The application of environmental management system based on ISO 14001 in Brawijaya Malang University

K E Sari¹ and S Kamalia¹

¹ Urban Regional and Planning Department, Universitas Brawijaya

Email: kartika_plano@yahoo.co.id

Abstract. Universitas Brawijaya (UB) Malang is one of the universities in Indonesia that having the issue of decreasing environmental quality prompted the Rector of UB to put the problem into the University's agenda. To solve this problem, UB plans to apply international standards to support the sustainability of the University, which includes implementing an environmental management system known as ISO 14001 by using Importance-Performance Analysis (IPA) analysis, AHP analysis (Analytical Hierarchy Process). The first objective in this study is to find out the management's condition on the readiness of the academic community to evaluate the success of the application of ISO 1400 in UB and the second objectives is to produce the extent of preparedness and progress in planning related to ISO 14001 management systems in UB. The results shows that it can be concluded that the current implementation of the environmental management system at UB still lacks the principles of ISO 14001. One of the principles in ISO 14001 that has not been applied at the University indicates lack of preparedness in a University can be seen in the lack of documentation and communication of management policies and commitments on environmental management systems.

Keywords: environmental; management; university; brawijaya

1. Introduction

Globalization is demanded for eco-friendly which has a huge impact on the environment. With the existing demands and regulations, the environmental impact of globalization is increasingly minimized. The standard SNI of ISO 14001 wherein this document contains guidance from what aspects fall into the criteria of the environmental management system. In this study will discuss whether ISO 14001 has become part of environmental management efforts in Brawijaya Malang University.

Based on the results of an interview by Dr. Endang Arisoesilaningsih (Chairperson of Brawijaya Malang University Quality Assurance Center) 2017 from the background above, there are several activities that are the focus of this research including:

1. There is no implementation of special programs for the institutional level in applying and ISO 14001 certification at Brawijaya Malang University.

2. There are no program priorities that are in accordance with ISO 14001 requirements, but several criteria for green campus (which are "aligned" with ISO 14001) have begun to be implemented.

3. Provision of a limited budget, so that the current budget priorities are not for implementing ISO 14001.
4. There is still a lack of readiness of human resources in implementing ISO 14001 requirements in the University of Brawijaya environment.
5. Brawijaya University still has not prepared facilities and infrastructure that are in accordance with ISO 14001 requirements.

The ISO 14001 International Standard is a vehicle for ensuring the performance of the environmental management system. The ISO 14001 standard actually arises as a result of several environmental issues that are often discussed in society. Work units are assessed based on the planning, implementation and evaluation process (PDCA-Plan, Do, Check and Action). The size used by this international institution towards Brawijaya University lies in the implementation of quality management that is adjusted to the requirements of ISO 9001: 2008.

2. Methodology of research

This type of research is qualitative in that the survey method in this study was conducted by distributing questionnaires and interviewing respondents. The following are the research variables used.

This type of research is qualitative in that the survey method in this study was conducted by distributing questionnaires and interviewing respondents. The following are the research variables used.

| Table 1. Variable Of The Research |
|----------------------------------|
| Variable                        | Sub of Variable                     |
| Environmental Policy            | Environmental Impact               |
|                                 | Characteristic of activities        |
| Environmental Planning          | Environmental Aspect                |
|                                 | Action Plan                         |
| Implementation And Operation    | Structure and Responsibility        |
|                                 | Training and Control                |
|                                 | Communication                       |
| Emergency Preparedness and Response | Evaluate the need to carry out actions |
| Management Review               | Review the effectiveness of corrective actions |
|                                 | Identify and implement corrections  |
|                                 | Evaluation of program achievements  |

Determination of respondents is done in a non-probability sampling method where AHP analysis is needed ≤ 5 respondents and for IPA analysis method ≥ 30 respondents.

The analytical tool used from the evaluative analysis method in this study is the AHP and IPA analysis method with output to evaluate the management conditions that have been achieved based on the ISO 14001 environmental management system, and PDCA (plan -do-check- act) analysis with output to assess performance academic community in the environmental management system which will later become a recommendation for the application of ISO 14001 in Brawijaya University Malang.

