EUROPEAN ACADEMIC RESEARCH
Vol. III, Issue 4/ July 2015

Impact Factor: 3.4546 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Youth Awareness and Mitigation of Waste Pollution in Bulacan State University

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Abstract:

The aim of reducing garbage problem and eradicating potential risks to the individuals health and create waste that ways itself be hazardous to everyone. However, everybody is thinking a world free from any harm and most especially concerning health. It also aimed to determine the different practices on waste generated by the school. It also observed practices on waste management in term of garbage collection, disposal, on-site storage and off-site transport and treatment. The descriptive research design utilize a self-administered questionnaire in random sampling was employed in this study. There were 100 respondents in BulSU student. The researcher concludes that not all of the student are aware of waste segregation and waste management, but some of the student here in Bulacan State University, students know the principle of waste management and its implication of improper waste disposal of BulSU students. Students are aware on waste management technology, but they are not totally practicing it. Students have full knowledge about the serious effects on environment if we ignore practicing waste management processes. The students are willing to indulge themselves in environmental activities that can help to lessen environmental problems. It recommends to the students to practice the waste segregation in the school, by joining campaign and activities in and out of school premises. Based on this foregoing study, researchers found that many of the students are not aware of what waste pollution is, so should joined hand to help the school in solving this problem by encouraging the youth to have

knowledge by listening to their professor's campaign against waste pollution. The youth can help lessen waste pollution by their own if they are really willing to do so.

Key words: Education, Youth Awareness and Mitigation of Waste Pollution, Descriptive Research, City of Malolos, Bulacan, Philippines

Introduction

Waste management is the "generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes." There are various types of solid waste including municipal (residential, institutional, commercial), agricultural, and special (health care, household hazardous wastes, sewage sludge). The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics.

Throughout history, human progress has been intrinsically tied to the management of waste due to its effect on public and environmental health. Waste management has affected human history in many ways just as it will in the future. The modern waste management industry has come far and with the recycling and other advances – we are poised to go further. Below is a timeline of significant development in waste management history.

The amount of waste generated by humans was insignificant due to low population density and low societal levels of exploitation of natural resources. Common waste produced during pre-modern times was mainly ashes and human biodegradable waste, and these were released back into the ground locally, with minimum environmental impact. Tools made out of wood or metal were generally reused or passed down through the generations. However, some civilizations do seem to have been more profligate in their waste output than

others. In particular, the Maya of Central America had a fixed monthly ritual, in which the people of the village would gather together and burn their rubbish in large dumps.

Our modern era has been marked by Europe, the United States and other parts of the developed World establishing more organized waste collection and landfill programs. A variety of regulations affecting solid waste management have been imposed, and technologies have evolved dramatically improve the waste industry and in turn human health and well-being.

The composition of waste has changed over the last century. Many people now live in apartments and fewer people cook or heat with fires that produce ash and cinders. Changes in society such as increased mobility with the automobile, the rise of supermarkets and a steep rise in packaging have led to modern living standards that include dedicated waste management regimes.

The passage of the Clean Air Act in the United States in 1970 led to the closure of many early incinerators without air pollution controls. These incinerators have been replaced by modern waste-to-energy plants that include pollution controls adept at removing particles and reducing gas emission too.

In recent decades, the solid waste industry has pioneered other technologies, such as recycling, recognizing that today's waste stream is the feedstock for tomorrow's products. In a relatively short time frame, recycling has become a fully-developed technology. As of 2012, more than 34.5 percent of solid waste is recycled or composted, conserving vital resources and energy, reducing greenhouse gas emissions and protecting air and water quality.

The solid waste industry now serves more as a resource management industry. It continues to lead in responding to the most pressing environmental concerns of the day. Today, we are leaders in responding to concerns raised by climate change, the most dominant global environmental issue. Industry innovation

allows us to capture greenhouse gas from landfills, use it as a source of renewable and sustainable energy, and reduce our dependence on fossil fuels and foreign oil.

Statement of the Problem

The major problem of this study is: What is the level of awareness of the Youth and its Mitigation of Waste Pollution in Bulacan State University?

Specially, the study attempted to answer the following questions:

1. What is the profile of students in Bulacan State University?
2. Do the students know the principle of Waste Management?
3. How do the students segregate their waste into biodegradable and non-biodegradable waste?
4. How do they help to solve the environmental problems?

