

Risk Management Framework towards Zero Waste Strategy for Malaysia TVET Institution

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Abstract: A zero waste (ZW) approach is one of the fastest, cheapest and most effective strategies to conserve and sustain the environment. Litterless or ZW in particular, has become a proven business objective through policies and best practice of waste hierarchy, reduce, reuse, recycle, recover and dispose. Malaysia government has mandated to implementing ZW economy beginning September 1, 2015 under the Solid Waste and Public Cleansing Management Act 2007 (Act 672). Nevertheless, the ZW principles and enforcements changing over time to suit population and financial. All changes and amendments may impact the people and hinder the ZW implementation. Thus, the objective in this research was to develop a long term risk management framework towards ZW strategy for a public Malaysia TVET Institution using ISO 31000:2018 guidelines under Clause 4 (Principles), Clause 5 (Framework) and Clause 6 (Process). The findings comprises 6 elements, Objectives (scope, context, criteria), Risk Assessment (identification, analysis, evaluation), Risk Treatment, Reporting, Monitoring and Communication. This research recommends developing more resources to promote free-cycle and re-use networks. The ZW efforts and endeavor require further incentives and a comprehensive action plan.

Keywords: ISO 31000:2018, ISO 9001:2015, Risk Assessment, RBT Approach, Waste Management.

INTRODUCTION

Zero Waste (ZW) refers to waste management and planning approaches which emphasize waste prevention so that all products are reused. The goal of ZW is to maximize recycling and re-use of products thereby avoiding wasting which will end up in the waste stream. The term zero waste was founded by Paul Palmer (Chemist) in the mid-1970s in Oakland, California [1].

In 1986, environmental education was first formally introduced to Malaysia public schools. Petaling Jaya Municipal Council started a pilot garbage separation scheme in 1990s.

However, the response was not encouraging as only a few households bothered to separate their rubbish as recommended. Hence the scheme stalled [3]. Despite lack of active participation from the population, as a strategic towards ZW planning, Malaysia government has made it mandatory to separate solid waste at source beginning September 1, 2015.

The implementation is pursuant to regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672) enforced in the following states and Federal Territories: Kuala Lumpur, Putrajaya, Johor, Melaka, Negeri Sembilan, Pahang, Kedah and Perlis. Meanwhile, on June 1, 2016, the Penang state authorities introduced the recyclable waste separation and the residents were given a year to get used to the system [4].

Furthermore, Department of Environment (DOE) has introduced more than twenty laws and various incentives *inter alia*: the Environmental Quality Act 1974 (Act 127), Environmental Quality (Sewage and Industrial Effluents) Regulations 1979 and Environmental Quality (Prescribed Premises) (Schedule waste treatment and disposal facilities) Order 1989.[5].

As the population of Malaysia grows, the federal government spends almost RM2 billion in 2017 on solid waste disposal and public cleansing works. Only 17.3% of the solid waste is recycled. The government aims for a recycling rate of 22% by 2020 [3].

While Malaysia has federalized under the purview of the National Solid Waste Management Department (JPSPN), representation of local citizens is the main constrained. In spite of the federalization attempt, the enforcement of it is not uniform.

Moreover, the government subsidises inadequate financial resources to the facilities' operators [6]. The ZW principles and enforcements changing over time, to suit the community size and complexity of financial. All changes and amendments may impact people especially household, institution and industrial. There are inefficiency and ineffectiveness elements needs to be identified [2].

ISO 9001:2015 positions new version of Quality Management System (QMS) standard as an integral part of an organisation's efforts towards sustainable development, which required Risk Management Framework (RMF).

It encourages more internal and external stakeholder focus as part of the adoption of a Risk-Based Thinking (RBT) approach.

A framework helps decision makers to understand, improve, evaluate and guide as well as developing and proposing strategies and policies. RMF is a structured process used to identify potential threats and to define the strategy for removing or minimizing the negative impacts. The purpose is that risk-handling activities may be planned and invoked before the potential problems occur [8].

OBJECTIVE

Malaysia is one of the high-consuming cities that has adopting and implemented a ZW strategy to achieve optimum resource recovery from waste. The challenge to the public is an effort to explore the barriers in diverting and reducing waste.

A systematic framework needed to determine the future direction of municipal solid waste (MSW) and hazardous waste (HW) within a system. Hence, the objective in this research was to develop a long term risk management framework towards zero waste strategy for Malaysia TVET Institution and thereby the long term performance vividly predicted.

