A Review of Sustainable Campus Concept in the Context of Solid Waste Management

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Abstract

The concept of sustainability in higher education has begun to captive the attention many of tertiary institutions since 1990. Hence, plethora activities related to sustainable development have been implemented by higher education institution in many countries. For example, sustainable solid waste management program is one of the most implemented activities to achieve sustainable campus aspiration. However, the practices and programs related to managing sustainable solid waste in campus are confronted with many challenges. Therefore, this paper will examine the concept of sustainable campus in the context of solid waste management that suitable higher education environment. This conceptual discussion will provide an understanding of sustainable solid waste management that can be implemented in higher education institution. A case study of practices and programs related to sustainable solid waste management in campus were reviewed to inspire other higher education institution to conduct significant solid waste management programs. This could be an insight for developing countries like Malaysia for achieving sustainable solid waste management in campus.

Keywords: higher education institution; solid waste management, sustainable campus

1. Introduction

Higher education institution is an enclave that has a population size that can be recognized as a small town. As a top educational center, there are certainly many activities conducted in the campus that will impact the environment (Abas, 2012). Therefore, the issue of sustainable campus development has gained global attention. The application of the concept of sustainable development in campus activities is a necessity today (Abas &Md Nor, 2014). The Environmental Preservation Agency in the United States has urged all institutions of higher education in their country to enforce environmental protection laws and policies within the campus (Habib & Ismaila, 2008). As the result, many campuses in the United States have taken the initiative to reduce the negative impact of their activities on the environment which has involved multi-levels of communities in the campus (Perrin, 2004).

In Malaysia, the development of sustainable campus concept is focusing mostly on reducing number of solid waste generated (Yap, 2011). However, this concept is a daunting task for many higher education institutions in Malaysia because of low environmental stewardship and lack of commitment to environmental care among campus's community (Norizan et al., 2011). As the result, tertiary institutions in Malaysia are among the biggest contributors (>20%) of solid waste generated everyyear (Abas & Md Nor, 2014). Accordingly, the aim of this paper is to discuss the concept of sustainable campus which includes the definitions and elements that need to be addressed in the establishment of sustainable campuses in the context of solid waste management. Besides that, the concept of sustainable solid waste management is reviewed to understand the principles of sustainability in the context of solid waste management. Sustainable solid waste management practices and programs at higher education institution in Malaysia are discussed to illustrate the ideas of effective solid waste management in the campus.

2. Sustainable Campus

The sustainability issue in campus has grabbed the global concern (Habib & Ismaila, 2008). According to Sohif et al. (2009), the Stockholm Declaration was formed in 1972 as the first basic blend in dealing with sustainability issues at higher education institution. Under the Stockholm Declaration (1972), dependence between humans and the environment is essential to achieving world preservation (UNESCO, 1972).

As the result, the concept of sustainable campus has begun to get the attention of many universitiesin 1990. As of 2003, the Talloiries Declaration has been signed by more than 300 university presidents and chancellors (Shriberg & Tallent, 2003). In Malaysia, University of Malaya is the only university involved in signing the Talloiries declaration (Sohif et al., 2009). The Talloiries Declaration is a comprehensive platform for higher education institution in incorporating a concept of sustainability in learning, research, and innovation (UNESCO, 1990; ULSF, 2008).

In fact, higher education institution is one of the most potential instrumental in educating public (ULSF, 2008). Hence, higher education institution has a huge responsible for nurturing and enhancing awareness, knowledge, technology, and innovation to shape a more sustainable future (Clugston & Calder, 1999). Furthermore, previous studies have discussed diverse definition of sustainability has led to many understanding and principles of sustainable campuses (Table 1). However, the current question arises is how a higher education institution is able to execute a sustainability module proposed in reality. We have to admit that the real life nowadays has many conflicts which including social justice, technological use, and economic investment.