The stages of the AHP analysis method in this study are 2 stages:

1. Structuring Stage, where this stage determines the purpose of AHP, the criteria and sub criteria used and what alternatives are available. This stage has the purpose of making decisions in a structured manner based on the existing components.
2. Assessment Phase, which aims to provide weighting values of criteria and sub-criteria as well as alternatives. Giving weight at this stage is given based on the perception of the level of importance directly and also with the graph.

The criteria set for the selection of priorities from the ISO 14001 environmental management system evaluation in Brawijaya Malang University include the 5 variables used in this study is environmental policy (1), environmental planning (2), implementation and operation (3), emergency preparedness and response (4) and management review (5).
3. Results and Discussion
In general, ISO 14001 in Brawijaya Malang University is still in the form of a discourse. However, since 2014 Brawijaya Malang University has participated in a green metric program where some of its requirements are the principles of ISO 14001. For example, the convenience of the university environment, electricity energy savings, the application of injection wells for saving water, administrative governance that minimizes paper use, etc. For now Brawijaya Malang University still has no program priorities related to ISO 14001 requirements where environmental policies, environmental planning, implementation and operation, emergency preparedness and response and management reviews are elements contained in ISO 14001 regarding environmental management systems. However, several green metric criteria (which are in line with ISO 14001) have already begun to be implemented in Brawijaya Malang University.

3.1 Environmental Policy
Environmental policy in Brawijaya Malang University is still limited to an implementation form where in the environmental policy in Brawijaya Malang University this has not yet been formed as a policy document. The contents of environmental policy in Brawijaya Malang University still do not include a commitment to comply with environmental laws and regulations that are in accordance with other requirements. Meanwhile, Brawijaya Malang University still does not have documents related to environmental policy in SML 14001 and the extent to which the environmental policy in Brawijaya Malang University has been implemented is still in the form of minutes, but UB refers to the green metric UI where indicators of UI green metric can be reference in the application of ISO 14001 in Brawijaya Malang University.

3.2 Environmental Planning
Masterplan making for waste treatment in Brawijaya Malang University is triggered by the number of laboratories, especially in each Faculty in the exact field where some of these laboratories produce B3 waste. Considering that all B3 waste in Brawijaya Malang University, processing is carried out by means of all laboratory activities that produce B3 waste are collected first into one and then for processing the B3 waste is sent and processed in Malang Hospital. The documentation system and requirements related to the environmental management system in Brawijaya Malang University are good enough, where Brawijaya Malang University has planned several aspects to go to ISO 14001 which are among others:

1. The master plan for waste disposal has been carried out since 2017 which was compiled by a team from the planning division of the BAK.
2. It has been planned to make a WWTP which will be in place under the gazebo of the Faculty of Medicine, which will be implemented in 2018.
3. Planning the construction and laying of water catchments planned to be carried out in 2018, one of which is located in the area around the ATM center near the entrance gate of Brawijaya Malang University on Jalan Veteran this year.

The application of external communication that can be done in Brawijaya Malang University includes related agencies and communication with the academic community. By applying these two types of communication, Brawijaya Malang University will receive, document and respond to relevant complaints or complaints from external parties. Environmental communication refers to external and internal communication procedures. The procedure includes:

1. Internal communication between various organizational functions and levels.
2. Acceptance, documentation and responses to relevant communications from related external parties (ISO 14001, 2004).

According to the interview results from Prof.Ir. Sumeru Ashari, M.Agr.Sc., Ph.D. who served as chairman of the 2017 Green metric from the Agriculture Department, Brawijaya Malang University still has not developed and run a good communication system. The communication system (Kabiro with Faculties) in Brawijaya Malang University related to the cleanliness of the environment of the
Finance Admin Bureau is still not fully running smoothly. If the officers are able to do it, then environmental cleanliness in the area of Brawijaya University will be maintained.

