Opportunity and Risk Adaptation in Environmental Management System

N K Anandagiri	extsuperscript{1*}, M D Nowo	extsuperscript{1} and H U Syahnoedi	extsuperscript{1}

	extsuperscript{1} School of Environmental Science, Universitas Indonesia, Central Jakarta, 10440, Indonesia, ORCID ID: 0000-0002-5314-5559

	extsuperscript{1*} ketut.anandagiri@ui.ac.id, 	extsuperscript{1} dwi.nowo11@ui.ac.id, 	extsuperscript{1} udi.syahnoedi@ui.ac.id

Abstract. Organizations, in general, use Environmental Management System (EMS) from ISO 14001:2015 Standard. During the preparation phase, they shall determine their risks and opportunities following Risk Management System (RMS). EMS’s newest standard emphasizes the risks, as potential adverse impact, and the opportunities, like potential beneficial impact. However, Organizations tend to use the RMS to manage the threat only while putting aside the opportunity. This traditional paradigm should be changed to optimize the “opportunities” that can proactively trigger the action to achieve breakthroughs, especially in environmental performance. This research was conducted qualitatively and compared the literature studies with the selected informants’ experiences. From the in-depth interviews analysis result, EMS practitioners know the “opportunity” potential role to improve the current management system, but not easy to be implemented. The main reasons why the “opportunity” is not popular are limitations in understanding methods of quantification of “opportunity,” habits in controlling adverse risks, and “opportunity” concepts considered uncommon and still new.

1. Introduction

ISO 14001 Environmental Management System (EMS) is one of the most popular management systems in use. There are 307,059 organizations in 181 countries that have held ISO 14001 certification [1]. The history of EMS begins simultaneously as the spirit of sustainable development by the United Nations. The International Organization for Standardization (ISO) responded to agenda 21 and established the ISO SAG Environment in 1991. The team was the forerunner of establishing the technical committee TC 207 to develop the EMS standard in 1991. The team was the forerunner of establishing the technical committee TC 207 to develop the EMS standard in 1991, where one of the points of policy commitment also brought the concept of "sustainable"[2]. The Committee issued a standard for running environmental management systems, and in 1996 the first version of ISO 14001 was published and implemented worldwide. ISO 14001 went on to become the most successful environmental management standard internationally. The standard was later revised in 2004 and supported the MDG’s movement from the United Nations and was revised again in 2015 in response to the SDG’s target. In this latest version, there are several changes and improvements, including emphasizing the leadership role, the views of issues and expectations of stakeholders related to the environment, and the perspective of the life cycle.[3][2]

The ISO 14001:2015 EMS standard aims to be a frame of reference for organizations to protect the environment and respond to change by balancing sustainability pillars, namely environmental, social, and economy. Unlike the previous version in 2004, the EMS Standard in the 2015 version expands the
management of environmental management, considers the issues, expectations, and needs of interested parties, and emphasizes risk and opportunity management. 2018 is the organization's deadline to move from the 2004 version and fully use the 2015 version.

One of the hopes of using this latest version, organizations can conduct Risk Management Systems (RMS) more systematically and holistically. In line with da Fonseca's research [2], it shows that determining risk and opportunity becomes the most useful concept in the 2015 version of EMS. The auditors in Vermeulen [4] showed that ISO 14001:2015 has the potential to reduce risk and regulatory violations due to a better risk understanding approach.

The ISO 14001:2015 standard contains general guidelines, making it easier for any type and magnitude of organizations to run EMS. On another side, the lack of best practice examples could affect the organization's willingness. Opportunity implementation exists in some literature and article related to project management [5]–[9], enterprise management systems [10], and good example implementation in TAMCO [11]. On the contrary, many implementations only see one side of handling risk in quality, occupational health, and environmental management systems [12][13]. The literature to exploit the opportunity in EMS is limited, and this article tries to discover the main reason why the opportunity is not widely used in EMS from the expert point of view.

If discussing about environmental risk management in the environmental field, there are many practical assessments to handle environmental risk [14]. Nevertheless, in this article, the environmental risk will be related to the management system. The risk matrix is the most common method to determine risk, but it also could determine the opportunities. Therefore, the risk matrix must also be designed carefully to avoid bias and reduce uncertainty [15]. Unfortunately, the use of opportunity is still not widespread. Much recent research focuses on the negative impact of uncertainty, for example, risk management in project management implementation [16] and the ore processing industry [13].