METHODOLOGY

Research background: The limitation of this research was RMF isn't about trying to remove all risks. Risk management will reduce the likelihood and impact of risks allowing to be fully prepared for future uncertainties, not remove negative risks completely. ZW strategy provides guiding principles for continually working towards eliminating wastes.

It's a long term goal process and doesn't happen overnight. Assumptions were the Quality Management Team (QMT) had relevant risk management knowledge and appropriate capabilities (technical skills, leadership, management).

Other assumption was the ZW principles has been adapted and practising within ITI KL organization. The research focusing on public TVET Institution because they working with internal and external stakeholders including government regulators, employees, students, industrial, contractors, alumni and communities. With the challenges and impacts of Industrial Revolution 4.0 (IR 4.0), the current risk analysis techniques are unable to address the increasing complexity of waste management throughout training. To make sense of unstructured data, a RMF required to aggregate and analyze risks data more efficiently and effectively.

Research Location: Area selected for the research was a public vocational institute, named Industrial Training Institute, Kuala Lumpur (ITI KL).

It was a Technical and Vocational Education and Training (TVET) Institution fully operated by government under Ministry of Human Resources Malaysia (MOHR).

ITI KL was established in 1964 in a 13.7 acre land located in Kuchai Lama, Kuala Lumpur coordinate: 3°05'33.1"N, 101°41'13.5"E as shown in Figure 1. They offer 12 courses with the total population were 182 staffs and 577 students in year 2018 [7].

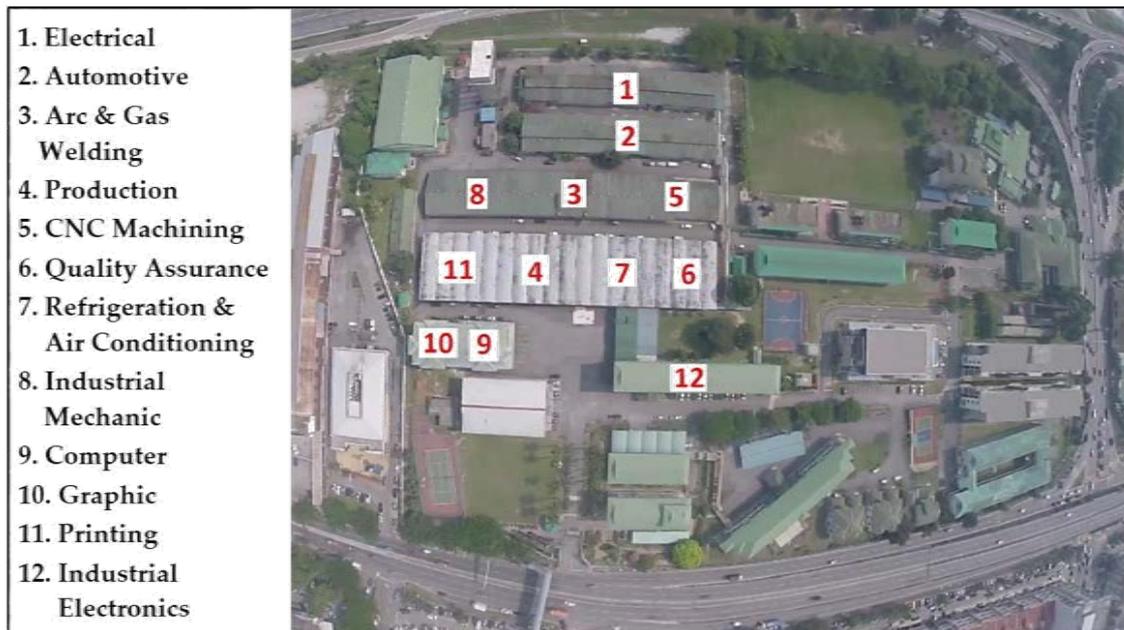
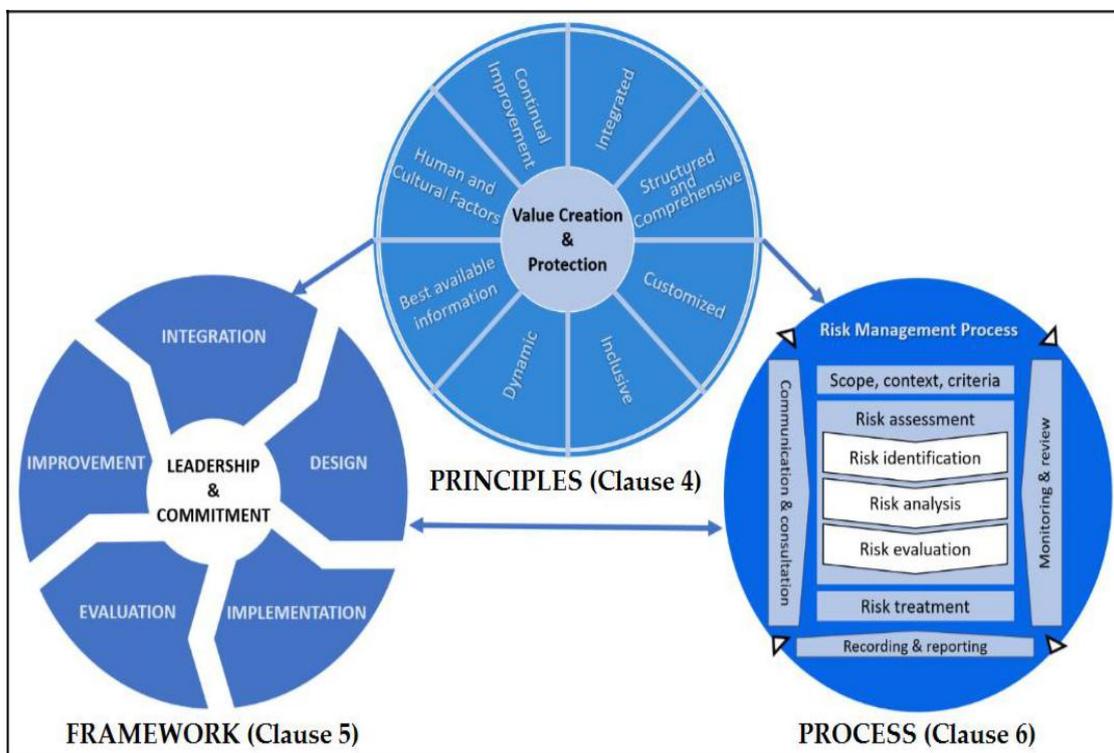


