Environment and Ecology Research 11(5): 873-880, 2023
DOI: 10.13189/eer.2023.110515 http://www.hrpub.org

A Literature Study: Evaluation of Environmental Management System 14001:2015 in Indonesian Companies

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Received July 5, 2023; Revised September 19, 2023; Accepted October 7, 2023

Cite This Paper in the Following Citation Styles

(a): *[1] Elanda Fikri, Oryza Filial Zulkarnain, Anshah Silmi Afifah, Yura Witsqa Firmansyah , "A Literature Study: Evaluation of Environmental Management System 14001:2015 in Indonesian Companies," Environment and Ecology Research, Vol. 11, No. 5, pp. 873 - 880, 2023. DOI: 10.13189/eer.2023.110515.*

(b): *Elanda Fikri, Oryza Filial Zulkarnain, Anshah Silmi Afifah, Yura Witsqa Firmansyah (2023). A Literature Study: Evaluation of Environmental Management System 14001:2015 in Indonesian Companies. Environment and Ecology Research, 11(5), 873 – 880. DOI: 10.13189/eer.2023.110515.*

Abstract To develop into an environmentally friendly company, technological advancements must always accompany the company's growth. Consequently, sustainable environmental management becomes essential, including the implementation of an environmental management system (EMS) in accordance with international organization for standardization (ISO) 14001:2015 standards. The objective of this study is to evaluate EMS compliance with ISO 14001:2015. This article employs a literature review methodology with case study approach, involving the collection, examination, and conclusion drawing from up to nine articles published from 2017 to 2022, focusing on the application of the ISO 14001 environmental management system in different industrial sectors. The research measures seven assessments: organizational context, planning, support, leadership, operations, performance evaluation, and improvement. The study's findings demonstrate that the dimensions of the environmental management system's sustainability have been implemented in accordance with the Global Environmental Management Initiative (GEMI-2017) ISO 14001:2015 method, and the implementation of the self-assessment checklist falls under the satisfactory sustainable category. Some studies have included assessment results based on the ISO 14001:2015 checklist for the organizational context field. Companies like PT Janata Marina Indonesia and PT Citra Abadi Sejati need improvement as they are still in the process of fulfilling the requirements for ISO certification. On the other hand, companies such as PT. Indonesia Power Up, PT. X waste processor, PT. X detergent manufacturer, PT. SAS International, PT. Nusa Konstruksi Enjiniring Tbk (NKE), PT. Adhi Karya, the Pulp and Paper Manufacturing Industry, and PT X Laboratory in Indonesia, which already hold ISO 14001 certificates, have shown good organizational context values. However, there are two companies that have not yet met the ISO 14001:2015 criteria.

Keywords Environmental Management System, ISO 14001:2015, Sustainability Analysis

1. Introduction

Environmental issues had gained significant prominence

in the past decade. The development of environmental issues has been closely associated with globalization in various fields. Among the crucial aspects of globalization are environmental concerns, which have prompted companies to enhance their overall performance and manufacture more environmentally friendly products [1]. Achieving commendable environmental performance necessitates a company's commitment to adopting a systematic approach and continually improving their environmental management system (EMS) [2]. The transition from human power to mechanical power in technology has had a positive impact on facilitating high productivity [3]. This progress calls for concrete actions, including the establishment of a reliable, effective, and well-documented environmental management system, and encourages continuous improvement such as the implementation of an Environmental Management System (EMS) in accordance with the ISO 14001:2015 standard [4] [5].

The implementation of an effective environmental management system is crucial, and to ensure its effectiveness, a standard that outlines the system is necessary. The International Organization for Standardization (ISO), which is a global standardization organization, has emerged as a platform that enables companies to enhance their competitiveness on a global scale [6]. The environmental management system is an essential component of the overall management system of a company. It encompasses a systematic approach to environmental management, including organizational structure, responsibilities, procedures, processes, and resource allocation in order to actualize environmental policies. By implementing an environmental management system, companies can establish a framework to achieve and demonstrate commendable environmental performance by controlling the environmental impact of their production activities [7]–[9].