Significance of the Study

This research is entitled to be able to know about the level of awareness, knowledge and skills of the people specifically the Bulacan State University engineering students on solid waste management. And also to convince them on how to address and lessen the malignant environmental problems which our country experiences nowadays.

This will help the students to learn the significance of proper segregation and recycling. As for teachers, they will understand the importance of the disciplining the students when it comes to waste management and properly impose the rules and regulations about having a clean environment. However, this can encourage the administration to employ a better waste management system that will improve their waste

management practices. Knowing the mindset of the students about waste management can bring us to a beginning of a helpful means that the university could use.

Scope and Limitation

The researchers conducted a survey among the students of Bulacan State University. First year to fourth year students were given a questionnaire about Waste Management to assess their opinion and understanding about the topic. The numbers of respondents were limited to 200, resulting to 40 students per College.

Related Literature

The volume of solid waste, particularly in urban areas, is increasing, and both public health and the environment are in jeopardy because disposal methods have not kept pace. This comment examines the historical role that the municipalities have played in providing adequate methods for solid waste disposal, emphasizes the traditional methods of zoning and critiques the effectiveness of municipal regulations. It reviews recent federal and state solid waste management acts and analyzes the issue of preemption. This comment also discusses the constitutionally of state and municipal waste bans. In conclusion, this comment recommends more effective methods for states and municipalities to pursue in solving the problems of solid waste disposal.

A large number of reports produced over the last two decades highlighted different aspects of solid wastes in Nepal, particularly in Kathmandu Valley. But only a very few of the reports and documents are about community based solid waste management. As to researcher's knowledge there is no available documented case study on community based solid waste management in Nepal.

Some survey reports completed in the past by Solid Waste Management & Resource Mobilization Centre (SWMRMC) look at the total solid waste generations of small shops and household in Kathmandu and Patan. A survey on "Recycling and Recyclable Materials Generation in Households in Residential locations in Kathmandu" 1990, conducted by SWMRMC generated data on recyclable materials and characterize household understanding and knowledge of various aspects of recycling.

Paper presented by Mr. L. C. Rayamajhi, Deputy General Manager, SWMRMC, at fourth Regional Workshop SWMRMC, October 31st and Nov. 1st 1990, states that proper waste handling cost a lot of money which developing countries cannot afford and at the same time the people don't get direct output from it. Therefore, he further emphasized that SWMRMC should think about the cost involved in waste handling and a treatment system as a resource recovery process. At the same symposium, participants have come to a conclusion that "Community Participation being an integral part of SWMRMC's service approach should be fostered not only in regard to wise handling and waste disposal but also in reduction at source.

Study on the physical composition of municipal solid waste in Kathmandu, conducted by NESS Pvt. Ltd in 1990 revealed that the municipal solid waste composition has undergone drastic change in the last decade. Over the years, proportion of the compostable biodegradable waste has decline significantly, while uncompostable organic waste fraction has increased. These features point to the fact that the municipal waste of Kathmandu can be best reused by transformation into solid waste fuel briquettes than by composting.

By transformation into solid waste fuel briquettes about 85 percent waste by volume and 78 percentage of waste by weight can be reused. In other words, the same fraction of waste is reduced in the landfill site for final disposal. This

option can not only extend the life of landfill but also provide an alternative source of energy by utilizing unused waste product.

Above study has also identified that solid waste fuel briquettes, made out of organic fraction of the Kathmandu, are of high compressive strength, easily ignitable and has an estimated caloric value of 4,600 kcal/kg. Physical composition of solid waste in different parts of Kathmandu Valley provided in Annex-1.

Waste characteristics a common misconception is that the environmental protection and sustainable initiatives must come at the expense of economic development (El-Haggar, 2007). This is particularly true for managing wastes, a process which depletes natural resources and pollutes the environment if not done correctly. Proper waste management can be costly in terms of time and resources and so it is important to understand what option exist for managing waste in an effective, safe and sustainable manner (El-Haggar, 2007)

This is particularly true for organizations which fall into institutional, commercial and industrial (ICI) sector. Waste Streams Municipal solid waste (MSW) is often described as the waste that is produced from residential and industrial (non-process wastes), commercial and institutional sources with the exception of hazardous and universal wastes, construction and demolition wastes, and liquid wastes (water, wastewater, industrial process) (Tchobanoglous & Kreith, 2002). In Nova Scotia, MSW is defined through the Solid Waste-Resource Management Regulations (1996) which states that MSW "includes garbage, refuse, sludge, rubbish, tailings, debris, litter and other discarded materials resulting from residential, commercial, institutional and industrial activities which are commonly accepted at a municipal solid waste management facility, but excludes wastes from industrial activities regulated by an approval issued under the Nova Scotia Environment Act" (SWRMR, 1996).