Figure 1: ITI KL Aerial View

Framework: The RMF was developed using ISO 31000:2018 released in February 2018 by the American National Standards Institute (ANSI) as illustrated in Figure 2. It was selected because it fits the purpose of government procedure under Clause 4 (Principles), Clause 5 (Framework) and Clause 6 (Process). Based on Clause 5, the framework includes 5 entities, Integration, Design, Implementation, Evaluation and Improvement. The participants were Quality Management Team (QMT) consists of 15 persons from ITI KL top level management. A workshop and brainstorming session has been carried out for 2 weeks inclusive 3 days ISO 31000:2018 orientation. The RMF includes risk architecture, zero waste strategy and protocols. The risk assessment process is integral to identifying, analyzing and evaluating risks. The key is focusing on those risks and opportunities to ITI KL achieving its QMS.



Clause 4 (Principles)

Figure 2: ISO 31000:2018 Principles, Framework and Process

RESULTS AND DISCUSSION

Integration: The structure of RMF towards ZW strategy shown in Figure 3. It was integrated with all aspects of decision-making across all level of the ITI KL.

The processes must be communicated throughout the organization and adopted by everyone, not just those responsible for risk management. The ISO 31000:2018 (Clause 6) process includes 6 elements, business goal (scope, context criteria), monitoring & review, communication & consultation, risk assessment (identification, analysis, evaluation), risk treatment, recording and reporting. It requires leadership and commitment with two-way communication via top-down and bottom-up approach. A Risk Management Committee (*JawatankuasaPengurusanRisiko*) should be formed in compliance with ISO 9001:2015 Clause 4, 6 and 8. The committee will be functioning using Risk Based Thinking (RBT) approach designated by the ISO.

The purpose of the risk committee is to perform centralize risk management activities comprises site visit, meeting, discussion, orientation, briefing and workshop. Whereas, QMT play main role in monitoring and reviewing process.

The Malaysia TVET Institution were full adherence to QMS SIRIM MS ISO 9001:2015 which is just released in year 2017. Under the QMS implementation, there were 4 master documents and filing will be audited by SIRIM Malaysia, ISO Quality Manual, Core Procedure (Training), Support Procedure (Management) and Internal Audit documents.

Design: The risk management framework (Figure 3) was designed to defining the ITI KL target achievements; scope, context and criteria.

There were 3 outlines under scope, waste management system, SIRIM guidelines and government procedure. The context were internal and external factors through SWOT Analysis method. The first criteria of the framework were QMS involving trainers, management, students and outsiders. Second criteria, the waste category were MSW and HW, while third criteria the business unit consists of management and training.