The environmental management system is an integral part of a comprehensive system that encompasses planning, scheduling, implementation, and monitoring of activities aimed at enhancing environmental performance. In essence, the environmental management system establishes a positive correlation between the company and its environmental performance [10]. The ISO 14001 International Standard serves as a mechanism to ensure the effectiveness of the environmental management system. The development of the ISO 14001 standard is actually a response to various environmental issues frequently discussed in society [11]–[13]. These environmental issues include air pollution, water pollution, soil pollution, waste and hazardous materials, sound/noise and vibration, radiation, physical planning, material usage, energy consumption, and employee safety and health [14].

In several studies examining the implementation of ISO 14001 in companies, several reasons for adopting ISO 14001 have been identified, with the most significant one being the improvement of the company's image, employee engagement, reduction of environmental pollution, and meeting consumer demands [15]. Through the implementation of ISO 14001, companies have managed to reduce environmental pollution by 20%. The overarching objective of implementing the ISO 14001 Environmental Management System as an international standard is to support environmental protection and pollution prevention while maintaining a balance with socio-economic needs. ISO 14001 also offers numerous benefits to companies, including improved environmental performance, cost reduction, and increased market access [16] [17]. The purpose of this study is to assess the implementation and compliance with ISO 14001:2015 environmental management system standards in multinational companies based on research conducted between 2017 and 2022. This study has a contribution in reviewing and evaluating the company's suitability in implementing ISO 14001:2015.

2. Materials and Methods

This research constitutes a literature review that refers to specific research methodologies and developments aimed at collecting and evaluating research relevant to a particular topic focus [18]. The data source employed for this article search is Google Scholar, using the keywords "Environmental Management System" and "ISO 14001 Principles", which have been previously studied by researchers in Indonesia and are scientifically justifiable. The articles utilized in this paper were published between 2014 and 2022 and were obtained from various national journal sources, resulting in a total of nine articles. These articles were then analyzed based on their objectives, topic relevance, variables used, and the results presented in each journal. The research systematically and accurately analyzes the articles in connection with the Plan-Do-Check-Act (PDCA) system, based on the ISO 14001 Principles. The ISO 14001 principles (Figure 1) that were examined include the principles of environmental policy, planning, implementation and operation, inspection, and management review [17].