Table 1 The Principles of Sustainable Campus

Principles	Authors	Statements
Resources conservation, economic sustainability, social and cultural development	Quaddus & Siddique (2001)	"*institutions of higher education must meet the needs of the present without compromising the needs of future generations. Consequently, the conservation and enhancement of resources embraces economic development and social and cultural development*"
Protect and improve human well-being, health, and balance ecosystems	Cole (2003)	"*institutions of higher education are responsible globally and locally to provide protection and enhance human well-being and ecosystems*"
Reducing the negative impacts of university's activities on the environment, economy, social, and health	Velazquez *et al.* (2006)	"*an institution of higher education, should be prepared to face, engage, and promote global and local sustainability to minimize the negative impacts on the environment, economy, social and health that arise from the use of resources in the pursuit of learning, research, collaborative and helpful functions communities move toward a more sustainable lifestyle*"

Basically, the definition of sustainable campus are presented table above prior to proposing development capable of enhancing the quality of life in capacity capabilities supporting ecosystems and focusing on social, ecological and economic balance. In fact, the relationship between the Human System and Ecosystem is the foundation of sustainable campus development. According to Sohif et al. (2009), waste management is one of the important elements in Ecosystem and Human System balance. However, there are other elements such as energy management, water resources management, transportation management, internal environment and air quality that need to be addressed in the establishment of sustainable campuses. The relationship between human wellbeing and the scale of human activity will have an impact on the integrity of existing systems. Sustainability can be achieved when human needs are fulfilled without compromising the needs of future generations (Quaddus& Siddique, 2001).

The integration of sustainability approaches in the higher education institution framework is one of the most significant initiatives to address ecological issues and social challenges in the future. According to Habib and Ismaila (2008), the reduction of solid waste disposed is one of the objectives that need to be considered under the environmental care component of higher education institution framework. Additionally, Cortese (1999) also provides an overview of sustainable campuses that need a balance between social, economic and environmental. Hence, the establishment of resource conservation and recycling programs at higher education institutionis critical and worthwhile endeavor in achieving sustainability-related vision (Clugston& Calder, 1999). Hence, the paradigm shift of campus community is very crucial, so that the awareness on sustainability to be promoted to various levels of society (Yap, 2011).

3. Sustainable Solid Waste Management Concept

Empirical studies have highlighted that the concept of sustainable solid waste management is often discussed regarding the effectiveness of waste management systems in reducing the negative impact of solid waste generated to humans, economics and the environment (Abas & Seow, 2014; Seow & Abas, 2016). Hence, over the past decades, various concepts related to sustainable solid waste management were introduced such as integrated solid waste management, zero solid waste generation concepts, waste disposal approaches from sources and solid waste management hierarchy (Aziz, 2009). Figure 1 shows the solid waste management hierarchy that applicable in higher education institution. The concept of solid waste management hierarchy considers the reduction, reuse and recycling of solid waste generated from source before the waste is sent to the landfill for disposal (Abas, 2012). Reduction, reuse and recycling practices by campus communities are critical to reducing the number of solid waste send to the landfill. The waste hierarchy concept is very practical to be implemented by higher education institution, However, consistency in executing each component of waste hierarchy is most challenging and important to be addressed carefully (Norizan et al., 2012).