Implementation and Evaluation: The Risk Assessment is a term used to describe the overall processor method to identify, analyze and evaluated the risks associated with hazard that potential to cause harm. The risks data come from bottom-up where the relevant individual feeding in to the risk register and detailing within a risk aware environment. The risk register was online cloud encrypted and auto Date Time stamp. The Risk Identification step, user needs to key in name, risk ID, location, business unit and waste category.

There were selection for business unit (management/training) and waste category (MSW and HW). Secondly, the Risk Analysis step, user needs to select the options of risk type and detailing down the threats in Risk Description form. Five (5) Options for MSW were human damage, climate pollution, soil, air and water contamination. Meanwhile HW options were SW1, SW2, SW3, SW4 and SW5. The third step, Risk Evaluation where user defining the Risk Rating was calculated using equation

1. User will be selecting the Risk Matrix comprises degree of Likelihood (L) and Severity (S) of the issued risks. The output will be monitored in 5 colours Heat Map table with the score of Red (15-25), Orange (10-12), Yellow (8-9), Light Green (4-6) and Dark Green (1-3) as shown in Table 1.

$$\text{Risk Level} = \text{Severity (S)} \times \text{Likelihood (L)} \dots \text{equation 1}$$

Improvement: The final part of the risk framework was improvement process. This part was about oversee the risk treatment, zero waste strategy commitment and documentation. In order to prevent uncertainties, the user remarks suggestions on how to manage the risk and turn it into opportunity. The highest rated risks should be addressed as a matter of urgency. Then, user mention the commitment towards the ZW strategy by selecting final disposal method. The options were according to ZW hierarchy as illustrated in Figure 4. There were five (5) options, Avoid/Reduce, Reuse, Recycle, Recover and Dispose. The results should be recorded and reported externally and internally, as appropriate. The results should also be an input to the SIRIM auditors and continuous improvement of the ITI KL risk management framework. Contents of recording and reporting were risk heat map, ZW performance (current disposal, preferred method, ZW strategy) and activities documentation. Finally, the process of reviewing and monitoring by QMT completes the framework cycle. The QMT responsible for quarterly internal auditing, regular checking and surveillance. The effectiveness of the RMF implementation needs to be periodically reviewed to ensure consistent Kaizen.

