENEFITS AND ROLE OF IMPLEMENTATION; AND MAJOR FRAMEWORKS OF ENVIRONMENTAL MANAGEMENT SYSTEMS

**[1,*]Ho Lee Lee and [2]Prof. Ir. Dr Law Puong Ling**

[1,2]Department of Civil Engineering, Universiti Malaysia Sarawak (UNIMAS), Malaysia

**ARTICLE INFO**

*Article History:*
Received 24th January, 2015
Received in revised form
16th February, 2015
Accepted 20th March, 2015
Published online 28th April, 2015

*Key words:*

Environmental Management Systems, ISO 14001, USEPA's Performance Track, Responsible Care®, Eco-Management Audit Scheme.

**ABSTRACT**

An Environment Management System (EMS) is a tool for identifying the aspects and managing the impacts of an organisation's activities on the environment. The Environmental Management Systems (EMS) structure recognizes that both environmental and economic performances are directly linked with each other. The primarily purpose of implementing an EMS is to improve an organization's environmental performance continuously. Benefits of successful implementation of an EMS would include cost reduction in pollution prevention activities, compliance with legislation requirements, and a better organizational image internationally and locally. This review looks into the benefits and role of EMS implementation and three most common frameworks of EMS; 1) ISO 14001, 2) USEPA's Performance Track and 3) Responsible Care ®.



## INTRODUCTION

The concern for the environment is rapidly rising especially in those countries that are currently experiencing significant environmental impacts, such as global warming. Clarke (1989) argued that at its core environmental management asked two questions: (1) What kind of planet do we want? (2) What kind of planet can we get? Barrow (2006) viewed that the ultimate goal of most organization's environmental managers are to ensure that there is an optimum balance between environmental protection and allowing human liberty. An Environmental Management System (EMS) is a practical way to enhance a company's performance and ensure that an organisation is effectively managing its environmental risks (Nicholas and Smith, 2005). Alberti *et al.* (2000) viewed EMS as a systematic approach to effectively integrate environmental considerations into an organization's day-to-day operation and management culture. According to Richelsen *et al.* (2000), EMS could provide a predictable structure for managing, assessing and continuously improving the effectiveness and efficiency for managing the environment. Such approach also builds in periodic review by top management and emphasises continuous improvement instead of crisis management.

### The Benefits of EMS Implementation

Many definitions of EMS have been developed in the past few years and the most recognised definition is by TC 207/SC 1 from International Organization for Standardization (DSM, 2004) that defines an EMS as "part of an organization's management system used to develop and implement its environmental policy and manage its environmental aspects". The EMS structure recognizes that both environmental and economic performances are directly linked with each other (Alberti *et al*., 2000). The primary objective of implementing an EMS is to continuously improve the organization's environmental performance. Successful implementation of an EMS would lead to cost reduction in pollution prevention activities, compliance with regulatory requirements, and a better organizational image internationally and locally (Muhamad Awang *et al*., 1999). Pollution prevention strategies help reduce or eliminate environmental concerns at source, resulting in less waste, more efficient use of inputs, reduced risk and liability that may be reflected in lower insurance premiums and avoided contingency expenses, and many other environmental, health, safety, and financial benefits (Morris, 2004). EMS offers the opportunity for a facility to integrate its chemical and product quality management and planning efforts, so that the focus is not just on hazardous chemicals or wastes, but also on prudent use of all materials and resources by the organization (Mass DEP, 2014).

Environmental performance is a new central concept in systematic environmental work. Piper *et al.* (2003) viewed that environmental performance is what the organization accomplishes through its environmental efforts over a particular period of time. According to ISO/TC/SC4 in ISO 14031 (1999), environmental performance is "the result of how

***Corresponding author: Ho Lee Lee,***
*Department of Civil Engineering, Universiti Malaysia Sarawak (UNIMAS), Malaysia.*

well the organization handles its environmental aspects, or the result of how well the organization is able to handle its environmental aspects." The definition of environmental performance in ISO 14001:2004 (DSM, 2004) is "the measurable results of an organization's environmental management system of its environmental aspects, based on the organization's environmental policy, environmental objectives, environmental targets and other environmental performance requirements."