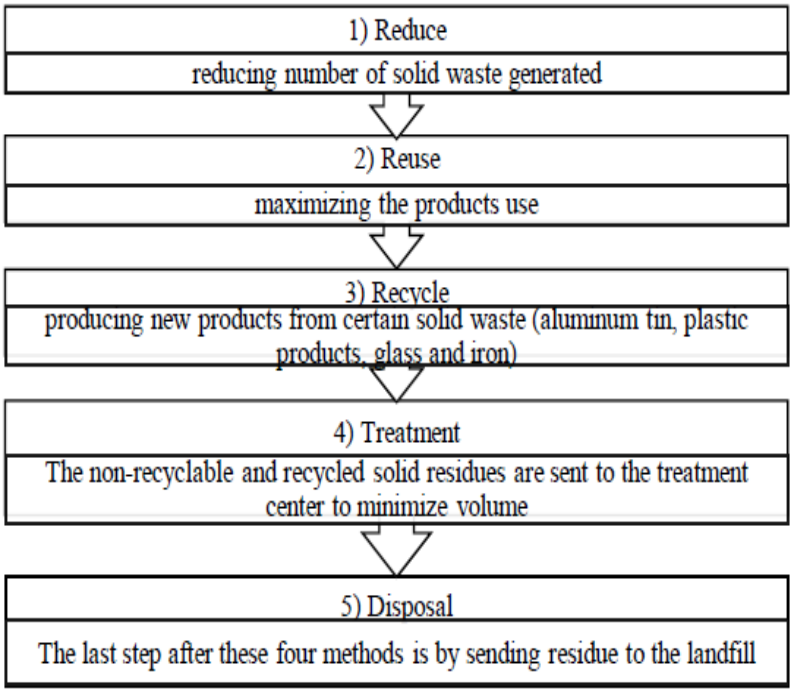

Figure 1: Waste Hierarchy Concept (Aziz, 2009)

In addition, the paradigm of Integrated Solid Waste Management (ISWM) is one of the prominent concepts in sustainable solid waste management. Previous studies have pointed out that the ISWM is a holistic concept by integrating methodologies thataddress theinterconnectednessof socio-cultural, environmental, economic, and technical spheres (Memon, 2010; Marshall & Farahbakhsh, 2013). Figure 2 illustrates the paradigm of ISWM which focuses on multiple components. In addition, stakeholders have responsible in ensuring the management system is administered effectively.

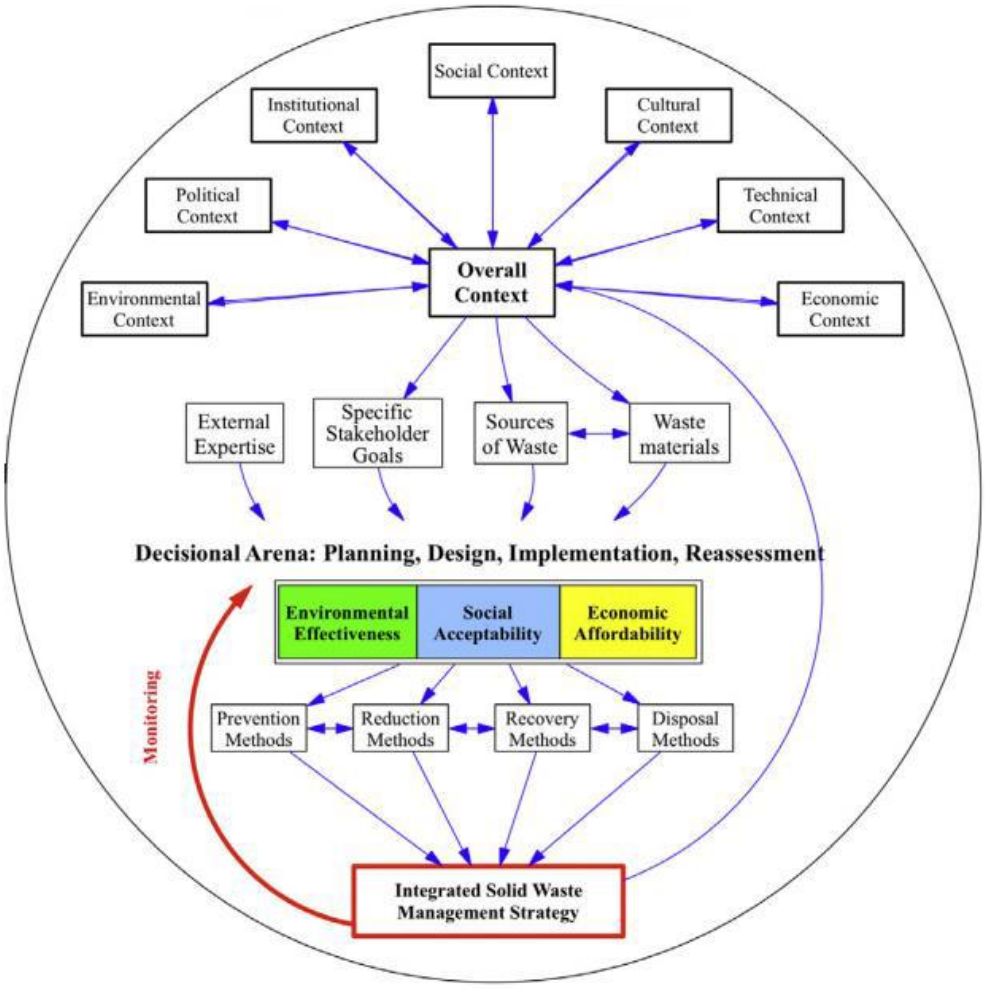

Figure 2 Integrated Solid Waste Management Paradigm (Marshall & Farahbakhsh, 2013)

