

NEW PERSPECTIVE OF INTEGRATED SOLID WASTE MANAGEMENT IN MALAYSIA

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ABSTRACT

Current practices of many scholars in solid waste management define Integrated Solid Waste Management (ISWM) is a comprehensive waste prevention, recycling, composting, and disposal program. In the other hand, some of the countries implemented hierarchy of solid waste management, but it still a little scientific or technical. However, the sustainable of integrated solid waste needed to look into the local scenario and the element should be according to the local practice. This concept paper aims to discuss the elements of integrated solid waste management. There are five elements are discuss toward integrated solid waste management in the local situation. They are element of landfill site chosen, element of recycling programme, element of public opinion, element of worker's health and safety and element of management.

INTRODUCTION

Municipal solid waste management is a complex task which depends as much upon organization and cooperation between households, communities, private enterprises and municipal authorities as it does upon the selection and application of appropriate technical solution for waste collection transfer, recycling and disposal. Furthermore, waste management is an essential task which has important consequences for public health and well being, the quality and productivity of the urban economy. In most of cities of developing countries, waste management is inadequate: a significant portion of the population does not have access to a waste collection service and only a fraction of the generated waste is actually collected. Systems for transfer, recycling, and / or disposal of solid waste are unsatisfactory form the environmental, economic and financial points of view.

Now day, Integrated Solid Waste Management (ISWM) is a comprehensive waste prevention, recycling, composting, and disposal program. An effective ISWM system considers how to prevent, recycle, and manage solid waste in ways that most effectively protect human health and the environment. ISWM involves evaluating local needs and conditions, and then selecting and combining the most appropriate waste management activities for those conditions. The major ISWM activities are waste prevention, recycling and composting, and combustion and disposal in properly designed, constructed, and managed landfills (EPA 2002). Tchobanaglou et al. (1993) defined integrated solid waste management as the selection and

application of suitable techniques, technologies and management programs to achieve specific waste management objectives and goals. The integrated waste management solution is more focusing on technical aspect rather than others factors and management elements. The combination methods as mention are source reduction, recycling, waste to energy incineration, composting and landfilling.

The hierarchy has little scientific or technical basis. There is no scientific reason, for example, why materials recycling should always be preferred to energy recovery (McDougall & Anderson 2003). McDougall et al. (2002, 2001) the hierarchy is of little use when a combination of options is used, as in an integrated solid waste management system. In an integrated solid waste management system, the hierarchy cannot predict, for example, whether composting combined with incineration of the residues would be preferable to materials recycling plus landfilling of residues. What is needed is an overall assessment of the whole system, which the hierarchy cannot provide. Figure 1 shown that the useless of waste hierarchy to solve the current 'integrated solid waste management'.

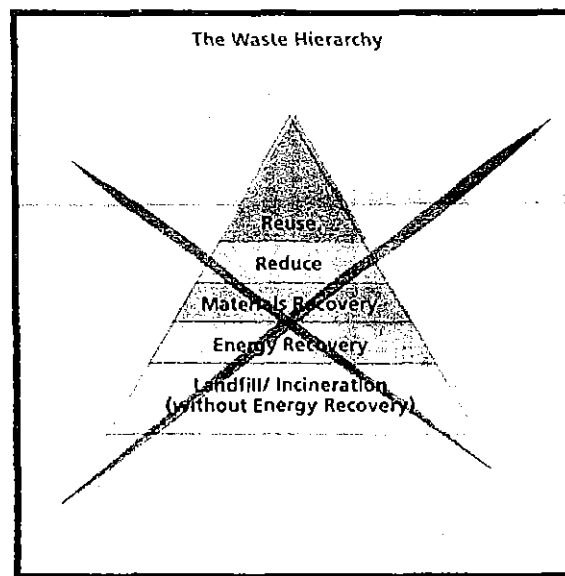


Figure 1. Current waste hierarchy practices

In the other side, UNEP (2009) defined integrated solid waste management practices including regulations and economic tools, institutions and resources, coverage of the services and technology, and role of various stakeholders. Therefore, developing and implementing integrated solid waste management requires comprehensive data on present and anticipated waste situations, supportive policy framework, knowledge and capacity to develop plans/systems, proper use of environmentally sound technologies, and appropriate financial instruments to support its implementation. The aim of this paper is to discuss the conceptual idea of new perspective of integrated solid waste management in Malaysia.

