

PUBLIC AWARENESS AND WILLINGNESS TO RECYCLE SPENT NICKLE-  
CADMIUM (Ni-Cd) RECHARGEABLE BATTERIES

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## ABSTRACT

Malaysia approaches the management of hazardous waste in an integrated manner, addressing waste handling, storage, treatment and disposal as well as waste assessment and remediation. However, there seems to be no such term as hazardous municipal waste in Malaysia, as it is simply regarded as either solid wastes or hazardous waste and hence, no regulations or policies on the generating public in the aspects of safe disposal. This paper thus, examines the level of awareness in the recycling of Hazardous Municipal Solid Waste (HMSW), with a specific focus on Nickel-Cadmium (Ni-Cd) rechargeable batteries in the study area of Taman Universiti, Johor, Malaysia. From the study carried out, a percentage of respondents (73%) affirmed to the knowledge of recycling Ni-Cd rechargeable batteries and 27% not having the idea. During the course of this study also it was analysed that there was a high rate of willingness to participate, with 85% of respondents willing and 25% not being sure. There was a significant strong correlation of 99%, that is, ( $r=0.407$ ), and ( $P\leq 0.01$ ) between the different income levels and how they perceived the study being carried out from the questionnaires distributed. Awareness within the study area seems to be high due to the level of education of the study area but there are confirmations on low awareness programmes and this could lead to accumulated pollution in the environment.

## ABSTRAK

Kini, Malaysia sedang melangkah ke arah integrasi pengurusan sisa berbahaya, di mana khusus dalam pengendalian sisa, pengumpulan dan penyimpanan, pengolahan dan pembuangan dan juga pemantauan sisa dan pembaik pulih. Walau bagaimanapun, istilah sisa domestik berbahaya tidak digunakan di Malaysia. Istilah yang digunakan hanyalah sisa pepejal atau sisa berbahaya. Sehubungan dengan itu, tiada undang-undang bagi pengurusan sisa pepejal domestik. Kajian ini dijalankan untuk mengenal pasti tahap kesedaran penduduk di Taman Universiti, Johor, Malaysia tentang kitar semula bateri berupaya cas kembali Nickel-Cadmium (Ni-Cd). Daripada kajian, sebanyak 73 peratus penduduk mempunyai pengetahuan tentang kitar semula bateri Ni-Cd manakala 27 peratus tidak mempunyai pengetahuan tentang kitar semula bateri berupaya cas kembali Ni-Cd. Melalui kajian ini juga, sebanyak 85 peratus sanggup untuk terlibat dalam program kitar semula manakala 25 peratus tidak pasti untuk menyertai program tersebut. Terdapat pertalian ketara ( $r=0.407$ ;  $p<0.01$ ) di antara tahap pendapatan dan penerimaan tentang kajian kitar semula bateri Ni-Cd. Kesedaran penduduk di kawasan kajian adalah tinggi disebabkan oleh tahap pendidikan penduduk di kawasan kajian. Akan tetapi, maklumat berkaitan program kesedaran di kawasan kajian tidak begitu membanggakan dan ini mungkin boleh menular ke pencemaran alam sekitar.

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## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 General**

Solid wastes are all the wastes arising from human and animal activities that are normally solid and are discarded as useless or unwanted. These discarded waste materials are often re-useable and can be considered a resource in different aspects. This solid waste comprehensively includes diverse mass of discards from the urban community as well as more homogenous accumulations of agricultural, industrial and mineral wastes (George et. al., 1993).

During the early generations, both humans and animals have used the natural resources from the earth to support their livelihood and discard the waste (solid waste) and did not in any way pose any sort of threat to their environment. But in these recent times where the population far exceeds that of the early/primitive days, the amount and quality of solid waste generated is more than the space on land provided to effectively and efficiently assimilate.

Today's society is more concerned about the environment and is much more aware about its activities and impact resulting from these activities on the environment. Society demands that waste management must be sustainable with the introduction of innovations such as recycling. The proper management and reduction of solid waste before disposal needs an appropriate technological knowhow, which is economically affordable, socially accepted and environmentally friendly.

Solid waste management is the aspect and discipline associated with the control of generation, storage, collection, transfer and transport, processing and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation aesthetics and environmental considerations and that is also responsive to public attitudes (George et. al., 1993). The scope of solid waste management includes all administrative, financial, legal, planning and engineering functions involved in solutions to all problems of solid waste.

However, the problem of solid waste management is a global issue. That is, both in developed and developing countries. Though in developed countries, the reason for waste collection and disposal are well understood and as such, accepted and workable regulations are now in place. For example, a country like United Kingdom (UK) has a range of operational collection and treatment facilities of solid waste. But, still encountering problems like the increasing quantities of solid waste because of greater use of packaging, bottles and can containers. In developing countries, solid waste is still a big issue, disposal systems are still largely uncontrolled leaving large quantities of solid waste not properly managed.