Materials which are organic or recyclable are excluded from this definition, and so MSW in Nova Scotia is significantly different from that in many other jurisdictions. This definition of MSW works together with a legislated landfill ban which prohibits certain materials from landfill (Appendix C) to ensure that only certain materials are entering landfills. Banned materials cannot be disposed of and are processed through alternative methods (SWRM, 1996); typically recycling, reuse and composting. The designation of materials into specific categories such as organics, recyclables and garbage can be differ by region, therefore organizations must ensure that waste is separated according to local area by-laws. Construction and demolition (C&D) waste consists of materials which are normally produced as a result of construction, demolition, or renovation projects and can be a significant source of waste for all organizations in the ICI sector. According to the Nova Scotia Solid Waste-Resource Management Regulations (1996), C&D waste/debris "includes, but it is not limited to, soil, asphalt, brick, mortar, drywall, plaster, cellulose, fiberglass fibers, gyproc, lumber, wood, asphalt shingles, and metals." Hazardous wastes are substances which are potentially hazardous to human health and/or the environment. As such, they typically require special disposal techniques to eliminate or reduce the hazards they pose (Meakin, 1992).

Hazardous wastes are handled differently across different provinces; however, many provinces, including Nova Scotia, have adopted the federal Transportation of Dangerous Goods Regulations to manage hazardous wastes. Hazardous wastes are typically classified by product type; however, it is important to consider that material properties and concentrations can impact the dangers and risks posed by certain materials (N. P. Cheremisinoff & P. N. Cheremisinoff, 1995).

Commercial and institutional firms typically produce waste as a result of conducting trade and business (Smith & Scott, 2005), whereas the waste streams of industrial firms (manufacturing, repair, production) are typically characterized as liquid wastes, solid wastes, or air pollutants with each typically being managed and regulated differently (Woodard & Curran Inc., 2006). Industrial settings also produce MSW. Aside from dealing with highly varying waste streams, there is also the issue that many firms place a high value on company privacy and may not share information willingly (Ehrenfeld&Gertler, 1997).

Integrated Waste Management methods cannot be uniform across regions and sectors because individual waste management methods cannot deal with all potential waste materials in a sustainable manner (Staniskis, 2005).

A waste management framework provides:

1. Flexibility to frame and analyze quantitative and qualitative information across different scales
2. Structure to clearly identify key goals and values
3. Logic to consider the potential probability and consequences related to a particular option
4. Communicably to clearly communicate key ideas to key stakeholders (Owen, 2003).

Integrated waste management (IWM) has emerged as a holistic approach to managing waste by combining and applying arrange of suitable techniques, technologies and management programs to achieve specific objectives and goals (McDougall et al., 2001; Tchobanaglous & Kreith, 2002). The concept of IWM arose out of recognition that waste management systems are comprised of several interconnected systems and functions, and has come to be known as "a framework of reference for designing and implementing new waste management systems and for analyzing and optimizing existing systems" (UNEP, 1996). Just as there is no individual waste management method

which is suitable for processing all waste in a sustainable manner, there is no perfect IWM system (McDougall et al., 2001). Individual IWM systems will vary across regions and organizations, but there are some key features which characterize IWM: employing a holistic approach which assesses the overall environmental burdens and economic costs of the system, allowing for strategic planning; using a range of collection and treatment methods which focus on producing less waste and in effectively managing waste which is still produced; handling all materials in the solid waste stream rather than focusing solely on specific materials or sources of materials (Hazardous materials should be dealt with within the system, but in a separate stream); being environmentally effective through reducing the environmental burdens such as emission to air, land and water; being economically affordable by driving costs out and adopting a market-oriented approach by creating customer-supplier relationships with waste products that have end uses and can generate income; social acceptability by incorporating public participations and ensuring individuals understand their role in the waste management system. (McDougall et al., 2001) Due to the varying needs and challenges faced by organizations in the ICI sector, a flexible yet comprehensive approach is needed to manage waste properly.