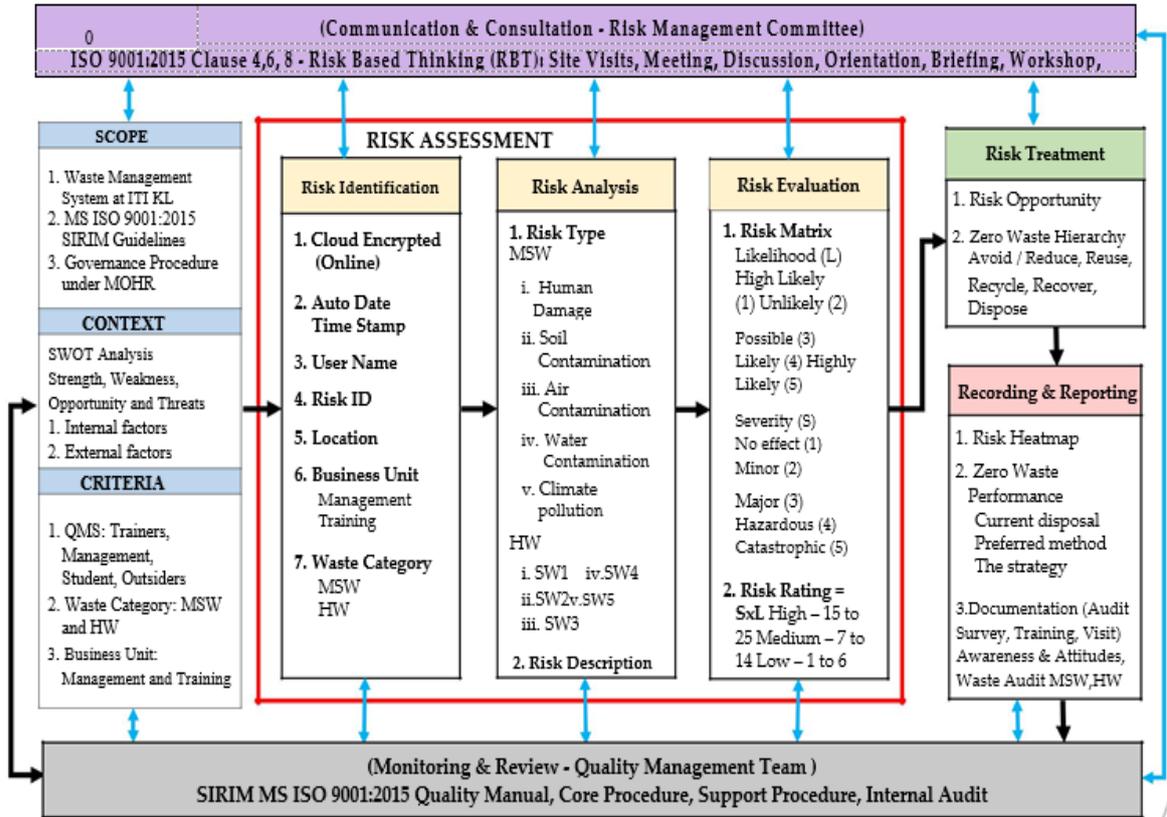
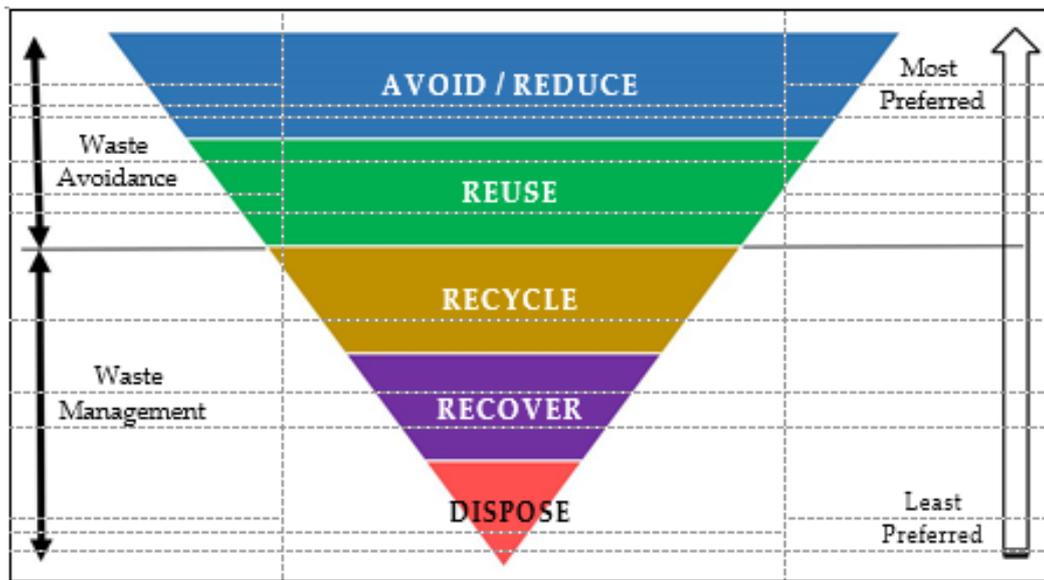


Figure 3: Risk Management Framework Towards Zero Waste

Table 1: Heat Map Table of Risk Rating

d	Almost Certain >90%	5	5	10	15	20	25
	Likely 65-90%	4	4	8	12	16	20
	Possible 5-35%	3	3	6	9	12	15
	Unlikely 35-65%	2	2	4	6	8	10
	Rare <5%	1	1	2	3	4	5
		1	2	3	4	5	
		Minor	Moderate	Significant	Major	Severe	
		Severity					



CONCLUSION

As a public TVET industrial training centre, ITI KL were exposed to uncertain risks associated with municipal solid waste and hazardous waste. The effect of this uncertainty can be a positive risk (opportunities) or negative risk (threats). Malaysia government has made it mandatory to implementing zero waste (ZW) economy beginning September 1, 2015. However, the ZW principles and enforcements changing over time to suit the community size and complexity of financial. All the changes and amendments may impact people especially household, institution and industrial. Litterless or ZW in particular, has become a proven business objective through policies and best practice of waste hierarchy, reduce, reuse, recycle, recover and dispose. This research studies provisions on the key guiding principles of the risk management framework towards ZW strategy for a Malaysia TVET Institution. The framework was developed using ISO 31000:2018 guidelines under Clause 4(Principles), Clause 5(Framework) and Clause 6(Process). The findings acknowledged 5 strategic elements, Integration, Design, Implementation, Evaluation and Improvement. The framework process comprises 6 elements, Objectives (scope, context, criteria), Risk Assessment (identification, analysis, evaluation), Risk Treatment, Reporting, Monitoring and Communication. This research recommends developing more resources to promote free-cycle and re-use networks. Beside creating a comprehensive ZW action plan, partnering with local community and further incentives required to support the all efforts in this important endeavor.

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