Therefore, the solution for the problem and future planning for solid waste management needs to be different in developed and developing countries. However, some market based approaches such as privatization of solid waste services, which are practised successfully in developed countries can be made useful for the

developing countries. Firms and entrepreneurs of all types play a central role in poverty reduction and availability of service to consumers. However, the tax revenues government can draw on to fund health, education and other services, depend on a good investment climate of the government. On the other hand, this raises a number of social, economic and environmental issues as many people now survive on waste-related activities such as solid waste collection, recycling and composting.

The solid waste is known to have different characteristics in which this research focuses on the municipal solid waste (MSW), having in its content, hazardous and non-hazardous solids. This can pose a serious threat to the health of the environment if not accurately managed through the methods of integrated solid waste management (ISWM).

## **1.2 Background of Study**

Though only a small percentage of hazardous waste is being generated from households or municipalities, the greater amount comes from industries and agricultural practices. The need for health implications of such wastes needs to be unfolded. Improper separation or no separation at all when mixed with other wastes say for incineration, can result in the production of toxic gases which when inhaled might bring about accumulative health problems and in turn results to air, land and water pollution.

The principal issue being studied is to check the level of awareness of recycling hazardous municipal solid wastes with nickel-cadmium (Ni-Cd) batteries as a priority and making recommendations in boosting this to accepted levels. This study aims to find out the level of participation from the generators that is, the end-

of-life product stewardship by manufacturers and marketers of these wastes and also looking into the likely contributions of the private and public sectors involvement in the collection, recycling and proper disposal of these hazardous wastes from communities.

The objective of this study is to obtain the level of awareness of the hazardous waste generators, and that these hazardous substances could lead to serious consequences if not properly disposed of. Thus, means of source separation is to be adapted, evaluation of willingness to participate in such practice, willingness to use recycled materials from waste generated and recycled and overall assessment of social attitudes towards recycling of hazardous solid waste from households.

### **1.3 Statement of Problem**

The main question of this study is “how to improve the recycling of municipal hazardous waste; and in a way, creating awareness to the generating public; a case study of Taman Universiti, Skudai, Johor Malaysia”.

The main research area is the municipality involvement in recycling of hazardous solid waste (Nickel-Cadmium (Ni-Cd) batteries) generated from households. The hazardous municipal solid waste was taken as a special case for investigation as the practice is quite low in Malaysia. The focus being how to achieve this investigation and creating awareness of community involvement since they are the main generators of these wastes.

The quantity of hazardous solid wastes generated from municipalities is quite low compared to that produced from the factories and industries. But the little

percentage of this hazardous solid waste that gets mixed with the non-hazardous wastes from households, when transported for further treatment and disposal leads to the formation of different sought of toxins dangerous to both man, animals and plants. Hence, a special means of collection from sources, transportation, recycling and final disposal needs to be devised to tackle the problem of toxic emissions.

Ni-Cd batteries are known to be made up of heavy metals which are toxic and carcinogenic when exposed to unfavourable conditions. Thus, the need to supervise its afterlife function comes in, where the collection process, transportation and disposal methods are specially improvised to protect the environment and human health as a whole.

#### **1.4 Research Methodology**

This project will adopt the methods of questionnaires and semi structured interview to gather data. Also question/answer forum with one collection centre within the study area of Taman Universiti and finally the willingness of the public to use recycled hazardous waste and also if willing to participate in the source separation of these waste from other types of wastes generated within the household from the answered questionnaires to be provided.

The data obtained there from is going to be processed using the SPSS software programme in order to generate the results, which will thus produce the assessment of the set questions in the form of bar chat, pie chart and frequency tables. Through this plots, the conclusion on the general awareness and recycling of Ni-Cd batteries will be determined.

## **1.5 Research Scope**

This study looks only into the awareness to recycle hazardous solid waste (HSW) (Ni-Cd batteries) generated from households in the community of Taman Universiti Skudai (study area), and not extending to all types such as those being generated from factories, industries, agricultural activities and also liquid hazardous waste from the area. The study will look into selected groups based on their monthly incomes resident within the area and one collection centre of these waste/spent Ni-Cd batteries. The scope here also does not look into formulation of policies or regulations but serve as a mere enlightenment towards further improvement on hazardous solid waste services.

## **1.6 Significance of Study**

Even though this study is going to be carried out in Taman Universiti, Skudai, the findings there from can be used to shed more light on the recycling processes of HMSW (Ni-Cd batteries) and the health implications arising from its improper disposal and handling, hence, involving the public in cleaning up these hazardous wastes at their various end of life. That is, from the source of acquisition to the point of exhaustion (disposal).

At the end of the study, the results obtained can help in decision making regarding HSW from households and can also be applicable in other communities other than Taman Universiti, Skudai, thereby; devising means of further investment in such areas as the process involves extensive funding, leading to a less polluted and safe environment (Sustainable environment).



## **1.7 Objectives of study**

This research aims at evaluating the willingness of the public to participate in recycling of HMSW (Ni-Cd) activities and assess recycling from the strategic disposal point of view as an alternative to land filling and incineration. Thus the objectives of the study are to:

1. Evaluate the awareness of recycling spent Ni-Cd batteries,
2. Assess public concern on recycling of waste Ni-Cd batteries, and
3. Evaluate the willingness to recycle spent Ni-Cd batteries from MSW stream.

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