In some instances, addition R's can be added to the basic three. Some organizations have chosen to add a fourth R (Concordia University, n.d.; FNQLSDI, 2008; UC Davis, 2008; U of T, 2008). The fourth R can represent different words including rebuy (UC Davis, 2008), rethink (Concordia University, n.d,; U of T, 2008), and recover (FNQLSDI, 2208). The concept of rebuy refers to consumer purchasing decisions. Consumers have the ability to take steps to improve waste management by helping to close the loop in waste management systems by purchasing products which have been recycled or used (UC Davis, 2008). Rethink is added to the three R's by

some because changing our behavior and our actions can lead to improvement in waste management. Changing consumption patterns and considering the impacts of our actions can lead to decreased production of waste, and even a reduction in waste management and waste minimization efforts (Concordia University, n.d). Recover can refer to methods which is used an process waste so that it is used rather than disposed of (which would include reuse and recycling); however, it can also include recovering energy form waste before it is disposed.

Waste can be processed into a fuel and used to produce a usable form of energy (FNQLSDI, 2008). Examples include incinerating waste to generate electricity, breaking waste down with (high temperature) plasmolysis to produce usable sources of fuel, or breaking down organic matter with anaerobic digestion to produce biogas. These additional concepts do not need to be limited to four R's. El-Haggar (2007) proposes that to achieve sustainable waste management, a 7R methodology should be adopted: Reduce, Reuse, Recycle, Recover, Rethinking, Renovation and Regulation. Renovation refers to taking action to develop innovative ways to process waste, while regulation is added in recognition that it is a driving force behind ensuring the implementation of responsible waste management practices (El-Haggar, 2007)

Related Studies

Waste management is the generation, prevention, characterization, monitoring, treatment, handling, reuse and residual disposition of solid wastes. There are various types of solid waste including municipal (residential, institutional, commercial), agricultural, and special (health care, household hazardous wastes, sewage sludge). The term usually relates to materials produced by human activity, and the process is generally undertaken to reduce their effect on health, the environment or aesthetics.

Waste management practices are not uniform among: countries (developed and developing nations); regions (urban and rural areas), and sectors (residential and industrial).

Sir Edwin Chadwick's (1842), report The Sanitary Condition of the Laboring Population was influential in securing the passage of the first legislation aimed at waste clearance and disposal.

Following the onset of industrialization and the sustained urban growth of large population centers in England, the build-up of waste in the cities caused a rapid deterioration in levels of sanitation and the general quality of urban life. The streets became choked with filth due to the lack of waste regulations. Calls for the establishment of a municipal authority with waste removal powers are being mooted as early as 1751 by Corbyn Morris in London, who proposed that "as the preservation of the health of the people is of the great importance, it is proposed that the cleaning of the city, should be put under one uniform public management, and all the filth be conveyed by the Thames to proper distance in the country".

However, it was not until the mid-19th century, spurred by increasingly devastating cholera outbreaks and the emergence of a public health debate that the first legislation on the issue emerged. Highly influential in this new focus was report The Sanitary Condition of the Laboring Population in 1842 of the social reformer, Edwin Chadwick, in which he argued for the importance of adequate waste removal and management facilities to improve the health and wellbeing of the city's population.

Landfill

Disposal of waste in a landfill involves burying the waste and this remains a common practice in most countries. Landfills were often established in abandoned or unused quarries, mining voids or borrow pits. A properly designed and well-managed landfill can be a hygienic and relatively inexpensive

method of disposing of waste materials. Older, poorly designed or poorly managed landfills and open dumps can create a number of adverse impacts such as wind-blown litter, attraction of vermin, and generation of liquid leachate. Another common product of landfill is gas (mostly composed of methane and carbon dioxide), which is produced from anaerobic breakdown of organic waste. This gas can create odor problems, kill surface vegetation and is a greenhouse gas.

Design characteristics of a modern landfill include methods to contain leachate such as clay or plastic lining material. Deposited waste is normally compacted to increase its density and stability and covered to prevent attracting vermin (such as mice or rats). Many landfills also have landfill gas extraction systems installed to extract the landfill gas. Gas is pumped out of the landfill using perforated pipes and flared off or burnt in a gas engine to generate electricity.