**Role of EMS Implementation in Environmental Performance**

EMS has demonstrated to provide measurable environmental as well as business performance improvements for many countries; be it in the local governments or private sector organizations throughout the world over the last decade or more. Recognizing these benefits, more organizations have developed and implemented EMS to achieve similar enhancements in various activities and facilities. Besides, Sheldon and Yoxon (2006) wrote that EMS plays a vital role in environmental performance, as in maintaining compliance with relevant legislation and regulation. An organization has to understand how the EMS works in relationship with legislation, tracking the development of environmental regulations, and knowing where to look for further information for the assurance staying within the law. According to Harte (1992); McEldowney (1996) and Bell (1997), law provided a framework for regulating the use of the environment and crucial for environmental management aiding the protection of the environment and biodiversity. With respect to the measurement of environmental performance, different companies in different countries have been using different approaches; such as environmental performance surveys, questionnaires, data collection, raw material usage data monitoring and other techniques (Stasiskiene and Staniskis, 2005). Different frameworks of EMS might also suggest the different methods in measuring environmental performance as a whole, and the results can vary tremendously, depending on given answers and style of information expression. Differences in the interpretation of presented information and other discrepancies can also affect the evaluation of an organization. However, it is suggested that basic data should include information obtained through implementation of Environmental Management Systems in their organization over a period of time.

Organizations are attracted by very practical benefits through implementation of EMS in their organizations, such as effective management of raw materials, improved operating efficiency, avoidance of penalties for transgression of environmental legislation, reduced energy and water consumption, costs reduction such as reduced insurance costs, reduced raw material usage through waste minimization, pollution prevention and consequently improved corporate performance and increase of overall sales (Morris, 2004). Sangster (1993) from Esso Petroleum, United Kingdom had personally experienced the improvement of environmental performance, such as relative reduction in effluent test results and reduction of volumes of oily wastes disposed off site, in Esso's petroleum distribution operations through management action with relatively small level of investment. According to Sangster (1993), it covered the establishment of an Environmental Management Systems incorporating field measurement, stewardship of results and management of corrective action to maintain progress towards meeting self-imposed targets. Besides, EMS implementation also aims for proactive management, in the aspect of taking action in advance of legislation before they are realized in the form of regulatory (Sheldon and Yoxon, 2006). Within business, most environmental management performance measurement or accounting activities seem to be taking place in the manufacturing sectors rather than in service or resource extracting sectors. According to Stasiskiene and Staniskis (2005), this is due to materials accounting of Environmental Management Systems, which can help manufacturing facilities gain better understanding of material flows and related costs. In other words, perspective created according to evaluation of implemented various environmental management programmes allows managers to see economic values of natural resources, and the business and financial value of good environmental performance.

However, Richelsen *et al.* (2000) reported that Kuching, city of Sarawak was selected as the project area for EMS implementation in June 1999 through the Sustainable Urban Development Project by State Government of Sarawak in collaboration with the Danish Cooperation on Environment and Development (DANCED). The focus of the Kuching City-EMS project was placed on the monitoring of the environmental quality, producing environmental statements and keeping the management informed on the development in the environment and the need for corrective measures. Therefore, implementation of EMS can be treated as a sound conceptual basis for measuring environmental impact of company's activities and linking it to environmental and economic performances in order to identify and implement win-win situations (Stasiskiene and Staniskis, 2005).

**Major Frameworks of EMS**

**Common Frameworks of EMS**

Several organizations, including governments, independent standards developers, and trade organizations have developed frameworks that companies can use to assure quality environment performance. Common frameworks that companies generally use for creating of EMS include ISO 14001, EPA National Performance Track, and Responsible Care ®. These frameworks commonly share the required elements of an EMS that are designed to assure that the company or organization using the system will be able to consistently manage and minimize the impact its operations may have on the environment (MassDEP, 2014).

Table 1.1 summarizes the key elements required in the three major EMS frameworks. However, it is noteworthy that different frameworks may share those common elements, whereby they may be managed differently among frameworks. It is noted that each of the elements listed in Table 1.1 have common definitions to the elements. Table 1.2 describes some of the other common elements used in major EMS frameworks with certain degree of variation across different frameworks.