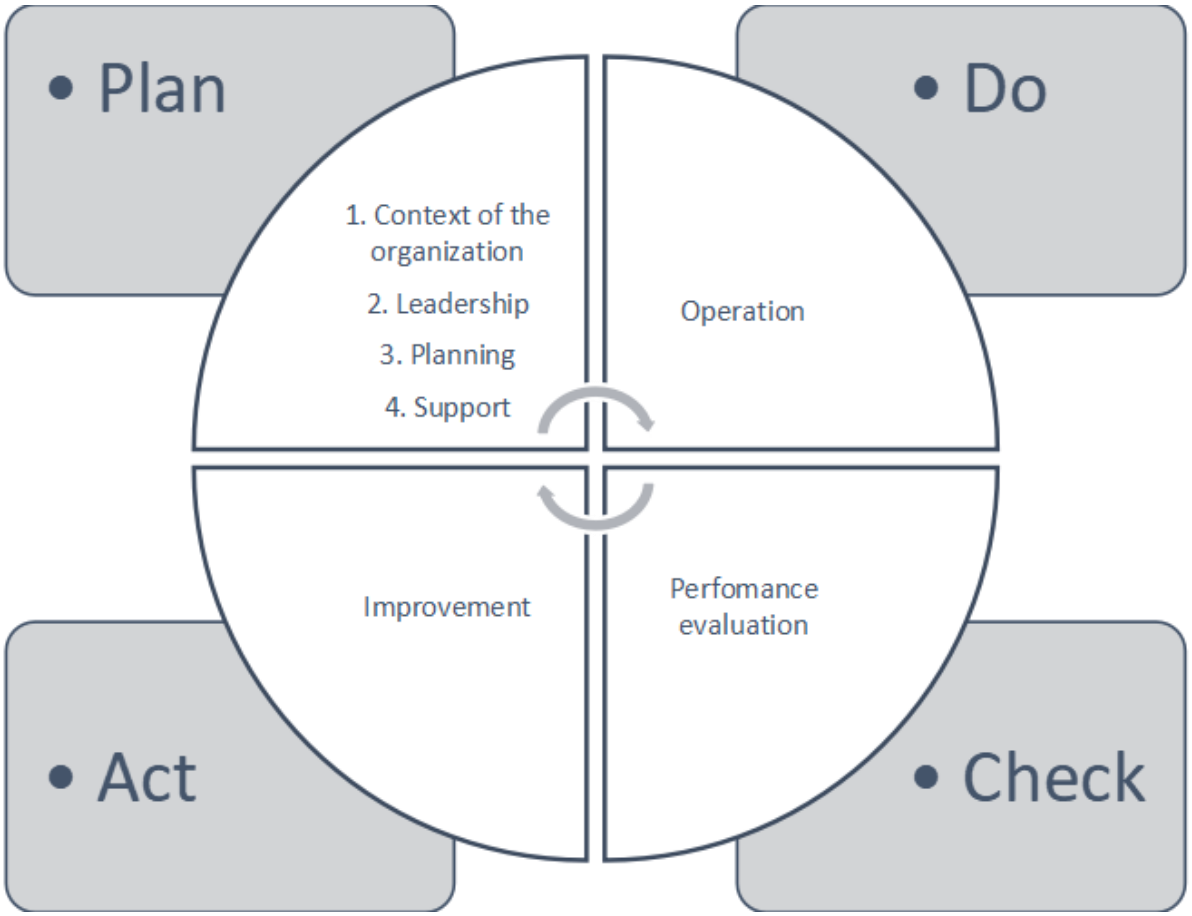

Figure 1. The Seven Principles of ISO 14001:2015

3. Results and Discussion

The collected articles are subsequently extracted and synthesized to acquire data that aligns with the objectives of this research. The data is compiled and analyzed to serve as a foundation for problem-solving through literature review studies. **Table 1** below presents a description of the literature references reviewed,