3.4 Emergency preparedness and response
Examination actions on physical conditions in the Brawijaya Malang University environment include conditions of several buildings/faculties that have several trash bins for every corner of the building. Some conditions in the trash can in each building/faculty are different. Some still have no sorting at disposal, some have already applied sorting. A lot of trash that has been sorted is found in several buildings/faculties that have applied sorting, among them are Rector, Faculty of Medicine, Faculty of Economics and Business, UB Polyclinic, Samanta Krida Building, Faculty of Agriculture and Law Faculty. The sorting of waste will then be brought to the final disposal site (TPA) near the Faculty of Mathematics and Natural Sciences. This janitor who is within the scope of Brawijaya Malang University is a combination of several internal janitors and external cleaning officers. The internal cleaning officer who is intended is a janitor who carries out cleaning activities in dry waste in the University of Brawijaya environment. Whereas for external officers is a janitor from outside Brawijaya Malang University where the officer carries out his duties in the form of a contract system. This external janitor is in charge of cleaning and sorting dry waste and wet waste in Brawijaya Malang University.

3.5 Management review
Relatively more complete data collection can be seen from 2012 to 2017 where those who participate in the AIM work unit are not only limited to faculties/programs and departments, but also study programs, laboratories and supporting units located in Brawijaya Malang University. However, when viewed from the composition of the number of participation from year to year which shows an increasing trend in the participation of work units in AIM at Brawijaya Malang University is at the level of study programs. In the beginning of 2012 there were still 72 participating study programs, but by the end of 2017 there were 167 participating study programs. From the beginning of 2014 to 2016, it was pointed out that the department was not much involved in the data collection process. Then for the study program which shows changes and variations in data, which shows the trend of decreasing data, namely from its supporting units. If in 2014 is the highest year supporting units, but in 2017 it has decreased to 11 supporting units participating.

Table 2. Conclusions on the Results of Each Variable

| Variable                        | Indicator                                                                 | Score |
|---------------------------------|---------------------------------------------------------------------------|-------|
| Environmental Policy            | Brawijaya Malang University still has no official documents related to environmental policy. | 3     |
| Environmental Planning          | Brawijaya Malang University has planned several aspects related to environmental management systems based on ISO 14001. | 5     |
| Implementation and Operation    | The closest plan to implement some aspects of the existing master plan is to be implemented in 2018 | 2     |
| Emergency Preparedness and Response | For now, Brawijaya Malang University has not yet done and scheduled | 1     |
Variable | Indicator | Score
--- | --- | ---
Management Review | For now, Brawijaya Malang University is still not doing and scheduled schedule related to management progress from ISO 14001 | 1

The total score for the implementation and operation variable is 2, where Brawijaya Malang University still does not fully schedule according to the planning agenda. For the nearest time, the construction of the parent WWTP will be built which will be built under the gazebo of the Medical Faculty of Brawijaya Malang University in 2018. According to observations that have been made, for examination and repair action variables and management review variables have a total score of 1 which Brawijaya Malang University is still not at both stages.

Table 3. Matrix of Condition Comparison with Brawijaya Malang University Masterplan

| Aspect | Masterplan | Existing |
| --- | --- | --- |
| Environmental Policy | There is still no masterplan related to ISO 14001 environmental policy documents | Referring to the green metric UI where several aspects of this green metric have led to ISO14001 |
| Environmental Planning | 1. UB Zoning Plans for the next few years 2. Plan for the construction of the main WWTP in UB | 1. Some development has been carried out 2. Still in the planning process |
| Implementation and Operation | - | There is no implementation and operation related to ISO 14001 SML in UB |
| Emergency Preparedness and Response | - | Checking some supporting facilities for several aspects of ISO 14001 related to waste processing at Brawijaya Malang University |
| Management Review | - | There is no management review related to ISO 14001 SML in Brawijaya Malang University |

Some of the problems that hamper the improvement of the ISO 14001 certification program in Universitas Brawijaya, one of which is communication between Kabiro and the Faculty in relation to environmental cleanliness. Here are a few inhibiting factors in improving the ISO 14001 program in Universitas Brawijaya Malang:

1. Brawijaya Malang University there is no implementation of special programs for the institutional level in applying and ISO 14001 certification.
2. Provision of a limited budget, so that the current budget priorities are not for implementing ISO 14001.
3. Still lack of readiness of human resources in implementing ISO 14001 requirements within the Brawijaya Malang University environment.
4. Brawijaya Malang University still has not prepared facilities and infrastructure that are in accordance with ISO 14001 requirements.