**Table 1.1. Elements Required by Major EMS Frameworks**

| Element | Description of Element Goals | ISO 14001 | Performance Track | Responsible Care ® |
|---|---|---|---|---|
| Environmental Policy | Develop a statement of organisation's commitment to environment. | √ | √ | √ |
| Environmental Aspects and Impacts | Identify environmental attributes of products, activities and services and impacts on the environment. | √ | √ | √ |
| Legal and Other Requirements | Identify and ensure access to relevant laws and regulations. | √ | √ | √ |
| Objectives & Targets | Set environmental goals for the organization. | √ | √ | √ |
| Environmental Management Programs | Plan actions to achieve objectives and targets. | √ | √ | √ |
| Structure and Responsibility | Establish roles and responsibilities within the organization. | √ | √ | √ |
| Training, Awareness and Competence | Ensure that employees are aware and capable of their environmental responsibilities. | √ | √ | √ |
| Communication | Develop processes for internal and external communications on environmental management issues. | √ | √ | √ |
| EMS Documentation | Maintain information about EMS and related documents. | √ | √ | √ |
| Document Control | Ensure effective management of procedures and other documents. | √ | √ | √ |
| Operational Control | Identify, plan and manage organization's operations and activities inline with the policy, objectives and targets, and significant aspects. | √ | √ | √ |
| Emergency Preparedness and Response | Develop procedures for preventing and responding to potential emergencies. | √ | √ | √ |
| Monitoring and Measurement | Monitor key activities and track performance including periodic compliance evaluation. | √ | √ | √ |
| Non-conformance, Corrective and Preventive Action | Identify and correct problems and prevent recurrences. | √ | √ | √ |
| Records | Keep adequate records of EMS performance. | √ | √ | √ |
| EMS Audit | Periodically verify EMS effectiveness in achieving objectives and targets. | √ | √ | √ |
| Management Review | Review of EMS. | √ | √ | √ |

Source :MassDEP, 2014

**Table 1.2. Other Common Elements Found in Major EMS Frameworks**

| Element | ISO 14001 | Performance Track | Responsible Care ® |
|---|---|---|---|
| Independent Audits | Independence be demonstrated by the freedom from responsibility for the activity being audited. | EPA defines an "Independent Party" as someone who is neither directly employed by a facility nor has played a substantive role in developing the facility's EMS. | RC membership requires certification by an independent RC-accredited auditor. Under RC, companies also can choose to certify as RC14001, which combines RC and ISO 14001 certification. |
| Continual Improvements in Environmental Performance | Environmental performance is defined as "measurable results of an organization's management of its environmental aspects". | Continuous improvement in environmental performance for regulated and unregulated activities is required. | Policy Statement includes commitment to continuous improvement. |
| Pollution Prevention | ISO requires a commitment to prevention of pollution, which include end-of-pipe treatment and remediation techniques, which do not constitute source reduction. | Performance Track requires policy commit the facility to pollution prevention at its source. | No element in the RC framework relates directly to pollution prevention; however, pollution prevention is implicit throughout the elements. |
| Sharing information on environmental performance with community | The ISO 14001 model does not require an EMS to include public reporting; however, inquiries made by the public of a facility's operation should be addressed in its communications programs. | Performance Track requires the facility make a commitment to sharing information on environmental performance with the community in the Policy Statement. | As part of the guiding principles of an RC EMS, the EMS must include a commitment to public input in products and operations and periodic reporting on performance. |

Source :MassDEP, 2014

**Other Frameworks of EMS**

Besides the common 3 frameworks described in the previous paragraphs, other frameworks that industries have also applied include the Toxics Use Reduction Act (TURA) EMS, Eco Management and Audit Scheme (EMAS), and Compliance Focused EMS guidance (CFEMS).

**Conclusions**

ISO 14001 is among the most widely adopted EMS framework internationally, and ISO 14001 can be implemented in all types of industries or any organization and normally requires an external certification annually. It does not specify how an organization needs to meet the requirements but it specifies what requirements an organization needs to meet in order to be certified to ISO 14001. ISO 14001 allows flexibility while requiring the certified facilities to attain to at least the minimum requirements set. EPA's Performance Track was another EMS framework that was implemented mostly within the United States of America. EPA had set 4 membership criteria in order for the acceptance of facilities into Performance Track membership. One of the more stringent criteria was facilities were to do annual environmental performance reporting based on chosen environmental indicators from Environmental Performance Table laid out by USEPA. Such membership could be removed by EPA if failed in submitting and or falsifying the information in the annual report. Openness in environmental performance result was highly regarded in Performance Track though no specified certification was needed. On the other hand, RC ® was birthed to encourage improved environmental, health and safety performance for chemical industry. The current 53 chemical associations, which are the respective national chemical association is responsible to coordinate on RC ® in their countries. It requires also open and transparent communication especially with stakeholders. RC ® embraces the development and application of sustainable chemistry, helping chemical industry to contribute to sustainable development while allowing chemical industry to meet the world's growing need for essential chemicals and the products those chemicals make possible. Verification every three year in force to ensure that the ethic and management systems are in place and compliance with the intent of the codes and continual improvement of performance to meet peer and public expectations. As for EMAS, it is a European EMS framework. EMAS is now open to all industries to use as a management tool for the purpose of evaluating, reporting and improving their environmental performance. The overall objective of EMAS is to promote continuous improvements in the environmental performance of industrial activity through the promotion of both positive environmental management and public disclosure of environmental impacts. Environmental performance reporting is also expected from EMAS members, which data and information will be verified.