Sustainable solid waste management concept is emphasizing the intervention from the initial phase of solid waste management. These interventions can be implemented via the concept of reduction, reuse and recycling of solid waste generated from the source. The main goal of sustainable solid waste management concepts is to reduce the number of solid waste send to the landfill for disposal purpose. In the context of higher education institution, there are plenty of sustainable solid waste management options to tailor which based on their campus capacity and environment.

4. Sustainable Solid Waste Management in Higher Education: A Malaysia's Case Study

According to McMillin and Dyball (2009), campus community engagement in research, management issues includes promoting knowledge integration, enhancing campus community thinking and ability systems to make knowledge as a guide and skill in facing a challenging life. The solid waste management issue in campus has attracted the higher education institution (Norizan et al., 2012). Hence, many practices and programs related to sustainable solid waste management have been implemented in Malaysia's higher education institution. Most programs implemented is focusing on student's activities through recycling programs and reducing resource programs (Abas and Norizan, 2014).

4.1 Universiti Sains Malaysia, Penang, Malaysia

Universiti Sains Malaysia (USM) is one of the Malaysia local universities and has been accredited as the only Accelerated Programme for Excellence (APEX) university by the Ministry of Higher Education in 2009.

Universiti Sains Malaysia (USM) is very prominent with the sustainability activities that lead by the students and top management for a sustainable future. USM is using the integration of bottom-up and top-down approach to address the issues of sustainable development in the campus. In fact, USM encourages student to engage with academia through activities and programs that apply sustainability theories and concept. Projects related to campus sustainability were conducted by a number of students since 2000 (Center for Global Sustainability Studies, 2012). Subsequently, most of the projects executed are not only focusing on environmental component. In fact, the programs are inculcating the economic and social component for equilibrium of development in the campus (Table 2).

Table 2: Sustainable Solid Waste Program at USM Programs

	Description
The White Coffin	• Provide awareness to the campus community about the impact of polystyrene to health and the environment • Objective is to reduce the usage of polystyrene in campus
Tapau Mania	• Encourage campus communities to bring their own food container to the cafeteria • Objective is to reduce the usage of food packaging in campus
Say No to Plastic Beg	• Encourage carrying your own reusable bag when purchasing goods at the campus mini market •Objective is to reduce the number of plastic waste generated in the campus
Waste to wealth	• Promote recycling practices in faculties and centers. • Objective is to reduce number of solid waste generated and as a platform to generate income for faculties by selling the recyclables

The implementation of these projects has involved good cooperation between multiple stakeholders such as the departments, faculties, research centers and others. According to Norizan et al. (2009), cooperation is beyond financial funds assistance. It is including the assistance in term of expertise and physical assistance. A total number of students involved in the sustainable solid waste management project in USM is around 800 students (Global Sustainability Study Centre, 2012). The implementation of this project has brought a slight increase in terms of student's awareness, cultural and attitude towards sustainable lifestyle especially in the context of solid waste management. Norizan et al. (2012) has highlighted that most of theSWM projects conducted in USM were an ad hoc program. Therefore, effective evaluation and monitoring should be executed to enhance existing projects so that the sustainability of the project is achieved as it will give positive impact to the campus community.

5. Conclusion

In Malaysia, higher education institution is one of the major contributors to solid waste generated. Therefore, sustainable solid waste management is an appropriate approach to reduce the number of solid waste generated at higher education institution in Malaysia. However, the development and execution of sustainable waste management programs by higher education institution is a daunting task because it's require the multiple cooperation by stakeholders in the campus. In fact, there are several issues that need to be addressed such as lack of commitment of campus community, inappropriate programs, and ineffective monitoring of program. Integration of bottom-up and top-down approach in developing program related to solid waste management is very crucial to ensure the program conducted is suitable with the campus environment.

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