2. Method
This research uses content analysis to review the implementation of opportunities in the environmental Risk Management System. This qualitative research uses a descriptive analysis approach through the following methods:
1. The literature study was chosen to show and compare how risk and opportunity used in the management system
2. In-depth interview was conducted online using a zoom meeting with the informants to analyze how they use the opportunity in the current implementation.

Informants from this study consist of five informants with a minimum experience of five years in risk management implementation. The minimum education background is a bachelor's degree, with other competency-related EMS and/or RMS. The researcher explores how the informant treats the risk and opportunity from practitioner, consultant, and academician point of view.

3. Results and discussion
3.1. Risk and Opportunity in literature and research
There are many literature, standards, and case studies related to risk and opportunities. Some critical studies are summarized in Table 1. ISO 31000 version 2018 that commonly used as a guideline to implement risk management in any field. Opportunity in risk management has a diverse implementation, from the terminology Hillson [5] describes the risk has divided into two terms, threat and opportunities. Threat means "any uncertainty that if it occurs would affect one or more objectives negatively," and the opportunities means any uncertainty that, if it occurs, would affect one or more objectives positively. Risk itself means any uncertainty, same terminology with ISO 31000 [19]. In ISO 31000, there is no specific definition of opportunities, and opportunities are stated to explain the positive deviation from the expected effect. Chapman [7] describes uncertainty as a "lack of certainty," and divides the possible favorable outcomes as opportunities and possible unfavorable outcomes as risk. Qazi [9] introduces uncertainty thinking, a process model to manage both risk and opportunities, as an interdependent setting
to avoid misunderstanding between risk and opportunities. The aim is to emphasize the project opportunities (rather than risk thinking terminology).

### Table 1. Risk and opportunities in literature and research.

| Reference       | Published | Type         | Field                  | Findings                                                                 |
|-----------------|-----------|--------------|------------------------|--------------------------------------------------------------------------|
| Hillson [6]     | 2002      | Book         | Project management     | ● Exclusively explain the opportunities                                   |
|                 |           |              |                        | ● Give an example for two sides matrix for risk and opportunity           |
|                 |           |              |                        | ● Describe the use of ‘mirror PI Grid,’ separate the function of risk and opportunity |
|                 |           |              |                        | ● A voluntary EMS standard                                               |
| ISO 14001[17]   | 2015      | Standard     | Environmental          | ● Separate the risk and opportunities                                     |
|                 |           |              |                        | ● No specific method to implement risk management                         |
| EMAS [18]       | 2017      | Standard     | Environmental          | ● Provide risk management method tools                                    |
|                 |           |              |                        | ● Focus on risk, no clear criteria for opportunities                      |
|                 |           |              |                        | ● Exploit the opportunity in project management                          |
| Hietajärvi [8]  | 2017      | Case study   | Project management     | ● Determine the opportunity as a positive risk that has to be managed     |
|                 |           |              |                        | ● Describe the difficulties to optimize the ‘opportunities’ in the project |
|                 |           |              |                        | ● Risk means the effect of uncertainty that can be negative, positive, or both |
| ISO 31000 [19]  | 2018      | Standard     | General                | ● Separate the risk and opportunities identifications                    |
|                 |           |              |                        | ● Use general concepts, no specific method or example to handle risks and opportunities |
| Susanto [13]    | 2018      | Case study   | Environmental          | ● Use a four-cell matrix in risk management                               |
|                 |           |              |                        | ● No clear criteria for opportunity                                       |
| Pourrajab [11]  | 2019      | Case study   | QHSE                   | ● Separate the risk and opportunity identification                       |
|                 |           |              |                        | ● Develop mirror matrix risk vs. opportunities                           |
|                 |           |              |                        | ● No clear criteria for opportunity                                       |
| Rivero [16]     | 2020      | Case study   | Project management     | ● The limitation of this research, not identify the opportunities as positive meanings. |
| Qazi [9]        | 2020      | Case Study   | Project management     | ● Introduce new loss and opportunity metrics                             |
|                 |           |              |                        | ● Emphasize the function of opportunities                                 |
|                 |           |              |                        | ● Separate the assessment for risk & opportunities                       |

3.2. The importance to exploit the opportunity

A depth interview was conducted with five informants after the agreement. Each informant then fills out the google form to match their experience with the requirements. The characteristic of informants is stated in Table 2.