According to the interview results from Prof. Ir. Sumeru Ashari, M.Agr.Sc., Ph.D for the future application of ISO 14001 in Brawijaya University must be realized immediately because, the
application of ISO 14001 must be the face of one of the work programs in Brawijaya Malang University.

3.6 Importance analysis based on Analytical Hierarchy Process (AHP)

Determination of the score weight in the AHP environmental management system based on ISO 14001 in Brawijaya Malang University uses the current scale, namely the scale of interests with a range of 1 to 9 with the following definition.

| Identification | Definition |
|----------------|------------|
| 1              | Both criteria are equally important |
| 3              | Criteria A is a bit more important than criterion B |
| 5              | A criterion is more important than criterion B |
| 7              | Criteria A is more important than criterion B |
| 9              | Criteria A is absolutely more important than criterion B |
| 2,4,6,8        | Value given if there are two criteria there is a compromise so that the middle value is taken between two consideration values that are close together |

Based on the results of AHP calculations using expert choice it can be seen that in the three-step calculation is:
1. Calculating the results of criteria with criteria
2. Calculate the results of criteria with the criteria of each respondent
3. The second calculation is sub criteria with sub criteria
4. Overall calculation of sub-criteria values with sub-criteria

Sub criteria are calculated separately because the limitations of expert choice cannot contain all the sub criteria simultaneously which are too many and have an impact on the inconsistency of sub criteria with sub criteria. Based on the assessment of the AHP questionnaire 5 respondents who have been selected and the calculation of CI can be seen that the results of each respondent can be seen in the table as follows.

| Name of Respondent | Score Result |
|--------------------|--------------|
| Environmental Policy | Environmental Planning | Implementation and Operation | Emergency Preparedness and Response | Management Review | CI |
| Dr. Ir. Moch Sasmito Djati M | 0,597 | 0,136 | 0,096 | 0,096 | 0,085 | 0,04 |
| Prof. Ir. Sumeru Ashari, M.Agr.Sc., Ph.D | 0,442 | 0,220 | 0,159 | 0,146 | 0,032 | 0,09 |
| Dr. Endang Arisoesilaningsih | 0,264 | 0,197 | 0,197 | 0,171 | 0,171 | 0,02 |
| Dr. Eng. Riyanto Haribowo, ST., MT | 0,469 | 0,225 | 0,153 | 0,109 | 0,044 | 0,08 |
| Dr. Ir. Sri Utami, MT | 0,264 | 0,171 | 0,197 | 0,197 | 0,171 | 0,02 |
The final calculation of sub criteria and sub criteria is combining all sub criteria so that the sub sub priority results are obtained and knowing the results of the consistency index of all sub criteria with the following score results.

Table 6. Overall Sub-Criteria Results of 5 Respondents

| No. | Sub Criteria                                      | Score |
|-----|--------------------------------------------------|-------|
| 1.  | Organizational environmental policy              | 0.233 |
| 2.  | Communication                                    | 0.190 |
| 3.  | Evaluation to carry out actions                  | 0.111 |
| 4.  | Identify and correct                             | 0.090 |
| 5.  | Review the effectiveness of corrective actions   | 0.076 |
| 6.  | Evaluation of program achievements               | 0.065 |
| 7.  | Training and control                             | 0.065 |
| 8.  | Action plan                                      | 0.054 |
| 9.  | Structure and responsibility                     | 0.046 |
| 10. | Characteristic of activities                     | 0.037 |
| 11. | Environmental aspects                            | 0.036 |

Consistencies Index 0.07

3.7 Importance Performance Analysis (IPA)

The average perception of each attribute is the basis for determining whether each attribute on the performance at Brawijaya Malang University is good or not, namely by comparing all the averages on the attributes. The average expectation of each attribute is the basis for determining whether the attribute is important or not.