Recycling

Recycling is a resource recovery practice that refers to the collection and reuse of waste materials such as empty beverages containers. The materials from which the items are made can be reprocessed into new products. Material for recycling may be collected separately from general waste using dedicated bins and collection vehicles, a procedure called kerbside collection. In some communities, the owner of the waste is required to separate the materials into various different bins (e.g. for paper, plastics, metals) prior to its collection, and the sorting is handled later at a central facility. The latter method is known as “single-stream recycling”

The most common consumer products recycled include aluminum such as beverage cans, copper such as wire, steel from food and aerosol cans, old steel furnishings or equipment, polyethylene and PET bottles, glass bottles and jars, paperboard cartons, newspapers, magazines and light paper, and corrugated fiberboard boxes.

The type of material accepted for recycling varies by city and country. Each city and country has different recycling programs in place that can handle the various types of recyclable materials. However, certain variation in acceptance is reflected in the resale value of the material once it is reprocessed.

Biological Reprocessing

Recoverable materials that organic in nature, such as plant material, food scraps, and paper products are can be recovered through composting and digestion processes to decompose the organic matter. The resulting organic material is then recycled as much as compost for agricultural or landscaping purposes. In addition, waste gas from the process (such as methane) can be captured and used for generating electricity and heat (CHP/cogeneration) maximizing efficiencies. The intention of biological processing in waste management is to control and accelerate the natural process of decomposition of organic matter.

Anaerobic digestion component of Lubeck mechanical biological treatment plant in Germany, 2007 stated that:

Energy recovered from waste is the conversion of non-recyclable waste materials into usable heat, electricity, or fuel through a variety of processes, including combustion, gasification, pyrolyzation, anaerobic digestion, and landfill gas recovery. This process is often called waste-to-energy. Energy recovery from waste is part of the non-hazardous waste management hierarchy. Using energy recovery to convert non-recyclable waste materials into electricity and heat, generates a renewable energy source and can reduce carbon emissions by offsetting the need for energy from fossil sources as well as reduce methane generation from landfills. Globally, waste-to-energy accounts for 16% of waste management.

The energy content of waste products can be harnessed directly by using them as a direct combustion fuel, or indirectly by processing them into another type of fuel. Thermal

treatment ranges from using waste as a fuel source for cooking or heating and the use of the gas fuel, to fuel for broilers to generate steam and electricity in a turbine. Pyrolysis and gasification are two related to forms of thermal treatment where waste materials are heated to high temperatures with limited oxygen availability. The process usually occurs in a sealed vessel under high pressure. Pyrolysis of solid waste converts the material into solid, liquid and gas products. The liquid and gas can be burnt to produce energy or refined into other chemical products (chemical refinery). The solid residue (char) can be further refined into products such as activated carbon. Gasification and advanced Plasma arc gasification are used to convert organic materials directly into a synthetic gas (syngas) composed of carbon monoxide and hydrogen. The gas is then burnt to produce electricity and steam. An alternative to pyrolysis is high temperature and pressure supercritical water decomposition (hydrothermal monophasic oxidation).

Waste collection methods vary widely among different countries and regions. Domestic waste collection services are often provided by local government authorities, or by private companies for industrial and commercial waste. Some areas, especially those in less developed countries, do not have a formal waste-collection system.

In San Francisco, the local government established its Mandatory Recycling and Composting Ordinance in support of its goal of zero waste by 2020, requiring everyone in the city to keep recyclables and compostables out of the landfill. The three streams are collected with the curbside "Fantastic 3" bin-system – blue for recyclables, green for compostables, and black for landfill-bound materials – provided to residents and businesses and serviced by San Francisco's sole refuse hauler, Recology. The City's "Pay-As-You-Throw" system charges customers by the volume of landfill-bound materials, which provides a financial incentive to separate recyclables and compostables from other discards. The City's Department of the

Environment's Zero Waste Program has led the City to achieve 80% diversion, the highest diversion rate in North America.

Waste Management in Developed Countries

Brought basically by their more developed industries and more advanced technology, developed nations have more efficient and standard liquid waste management plans.