There are several ways to describe integrated waste management. Perhaps the best way for our purposes is to look at the effect of solid waste on the economy and environment of a community at local scenario. Figure 2 shown the new conceptual of integrated solid waste management consists of five elements that look into at local perspective:

- i. Environmental, social and economic aspects;
- ii. Recycling program;
- iii. Public opinion;
- iv. Safety and health aspect;

v. Management aspect;

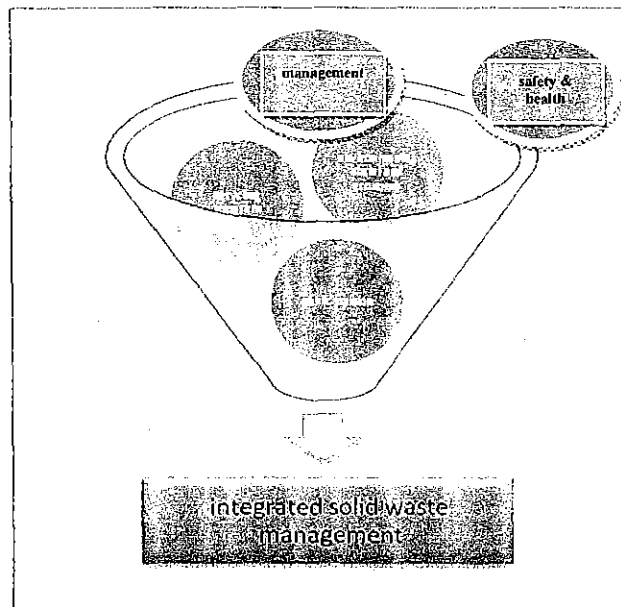


Figure 2. New concept of integrated solid waste management

ENVIRONMENTAL, SOCIAL AND ECONOMIC ASPECTS

Increasingly, municipalities additionally address urban environment issues related to solid waste management. Public concern and sensitivity to environmental issues is driving this expanded agenda. These include:

- Socioeconomic and environmental impacts of accumulated uncollected waste and clandestine disposal sites
- Socioeconomic and environmental impacts of solid waste facilities, including transfer, composting and landfill facilities
- air emissions from waste collection and transfer vehicles
- special handling and disposal of hazardous wastes, including healthcare and industrial hazardous waste.

(World Bank 2012)

Recycling Program

Recycling is not a new idea, but the idea of recycling for the environment is. Initially recycling was done only when people lacked the resources to manufacture a product from virgin materials. Recycling was a concept that was at first only employed by the needy (Strong 1997). Over the years as people became more attuned to environmental problems and issues recycling evolved into a socially acceptable practice. Currently recycling is thought of as the “in” thing to do. Three main reasons have been attributed as to why recycling is conducted. The first reason has to do with altruism; protecting the environment is and helping your fellow man is thought of as the right thing to do. The second reason is deals with economic imperatives; costs for properly disposing of wastes have risen until it now makes economic sense to recycle many materials. The third and final reason is legal considerations; many states have instituted recycling laws that use both penalties and incentives to encourage recycling (Ruiz 2001).

Ebreo and Vining (2001) found that the main rationale for non-recyclers not to recycle solid waste is the lack of information of knowing how to recycle. The second most important reason for not recycling is that non-recyclers tend to think that their household does not generate much garbage (Ebreo & Vining 2001). Hopper and Nielsen (1991) research confirm by mentioning that behavior is directly proportional to knowledge.

Several studies ascertained that people who have favorable viewpoints towards recycling tend to recycle more (Gamba & Oskamp 1994; Oskamp et al. 1991). Most of the respondents (82%) from Oskamp et al. (1991) research mentioned that they respected government regulation to inhibit the environmental deterioration. The research also noted that people are willing to spend more money on their trash bill to sustain local recycling. Werner and Makela (1998) stated that people who have strong personal and social attitudes and positive previous experiences were more inclined to describe multiple ways of organizing recycling and to report fewer interferences to recycling. Seow (2009) and Seow et al. (2008) in his research mention that government plays the importance role to encourage public to participate into recycling programme.

Public Opinion

The perception of one's capability is said to set a limit to what to do and ultimately what can be achieved (Holland & Rosenberg 1996). The influence of perception which describes how a person views himself and the world around him and how it tends to govern behavior is explained by Anomie theory (Merton 1968) which explains that deviance can arise by accepting culturally determined goals without the acceptability of cultural means. In this case integrated solid waste management practicing should have an opinion and perception of the public regarding the current waste management practices, knowledge about impact of waste to the environmental and socioeconomic aspects.