In the general term, the opportunity is favorable to be identified to get the benefit. In the EMS, exploiting the opportunity could reduce cost, profit and boost the company image. S1 describes the importance of opportunity as stated below:

"Opportunity motivating the progress of the implementation of environmental management systems in the form of "drivers." Opportunities also give a "positive feeling" that protecting the environment can also make money or other social benefits."

Similar to S1, A1 stated that:
"The importance of opportunity is value-added, in contrast to risk that is maintaining (status quo), while the opportunity will be more visible change. The result could be significantly observed.

A1 added, "I have experienced between two types of companies, in company "A" (a multinational manufacturing company) which has referred to European standards, is very proactive to do the environmental-related follow up. For example, company A determines the target to get carbon neutral in their process, contrary to the current "B" company where I work. We do not have any strategic plan to attain the opportunity. Even our risk management method already supports the "opportunity" practices, what a pity."

Table 2: Characteristics of In-depth Interview Informant.

| No. | Informant | Main Job | Secondary job | Position | Competence(s) | Field |
|-----|-----------|----------|---------------|----------|---------------|-------|
| 1   | A1        | Practitioner (5-10y) | Academician, Auditor | Country HSSE Manager, Business Dev & Tender, IMS MR | Master Degree – OHS, IRCA Lead auditor ISO 14001, 45001, 9001 | Occupational Health and Safety |
| 2   | M1        | Practitioner (>10y) | Auditor | Operational Manager | IRCA Lead auditor ISO 14001, 45001, 9001 | QHSE |
| 3   | L1        | Consultant (>10y) | Practitioner, Consultant, Auditor | Training Coordinator | Master Degree – Env. Engineering IRCA lead auditor 14001 | QHSE |
| 4   | S1        | Consultant (5-10y) | Practitioner Auditor | - | IRCA Lead auditor ISO 14001 | Environmental, Healthcare |
| 5   | B1        | Academician (5-10y) | - | Academician Certified Risk Professional | Economy |

The discussion then talks about how they usually implement the opportunities. For this discussion, the researcher finds out that each informant treats the opportunity differently. B1, as an academician and economic finance background, has no experience to determine the opportunities in opposing terms with risk. Usually, the opportunity is calculated as a cost-benefit analysis if there is any improvement needed. For the risk management in the process have no urgency to do so.

M1 works as a management representative in company "O," an oil and gas contractor company. M1 said that "Yes, I know the existence of opportunity, as stated in the standard (ISO 14001: 2015, ISO 45001:2015, and ISO 9001:2015). We treated opportunity as a normative term before, only to comply with the standards. However, a recent audit recommends that we modify our risk management system method. Currently, we use a 5x5 matrix to evaluate the risk as a negative impact. However now, we have developed another matrix to determine the opportunity. I could show it to you after this interview.”.

On the other hand, as consultants L1 and S1 usually suggest their clients to handle opportunities in each of their processes in the company, also use a similar method when determining the level of the risk. Risk is the combination of severity and likelihood. Meanwhile, the opportunity is the combination of good consequences and likelihood. Specifically, their method is quite different to determine the level during use risk matrix. L1 said, "I usually tell my clients to use the same risk matrix, but the criteria for risk and opportunity is different. For example, a risk with the highest risk, in the 5x5 matrix, scored 25 and became the highest priority to be controlled. For opportunity, the highest opportunity when scored 1x1 in the same matrix means the opportunity has the highest consequences and the highest likelihood, so it will be more accessible to use. A1 explains how they use the opportunity in their risk evaluation; A1 uses the typical risk matrix use the double probability impact as shown in Figure 1."
After the interview related to the technical method, the researcher asks, "Is it important to take the opportunity as a part of the evaluation process in a semi-quantitative or qualitative one? All of the informants agree to that process. L1 explained, "In best practice semi-quantitative method is necessary. This method help user to determining decisions to avoid subjectivity and facilitate the integration of other risk management (quality or Occupational Health and Safety). It is a pity when the opportunities are only used as normative terms."