Developed countries, however, still employ different methods of waste disposal (which largely depends on a country's policies and preferences). The large amount of solid waste (including its collection, transfer and disposal) generated in developed nations has been generally assumed by municipal governments. The format varies, however, in most urban areas, where garbage is collected either by the government agency or private contractor, and this constitutes a basic and expected government function in the developed world. (Zerbock, 2003)

1. Solid Waste Management

A) Landfill

The placement of solid waste in landfills is probably the oldest an definitely the most prevalent form of ultimate garbage disposal (Zerbock, 2003). It is to e noted, however, that most landfills refer to nothing more than open dumps. Nonetheless, in the case of developed countries, waste disposal is often in the form of sanitary landfills, which differ from open dumps by their higher degree of engineering, planning and administration. Landfills account for the disposal of 90% of the United States' solid wastes. It is also the most common disposal method in the United Kingdom where annually, approximately 111 million tons of controlled wastes are disposed in their landfill sites (Baker, 2005).

In modern landfill, refuse is spread thin, compacted layers covered by a layer of clean earth. Pollution surface water and groundwater is minimized by lining and contouring the fill,

compacting and planting the uppermost cover layer, diverting drainage, and selecting proper soil in sites not subject to flooding or high groundwater levels. The best soil for a landfill is clay because clay is less permeable than other types of soil. Materials disposed of in a landfill can be further secured from leakage by solidifying them in materials such as cement, fly ash from power plants, asphalt, or organic polymers (Bassis, 2005). Landfills can also be shifted to another use after their capacities have been reached. The City of Evanston, Illinois, built a landfill up into a hill and the now complete "Mt. Trashmore" is a ski area. Golf courses built over landfill sites are also increasingly common (Montgomery, 2000).

B) Recycling or the 3R's

Another method, which sets off before waste disposal is waste reduction through recycling or often coined as the 3R's: reuse, reduce, and recycle.

On the local or regional level, reducing wastes is accomplished through these methods by source separation and subsequent material recovery.

Currently, the United States recycles about 10% of its glass and 25% of its paper wastes; in countries such as Switzerland and the Netherlands, the proportion in the glass recycled approaches to 50% while Japan recycles 50% of its paper wastes (Montgomery, 2000).

C) Incineration

Some countries, on the other hand, manage most of their solid waste through incinerators. Incineration, or the controlled burning of waste at high temperatures to produce steam and ash, is another waste disposal option and an alternative to land filling (US Environmental Protection Agency, 2009). Incinerators are designed for the destruction of wastes and are commonly employed in developed nations who could afford the

costs of the burning facilities, plus its operation and maintenance (McCracken, 2005).

This type of waste disposal is the second largest disposal method in most developed countries and ranks next to landfills in the United States and the United Kingdom. In the UK, approximately 5% of household waste, 75% of commercial waste and 2% of industrial waste is diposed of through this method (Baker, 2005).

In spite of its huge capital requirements, incineration presents to be a promising option for developed island nations whose small land area makes land filling an unsuitable method for their waste disposal. Reduction by incineration, along with sanitary disposal of the residue, has been proven useful in nations such as Bermuda and the British Virgin Islands (Lettsome 1998 as cited by Zerlock 2003). A further benefit of incineration can be realized if the heat generated thereby is recovered. For years, European cities have generated electricity using waste-disposal incinerators as sources of heat (Montgomery, 2000).

There are negative issues, however, in the use of this burning method and much of that circulate around its safety for the environment and to the human health. It is argued that the combustion process crates air pollution, ash, and waste water, all of which must be properly managed using technical monitoring, containment, and treatment systems. Harmful pollutants are released into the environment whenever these by-products are not controlled (US EPA, 2009). Operators of these facilities must be well-trained and certified to ensure proper management.

Waste Management in Developing Countries

Although largely limited in terms of budget and technology as compared to the developed nations, developing countries also take their share in implementing waste management policies.

1. Solid Waste Management

In developing countries, it is common for municipalities to spend 20-50 percent of their available recurrent budget on solid waste management. Yet, it is also common that 30-60 percent of all urban solid waste in developing countries in uncollected and less than 50 percent of the population is served. In some cases, as much as 80 percent of the collection and transport equipment is out of service, in need of repair or maintenance. In most developing countries, open dumping with open burning is the norm (The World Bank, 2009).

A) Open Dumps

Dumps are long-established method of waste disposal in many countries. Although this method have been largely phased-out in most developed countries and replaced by sanitary landfills, many developing nations still rely on this form of disposal. Open dumps are not much to be endorsed though. They are unsightly, unsanitary and generally smelly, they attract rats, insects and other pests; they are also fire hazards. Still, behind these negative aspects, open dumps continue to be prevalent in countries like India, the Philippines and Indonesia.