Through the various reports produced by the official organizations of the common EMS frameworks, indeed the improvement of environmental performance as a whole for the participating facility cannot be denied. This is because EMS requires setting of policy, objectives and targets in facility with consistent evaluation and reporting, as well as external verification and or certification. Some of the environmental performance is in the form of compliance to the local statutory and regulatory requirements.

**Acknowledgements**

The authors would like to thank the Ministry of Education Malaysia for funding this research through My Brain 15 and Universiti Malaysia Sarawak for the facilities.

## REFERENCES

Alberti, M., Caini, L., Calabrese, A., and Rossi, D. 2000. Evaluation of the costs and benefits of an environmental management system. *International Journal of Production Research,* Volume 38, Issue 17. pp 4455 – 4466.

Barrow, C. J. 2006. *Environmental Management for Sustainable Development*. 2nd Edition. New York: Routledge. pp1-38.

Bell, S. 1997. *Ball and Bell on Environmental Law: the laws and policy relating to the protection of the environment.* 4th Edition. London: Blackstone Press.

Clarke, W. C. 1989. Managing Planet Earth. *Scientific American, 261 (3)*. pp 19-26.

Department of Standards Malaysia (DSM). 2004. *ISO 14001:2004 Environmental Management Systems – Requirements with guidance for use(First Revision) (ISO 14001:2004, IDT)* Putrajaya :Jabatan Standard Malaysia, 2004.

Harte, D. 1992. Environmental law, in M. Newson (ed.) *Managing the Human Impact on the Natural Environment*, London: Belhaven. pp. 56-79.

ISO/TC207/SC4. *ISO 14031: 1999(E) Environmental Management -- Environmental Performance Evaluation – Guidelines.* Canadian Standards Association.

Massachusetts Department of Environmental Protection (MassDEP) 2014. *Environmental Management System Planning Guidance : Under The Toxic Use Reduction Act (TURA).*http://www.mass.gov/eea/docs/dep/toxics/laws/emsguid.pdfAccessed on 25 September 2014.

McEldowney, J. F. 1996. *Environment and the Law*. Addison Wesley Longman, Harlow.

Morris, A. S. 2004. *ISO 14000 Environmental Management Standards: Engineering and Financial Aspects.* John Wiley and Sons. pp. 1-39.

Muhamad Awang, Hassan, M. N., Zakaria, Z., Badri, Karen, Theng, L.C., Sulaiman, W.N.A. and Yusoff, M.K. 1999. *Environmental Management Standards (ISO 14001): Towards a sustainable furture.* Serdang: Universiti Malaysia Putra Press, 1999.

Nicholas and Smith, 2005. *The ISO 14000 Challenge :Environmental Management – A Guide for Managers (Video recording),* Australia: Nicholas and Smith Pty Ltd.

Piper, L., Ryding, S.O., Henricson, C. 2003. *Continual Improvement with ISO 14000,* 1st Edition, IOS Press. pp. 13-71, pp. 307-316.

Richelsen, A., Jau, J. J. and Basiuk, R. 2000. *Environmental Management in Cities and Local Authorities (Sarawak Government/DANCED Sustainable Urban Development Project Sarawak), 1st Edition*. Malaysia: Wisma Printing Sdn. Bhd. pp. 1-5.

Sangster, A. 1993. Environmental Management – An Experience In Improving Environmental Performance. In *Implementing Environmental Management* (Shillito, D., ed.), p. 49-56. Institution of Chemical Engineers, UK.

Sheldon, C. and Yoxon, M. 2006. *Environmental Management Systems: A Step-by-Step Guide to Implementation and Maintenance*, 3rd Edition, London: Earthscan. pp. 3-9, 75-89.

Stasiskiene, Z. and Staniskis, J. 2005. *Integration of Environmental Management Accounting into Company's Environmental Performance Improvement System: Case Study of Lithuanian Industry*. The Institue of Environmental Engineering (APINI), Kaunas University of Technology.

*******