Table 7. Average Results of Performance Levels

| No. | Attribut                                      | Average of Perfomance |
|-----|----------------------------------------------|-----------------------|
| 1.  | Environmental Aspects                        | 3.97                  |
| 2.  | Legislation                                  | 3.91                  |
| 3.  | Goals, target and programs                   | 3.88                  |
| 4.  | Resources, roles, responsibilities and authority | 3.84              |
| 5.  | Communication                                | 3.84                  |
| 6.  | Documentation                                | 3.88                  |
| 7.  | Document control                             | 3.88                  |
| 8.  | Emergency preparedness and response          | 3.91                  |
| 9.  | Monitoring and measurement                   | 3.78                  |
| 10. | Structuring evaluation                       | 3.84                  |
| 11. | Record control                               | 3.84                  |
|     | Total                                        | 11.46                 |
|     | Average                                      | 1.04                  |

To answer the first hypothesis by using measurements from AHP and IPA analysis, the conditions that describe the achievement of the first problem formulation are to find out the management’s condition on the readiness of the academic community to evaluate the success in implementing ISO 14001 in Brawijaya Malang University. For this achievement, a calculation process is carried out in which the interests of the AHP results will be adjusted to the interests of the IPA scale by conducting the multiplication process. Furthermore, the results of the multiplication of the AHP interests are also multiplied by the performance in the Natural Sciences, so that the final results can be categorized into three categories: high, medium or low, calculated from the calculation process:
Conclusions related to AHP and IPA multiplication the largest value is found in the multiplication between organizational environmental policies and the control of documents with a score of 0.90 which can be said as a priority for assessing the readiness of the progress of the academic community in Brawijaya Malang University in running ISO 14001 certification related to environmental management systems.

### Table 8. Determination of Final Conditions AHP and IPA

| Sub Criteria                          | AHP Score | IPA Attribute          | IPA Score | Total Score |
|---------------------------------------|-----------|------------------------|-----------|-------------|
| Organizational environmental policy   | 0.233     | Document control       | 3.88      | 0.90        |
| Communication                        | 0.190     | Communication          | 3.84      | 0.73        |
| Evaluation to carry out actions       | 0.111     | Monitoring and measurement | 3.78      | 0.42        |
| Identify and correct                 | 0.090     | Record control         | 3.84      | 0.35        |
| Review the effectiveness of corrective actions | 0.076  | Goals, target and programs | 3.88      | 0.29        |
| Evaluation of program achievements   | 0.065     | Documentation          | 3.88      | 0.26        |
| Training and control                 | 0.065     | Record control         | 3.84      | 0.25        |
| Action plan                          | 0.054     | Legislation            | 3.91      | 0.21        |
| Structure and responsibility         | 0.046     | Resources, roles, responsibilities and authority | 3.84 | 0.18 |
| Characteristic of activities         | 0.037     | Structuring evaluation | 3.84      | 0.15        |
| Environmental aspects                | 0.036     | Environmental Aspects  | 3.97      | 0.14        |

### 3.8 PDCA (Plan-Do-Check-Act) Analysis

PDCA analysis is conducted to find out what are the recommendations for the application of ISO 14001 in Brawijaya Malang University related to the environmental management system. It can be seen that for the variables of implementation and operation, inspection actions and improvements as well as management reviews related to the environmental management system based on ISO 14001 in Brawijaya Malang University there is still no action on these three variables because it has not arrived at that stage and there is still no action physical condition planning. So that the stages of management from implementation and operation, inspection actions and improvements and management reviews are still not carried out. It can be concluded that the environmental management system based on ISO 14001 in Brawijaya Malang University is still at the stage of environmental policy and environmental planning.