Safety and Health Aspect

Waste that is not properly managed, especially excreta and other liquid and solid waste from households and the community, are a serious health hazard and lead to the spread of infectious diseases. The susceptible group from the unscientific disposal of solid waste includes the population in areas where there is no proper waste disposal method, especially the pre-school children, waste workers, and workers in facilities producing toxic and infectious material (Kit 2002). Direct handling of solid waste can result in various types of infectious and chronic diseases with the waste workers and the rag pickers being the most vulnerable especially those exposed to microbial pathogens via organic domestic waste. Other than that, co-disposal of industrial hazardous waste with municipal waste can expose people to chemical and radioactive hazards.

Meanwhile, workers working with waste containing chemical and metals for recycling purpose may experience toxic exposure. For example, rag pickers and others who are involved in scavenging in the waste dumps for items that can be recycled, may sustain injuries and come into direct contact with these infectious items. A cross sectional study found the prevalence of biological markers [anti-Hbc (+)] of hepatitis B virus (HBV) infection was significantly different between exposed and non-exposed waste employees. Older employees had a significantly higher prevalence of anti-Hbc (+) (Williams 2002).

Solid waste management activities involve collection, transportation, transfer station and operation, recycling and waste recovery, treatment, and disposal to the landfill. Occupational hazards associated with waste handling include infections, chronic diseases and accidents Table 1).

Table I. Occupational hazards associated with waste handling

| Occupational hazards | Example |
|----------------------|--|
| Infections | Skin and blood infections resulting from direct contact with waste, and from infected wounds. Eye and respiratory infections resulting from exposure to infected dust, especially during landfill operations. Different diseases that results from the bites of animals feeding on the waste. Intestinal infections that are transmitted by flies feeding on the waste. |
| Chronic diseases | Incineration operators are at risk of chronic respiratory diseases, including cancers resulting from exposure to dust and hazardous compounds. |
| Accidents | Bone and muscle disorders resulting from the handling of heavy containers. Infecting wounds resulting from contact with sharp objects. Poisoning and chemical burns resulting from contact with small amounts of hazardous chemical waste mixed with general waste. Burns and other injuries resulting from occupational accidents at disposal sites or from methane gas explosion at landfill sites. |

Source: Modified from Hester and Harrison 2002

Based on a review done by Rabl and Spadaro et al. (2002), there is an association between the performance of job tasks involving the handling of municipal solid waste and various respiratory, dermatologic and gastrointestinal health effects. While increased incidences of specific adverse health outcomes have been documented in this group of workers, the limited nature of exposure assessment does not allow for strong evidence based conclusions to be drawn regarding exposure levels and associated health effects. Therefore, it was concluded that the detailed characterisation of organic dust exposure experienced by municipal solid waste workers is necessary in order to both improve understanding of resultant health effects and develop strategies to improve occupational health.

During treatment of organic waste phase, composting plant workers may exposed to hazardous agents such as bioaerosols and volatile organic compounds released during the process which can cause cancer and non-cancer effects (Dolk 2002). However, Swan et al. (2002) claimed that the available information referring to occupational risks, and/or to the factors that produce health risk among waste composting facilities workers is scarce. They suggested developing surveillance programmes focused on relating occupational exposure and health effects.

Management Aspect

Arnold and Justine (2000), highlighted the integrated solid waste management should look into aspects;

- i. Financial-economic principle
- ii. Institutional / organizational principle
 - Human resource development
 - Organizational development
 - Institutional development
- iii. Policy / legal / political principle

To meet the needs of society three distinct sectors – public, private and non-profit have emerged although their boundaries are not always completely distinct. Each of these sectors has its comparative advantage. Now day, public private partnership (PPPs) have been identified as

efficient instruments to promote solid waste management at the municipal level (Nyachhyon 2006; Rathi 2005).

In Malaysia, Seow (2005), Seow and Indera (2006) scavenger is the 'informal player' in solid waste management and they are contributes in recycling programs at landfill site, road site and institution. An authority should put them into the formal player in the solid waste management system for improving their quality of life.

CONCLUSION

Integrated solid waste management in this paper refers to:

- i. Integrated of five components
 - Environmental, social and economic aspects;
 - Recycling program;
 - Public opinion;
 - Safety and health aspect;
 - Management aspect;
- ii. Apply integrated solid wastes management should based on different aspects and treatment option at different habitat of scares; such as household, neighborhood, community, area of local authority, city etc.

Implementing an integrated solid waste management plan is an ongoing process, so expect to make adjustments to the plan along the way. Always evaluate system inefficiencies and make adjustments to improve or expand solid waste management services. Be flexible and creative when implementing of integrated solid waste management plan. If planning is not making progress in a certain area, be prepared to reevaluate components of your integrated solid waste management plan. It is helpful to keep in mind the ultimate goal of integrated solid waste management: to improve human health and protect the environment.

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