Table 1. The Identity and Findings of Selected Published Articles 2014-2022

Authors and Year	Title of Article	Finding	Reference
Bimastyaji Surya Ramadan, Ajeng Lakshita, Pramesti, Santika Budi Hapsari, Nurani Ikhlas (2019)	Quantitative Analysis of Environmental Management System Based on ISO 14001:2015 Clauses	Based on the conducted analysis, it is evident that PT X waste processor has successfully fulfilled the principles outlined in ISO 14001:2015. This can be observed through the presence of a comprehensive Standard Operating Procedure (SOP) that encompasses operational procedures, production processes, and environmental maintenance. Additionally, the company demonstrates its commitment to environmental management systems through documented policies and the support of top management. Environmental policy and commitment serve as foundational principles for the implementation of an effective environmental management system.	[19]
Setiya Tiara, Tatan Sukwika, Kholil Kholil (2022)	Analysis of the Sustainability Dimensions of the ISO 14001:2015 Environmental Management System at PT Indonesia Power UP-Mrica	The study conducted measurements on seven assessments, out of which three assessments, namely organizational context, planning, and support, were categorized as good. On the other hand, the remaining four assessments, including leadership, operations, performance evaluation, and improvement, were classified as satisfactory in terms of sustainability.	[17]
Atik Kurnianto (2019)	IMPLEMENTATION OF ISO 14001 ENVIRONMENTAL MANAGEMENT SYSTEM: 2015 PT "X"	Company policies should reflect the commitment of top management to comply with applicable laws and prioritize continuous improvement. PT X detergent manufacturer has implemented several environmental management programs, including environmental campaigns, the implementation of environmental procedures and practices, as well as the monitoring and measurement of the internal and external environment.	[20]
Andri Yoshana, Muhammad Fidiandri Putra, Ninta Sri Ulina (2021)	GAP ANALYSIS OF ISO 14000: 2015 IMPLEMENTATION AT PT. SAS INTERNATIONAL	There is a 25% gap, indicating that PT SAS International has achieved a readiness score of 75% for implementing ISO 14001:2015. This score suggests that PT SAS International is prepared to finalize the SML 14001:2015 document and is ready for certification. To bridge this gap, PT SAS International should make improvements based on the checklist that aligns with ISO 14001 requirements.	[10]
Darminto Pujotomo, Agus Yulianto Subekhi (2019)	ENVIRONMENTAL MANAGEMENT SYSTEM ANALYSIS AT PT. JANATA MARINA INDAH SEMARANG BASED ON ISO 14001	The current implementation of the Environmental Management System at PT Janata Marina Indah Semarang does not meet the ISO 14001 requirements. This inadequacy indicates insufficient preparation for obtaining ISO 14001 certification. Therefore, an improvement design is necessary to ensure compliance and facilitate the acquisition of ISO 14001 certification.	[15]
Anita Nurfida, Muhammad Fidiandri Putra, Ridwan Usman (2020)	GAP ANALYSIS OF ISO 14000 IMPLEMENTATION AT PT. CITRA ABADI SEJATI	In the evaluation of PT Citra Abadi Sejati Bogor's SML, a gap analysis was conducted, resulting in a 15% difference, which indicates the company's readiness to implement ISO 14001:2015. With this score, it implies that PT Citra Abadi Sejati is prepared to finalize the SML 14001:2015 document and is also ready to pursue certification.	[7]
Rizka Dwi Apriliani, Yemima Marnalita Hasibuan, Filson Maratur Sidjabat (2019)	ISO 14001:2015 and ISO 9001:2015 Implementation in Con-struction Company	The results of this study reveal that each company has its own strategy to achieve ISO 14001:2015 compliance. In PT. Nusa Konstruksi Enjiniring Tbk (NKE), they take direct actions to protect the environment, such as managing waste, preventing pollution, and complying with regulations. In PT. Adhi Karya, they prioritize the health and safety of the workplace, emphasize the use of eco-friendly and energy-saving products, and focus on pollution prevention and the conservation of natural resources. Acciona, S.A., and Eiffage, on the other hand, prioritize compliance with environmental protection norms and commonly construct dedicated infrastructure to preserve the environment and manage waste treatment.	[21]
Erwin Erwin (2021)	Implementation of Environmental Management System (ISO 14001) in Supporting the Achievement of Corporate Sustainability Performance in the Pulp and Paper Manufacturing Industry in Indonesia	The results show that the implementation of the ISO 14001 System has a positive impact on the sustainability performance of companies in the pulp and paper manufacturing industry in Indonesia. Companies that implement ISO 14001 have better performance in terms of energy efficiency, waste management, sustainable use of raw materials, and compliance with environmental regulations.	[22]
Rani Gustia, Dwi Nowo Martono, and Udi Syahnoedi Hamzah (2021)	Environmental Performance Evaluation of Applying ISO 14001 in Laboratory	PT X laboratory has implemented ISO 14001:2015 quite well. Efforts are needed to improve improvements for wastewater management. There are several parameters produced that are still above the quality standard. Second, hazardous waste management is not yet optimal, the results show that the testing of hazardous waste carried out is less than the production of the waste. Third, there is a need for good efficiency in the use of clean water.	[44]

The research instrument used in this study is a self-assessment checklist adapted from the Global Environmental Management Initiative (GEMI) and the ISO 14001:2015 clause [14]. The checklist includes 7 principles: context of the organization, leadership, planning, support, operation, performance evaluation, and improvement. These principles are further divided into 17 elements, which are then formulated into 31 main questions. Each question is scored on a scale of 0 to 2, resulting in a perfect score of 62, indicating that the organization has successfully incorporated all the required elements outlined in the ISO 14001 standard [14].