### 4. Conclusion

Explained that this research can be concluded that:

1. The implication of this research is that the attention to the environment is getting higher, even in several universities in Indonesia where the academic community is only willing to use products whose manufacturing processes are guaranteed not to damage the environment. Realizing this, the implementation of an environmental management system based on ISO 14001 is a key step of the management system to achieve improvements in the environmental field.
2. Universitas Brawijaya has a commitment that all activities carried out must be environmentally sound. The right way is to implement an environmental management system.
3. The application of the environmental management system based on ISO 14001 in UB has gradually been implemented. This was demonstrated by the University of Indonesia's green metric program which is one of the references for obtaining ISO 14001 certification.
4. The application of objectives and targets, environmental impact management and waste minimization, as well as several environmental management system plans have been carried out in accordance with established procedures.

5. The application of an environmental management system based on ISO 14001 in Brawijaya University, namely by identifying environmental risks and impacts, as well as identifying the level of conformity and the relevant laws and other requirements.

6. The obstacles faced in the implementation of the environmental management system in Brawijaya University include the lack of understanding of the academic community about the importance of environmental problems which considers that this is the responsibility of top management. This causes a lack of awareness of the academic community to implement environmental management system programs that have been implemented.

5. Reference

[1] Imam Munandar. Juni 2017. Pengaruh Sertifikasi Sistem Manajemen Lingkungan Iso 14001 Pada Kinerja Perusahaan. Pascasarjana Sekolah Ilmu Lingkungan Universitas Indonesia

[2] Bima Dirgantara, Harya, Aryo Tri Sambodo. Februari 2015. Penerapan Model Importance Performance Analysis Dalam Studi Kasus: Analysis Kepuasan Konsumen bhineka.com. Jakarta

[3] Chafid Fandeli, Retno Nur Utami, Sofiudin Nur mansyah. April 2008. Audit Lingkungan. Universitas Gajah Mada. ISBN 979-420-6229

[4] Darminto Pujotomo, ST.MT., Agus Yulianto Subekhi. Analisa SML di PT. Janata Marina Indah Semarang Berdasarkan ISO 14001. Program Studi Teknik Industri, Universitas Diponegoro

[5] Dian Anggraini, Lulu, Panji Deoranto, Dhinta Morita Ikasari. Analisis Persepsi Konsumen Menggunakan Metode Importance Performance Analysis Dan Customer Satisfaction Index. Jurusan Teknologi Industri Pertanian Universitas Brawijaya. Malang

[6] Ryan Natasaputra, Muhammad, Parswoto, Yudi Chadirin. November 2015. Evaluasi Efektivitas Penerapan Sistem Manajemen Lingkungan Iso 14001 Di Pabrik Ban XYZ-Jawa Barat. Progran Studi Teknik Sipil dan Lingkungan FTP. Bogor

[7] Setyo Utomo, Budi, Syamsul Maarif, Surjono H.S., Sumardjo. Desember 2011. Aplikasi Analitical Hierarchy Process (Ahp) Dalam Penentuan Alternatif Pengelolaan Lingkungan Industri Komponen Alat Berat Berbasis Partisipasi Dan Kemitraan Masyarakat. IPB. Bogor

[8] Shoumil Ilhani, Rizka, Dino RimanTho. 27 September 2017. Penilaian Kinerja Karyawan Dengan Metode AHP dan Rating Scale. Jurusan Teknik Industri FT Universitas Pancasila. Jakarta

[9] Sokovic, M, D. Pavietic, K. Kern Pipan. November 2010. Quality Improvement Methodologies-PDCA Cycle, RADAR Matrix, DMAIC and DFSS. Metrology Institute of the Republic of Slovenia (MIRS). Slovenia

[10] Sueb, Memed, Maria Nety Indramayu Keraf. Maret 2012. Relasi Sistem Manajemen Lingkungan ISO 14001 dan Kinerja Keuangan. FEB Universitas Padjajaran. Bandung