"If the opportunity is important, what is the factor that causes the organization not implement this as soon as possible?" This question asked to identify the obstacles to handle risk and opportunity in the management system. L1 and A1 said this happened because this method is still "new" and unfamiliar compared to the traditional point of view that only sees the risk. A1 said that this concept is not easy to be implemented in actual implementation. It could be because the concept is not good or the awareness and competency of the human resources is minimal. Even after six years after ISO 14001:2015 introduced and standardize the concept of opportunity, still many cases that this opportunity has not yet been taken seriously.

4. Conclusion
Opportunity is not a new concept in implementing risk management and has been further strengthened since 2015 in ISO 14001 and ISO 9001. Those standards have not determined a particular method to be followed. It is understandable because this standard could be implemented at any level of company maturity. For the company that is ready to go to the next level, keep looking for improvement from any opportunity have to become a natural activity. To be optimal, the use of opportunities that organizations can exploit helps determine the decisions of an organization acting that is not only at the organizational surface level but also goes into the processes that occur in it. Optimization of opportunities is considered to provide proactive action in the organization's action plan and can produce significant environmental performance, benefit, and improve the organization's image.

References
[1] ISO 2020 The ISO Survey https://www.iso.org/the-iso-survey.html
[2] da Fonseca L M C M 2015 ISO 14001:2015: An improved tool for sustainability J. Ind. Eng. Manag. 8 35–50
[3] ISO 2019 The ISO Survey Of Management System Certifications – 2018 – Explanatory Note http://maruyama-mitsuhiko.cocolog-nifty.com/security/files/0_explanatory_note_on_iso_survey_2018_results.pdf
[4] Vermeulen H L 2018 Risks and opportunities of ISO14001: 2015 transition process - perspectives from South African environmental practitioners Supervisor (Potchefstroom: North-West University's Library)
[5] Hillson D 2004 *Effective Opportunity Management for Projects – Exploiting Positive Risk* vol 35 (New York: Marcel Dekker, Inc)

[6] Hillson D 2002 Extending the risk process to manage opportunities *Int. J. Proj. Manag.* **20** 235–40

[7] Chapman C and Ward S 2011 *How to manage project opportunity and risk: why uncertainty management can be a much better approach than risk management* 3rd ed (West Sussex: John Wiley & Sons Ltd)

[8] Hietajärvi A M, Aaltonen K and Haapasalo 2017 Opportunity management in large projects: A case study of an infrastructure alliance project *Constr. Innov.* **17** 340–62

[9] Qazi A, Dikmen I and Birgonul M T 2020 Mapping Uncertainty for Risk and Opportunity Assessment in Projects *Eng. Manag. J.* **32** 86–97

[10] Bensaada I and Taghezout N 2019 An enterprise risk management system for SMEs: innovative design paradigm and risk representation model *Small Enterp. Res.* **26** 179–206

[11] Pourrajab V, Eftekhari N and Hashemi S K 2019 Implementation of an integrated management system for monitoring risks and opportunities: a case study at TAMCO *Int. J. Qual. Innov.* **4** 210

[12] Rebelo M F, Silva R and Santos G 2017 The integration of standardized management systems: managing business risk *Int. J. Qual. Reliab. Manag.* **34** 395–405

[13] Susanto A and Mulyono N B 2018 Risk assessment method for identification of environmental aspects and impacts at ore processing industry in Indonesia *J. Ecol. Eng.* **19** 72–80

[14] Ricci P F 2005 *Environmental and Health Risk Assessment and Management Principles and Practices* vol 9 (Dordrecht: Springer)

[15] Peace C 2017 The risk matrix: Uncertain results? *Policy Pract. Heal. Saf.* **15** 131–44

[16] Rodríguez-Rivero R, Ortiz-Marcos I, Ballesteros-Sánchez L and Martínez-Beneitez X 2020 Identifying risks for better project management between two different cultures: The Chinese and the Spanish *Sustain.* **12** 7588

[17] ISO 2015 International Standard ISO 14001:2015 Environmental management systems - Requirements with guidance for use https://www.iso.org/standard/60857.html

[18] EMAS 2017 *EMAS Implementation Tools* (Luxembourg: Publication Office of the European Union) pp 1–24

[19] BSN 2018 *Standar Nasional Indonesia SNI ISO 31000:2018 Manajemen risiko – Pedoman* (Jakarta: Badan Standardisasi Nasional)