Table 2. The Assessment of Fulfillment of ISO 14001:2015 Requirements

Score	Description
0	The organization or company has not met the requirements
1	The organization or company meets some of the requirements
2	The organization or company has fully met the requirements

The highest score is in **Table 2**. Any element does not necessarily indicate that basic needs are being met. Furthermore, since all principles and elements are interconnected, a low score in one element may raise concerns about the higher scores achieved in other elements [14]. The seven principles form an interconnected plan-do-check-act (PDCA) flow, which represents the company's continuous improvement efforts. Conversely, a score of 1 or 2 in each question provides the assessed organization with confidence that their management approach aligns with the ideal environmental management system described in ISO 14001:2015 [17].

Some organizations or companies have made efforts to enhance the implementation of ISO 14001. In the checklist, each condition is assigned a score for each ISO 14001 principle to evaluate its implementation within the company. The scoring results are valuable for assessing the company's current state in terms of its Environmental Management System. The interpretation of the score for each principle will be explained during the analysis stage.

Some studies have included assessment results based on the ISO 14001:2015 checklist for the organizational context field. Companies like PT Janata Marina Indonesia and PT Citra Abadi Sejati need improvement as they are still in the process of fulfilling the requirements for ISO certification. PT X Laboratorium has implemented ISO 14001:2015, but efforts are needed to make improvements for the management of liquid waste, hazardous and toxic substances, and the efficiency of clean water use. On the other hand, companies such as PT. Indonesia Power Up, PT. X waste processor, PT. X detergent manufacturer, PT. SAS International, PT. Nusa Konstruksi Enjiniring Tbk (NKE), PT. Adhi Karya, and the Pulp and Paper Manufacturing Industry in Indonesia, which already hold ISO 14001 certificates, have shown good organizational context values. This assessment is based on these organizations having procedures or written documentation that address the organizational context and understanding of interested parties, as well as procedures or written documentation regarding the scope of the environmental management system and its implementation in all relevant aspects of the company's activities[23]–[26].

Table 3. The Assessment Classification ISO 14001:2015

No	Dimensions of Sustainability	Percentage of Implementation
1	Poor	0-59%
2	Good	60-84%
3	Satisfy	85-100%

Based on the assessment results in **Table 3**, the scores range from 85% to 92%, based on 19 assessments with a maximum score of 38. These assessment results fall within the satisfactory sustainability category, indicating that the company demonstrates good leadership. The company has established documented policies for safety, occupational health, environment, and quality (K3LM), which have been signed by the president and communicated to all employees. Additionally, the company has implemented a well-defined organizational structure as outlined in the Human Capital Management System procedure [27]. The top manager actively monitors the implementation of the environmental management system and submits monitoring reports on the follow-up of system audit results to the representative manager. Furthermore, periodic management reviews are conducted to ensure the ongoing effectiveness of the environmental management system [28]–[30].

Based on the assessment results in the planning field of ISO 14001:2015, the scores range from 70% to 89%. Companies classified under the good sustainability category have shown progress in identifying most of the environmental aspects as listed in the Environmental Aspect Identification, Determination of Environmental Impact, and Determining Control. They have also implemented procedures for legal requirements and environmental monitoring [31]–[33]. However, there is still room for improvement. These companies need to enhance their planning by setting environmental goals with appropriate timeframes and ensuring effective communication of these goals to employees. This area requires attention in the assessments of PT Indonesia Power Up and PT NKE.

Based on the observations, the overall score for the support principle ranges from 60% to 84%. This indicates that companies in the satisfactory sustainability category have established procedures related to human resources and have a good understanding of the competency requirements for their personnel. This is evident through activities such as environmental training and communication of health, safety, and environmental

policies[34]–[36]. However, companies with good sustainability classifications, such as PT X waste processing, PT Janata Marina Indonesia, and PT Citra Abadi Sejati, need to develop an improvement plan. PT X Laboratorium has implemented ISO 14001:2015, but efforts are needed to make improvements for the management of liquid waste, hazardous and toxic substances, and the efficiency of clean water use. This includes making ISO 14001:2015 training mandatory for all employees as a fundamental requirement.

Based on the observation, the overall score for the Implementation and Operation principles ranges from 78% to 88%. This indicates that the companies have implemented various procedures to achieve their policy objectives and targets, including waste minimization activities and energy conservation programs. However, companies with good sustainability classifications still need improvement in certain areas. For example, they have not effectively communicated important environmental aspects to cooperate contractors, and not all employees have received emergency response training [12] [37] [38]. These areas require attention to ensure comprehensive implementation of the ISO 14001 standards.

There are 4 sub-clauses in the performance evaluation assessment: monitoring, measurement, analysis and evaluation; compliance evaluation, internal audit program, and management review. Based on the assessment results, the total score for the Performance Evaluation principles ranges from 78% to 92%. This indicates that the company regularly monitors and evaluates the performance of the Environmental Management System (EMS) and its components according to a predetermined schedule. Consequently, non-conformities can be promptly identified, allowing for effective corrective or preventive actions to be taken. The company has established procedures related to internal audits as outlined in the Internal Audit of SHEQ Management System Procedure, and a written schedule for environmental audit programs is in place. Internal audits have been documented through audit reports and records, and the results are evaluated and verified to identify preventive measures, corrective actions, and opportunities for continuous improvement in line with the requirements of OHSAS 18001, ISO 14001, ISO 9001, and ISO 45001 Integrated Management standards [39]–[41].

The total score generated for the Improvement principle ranges from 80% to 94%. This indicates that the company being studied responds to complaints or nonconformities by conducting investigations and implementing improvements in line with the identified problem's impact. Additionally, the company follows corrective action procedures to address problems identified through nonconformity procedures and reviews the effectiveness of implemented corrective actions [42]. Continuous improvement is emphasized in enhancing the effectiveness of the integrated management system aligned with OHSAS 18001, ISO 14011, ISO 9001, and ISO 45001. The company adopts methodologies such as Plan-Do-Check-Act (PDAC) or Define-Measure-Analyze-Improve-Control (DMAIC) to drive improvement efforts [43] [44] [45]. The limitation of this study is that the literature used does not describe the current year's conditions. There are two companies PT Janata Marina Indah Semarang in 2019 and PT Citra Abadi Sejati Bogor's in 2020 that may have met the ISO 14001:2015 criteria this year.

4. Conclusions

The assessment of the 8 companies reviewed, based on ISO 14001:2015, reveals a good and satisfactory sustainability category overall. The fulfillment of sustainability assessment aligns with the GEMI-2017 method in ISO 14001:2015, and the self-assessment checklist demonstrates a satisfactory implementation category. The aspects of organizational context, planning, and support are categorized as good, while the aspects of leadership, operations, performance evaluation, and improvement fall under the satisfactory sustainability category. Among the seven assessments conducted, the improvement assessment receives the highest score, while the organizational context aspect receives the lowest score. This is due to some companies not fully understanding the needs of employees in implementing the environmental management system.

To enhance the implementation of the ISO 14001:2015 environmental management system, it is recommended that companies focus on improving the organizational context, particularly in identifying internal and external issues within the scope of the environmental management system. A managerial implication is to implement an employee competency improvement program that aligns with the principles of Life Cycle Assessment (LCA) within the company.

Acknowledgements

The authors would like to thank the Bandung Health Polytechnic; Airlangga University; Polytechnic of Furniture and Wood Processing Industry; Santo Borromeus University; and Sebelas Maret University for supporting this study.

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