B) Landfill

Is also a common method of solid waste disposal in most developing countries, although many of them harbours open dumps.

C) Recycling

In many developing countries and countries with economies in transition there are two types of recycling sectors, a formal sector and informal sector. Formal recycling sector, using efficient technologies and state-of-the-art recycling facilities are rare. As a result, recyclable materials are managed through various informal sectors with low-end management alternatives such as manual separation of recyclable components, burning of

some components in open pits to recover precious metals, and dumping of residues into surface water bodies. This informal sector of the economy employs thousands of poor people who are not aware of the hazard of exposure or hazards that exist in some recyclable materials (Besel Convention Report Paper, 2009).

Waste Management: The Philippine Setting

1. Philippine Solid Waste Management

In our country, solid waste management is embodied in RA 9003 or the Ecological Solid Waste Management Act of 2000. This law provides "the legal framework for the country's systematic, comprehensive and ecological solid waste management program that shall ensure protection of public health and the environment" (Environmental Management Bureau-DENR, 2009).

Liquid Waste Management in the Philippines, this is the concern of NEDA Board Resolution No. 5 series of 1994 which stated the national policy for urban sewerage and sanitation (Magtibay, 2006). The management of liquid wastes requires a coordinated system of policies which covers requisites on drainage, sewers, and waste water treatment facilities. It is also a complex issue as it traverses across various sectors: domestic, industrial, agricultural, etc.

Unfortunately, with the current situation of the country, with its political clashes and poverty situation, liquid waste management had largely been centered only in the private sectors (Contreras, 2005). Treatments are largely carried out by industrial groups. Effective domestic liquid waste management occurs mostly in private households.

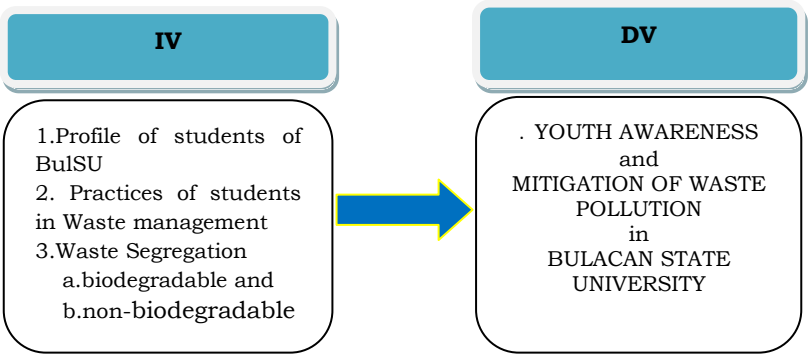
In this area, policies once again govern the actions of the concerned agencies. The treatment and discharge of commercial waste water (liquid waste generated by trading or business establishment and or any other related firms or companies) is

regulated and monitored through the provisions of the DENR Administrative Order No. 2002-16 or the DENR-EMB National Environmental User's Fee of 2002, which authors the DENR Wastewater Discharge Permitting System.

2. Philippine Hazardous Waste Management

Before the enactment of the Clean Air Act (which included in its provisions the banning of incinerators in the country), hazardous wastes such as medical and laboratory wastes are subjected to burning processes. Some of the wastes are also recycled. In 2003, hazardous waste management shifted to landfills and open dumping as an answer to the banning of burning. In a case study conducted in hospitals in the Cagayan Valley Region, Northern Luzon, the most common method of hazardous waste disposal in the area is through dumping. Results indicated that proper waste management is not fully implemented due to budget constraints (Bernardo, 2008).

Conceptual Framework



Population of the Study

The investigation made use of purposive sampling technique since the study aimed to ascertain the level of awareness of students in waste pollution. Purposive sampling is a technique used to select samples based on specific objectives (Baciles, et al.: 2005). Since the purpose of the study was to ascertain the

level of awareness and mitigation of students in waste pollution concerned in such area were included in the investigation are the students from different Colleges of Bulacan State University calendar year 2014-2015.

The table below shows the distribution of respondents as follows:

Table I Frequency and Percentage Distribution of Respondents. Population and Sample of students of Bulacan State University Main Campus

RESPONDENTS	POPULATION
College of Physical Education, Recreation and Sports	***40***
College of Engeneering	***40***
College of Industrial Technology	***40***
College of Nursing	***40***
College of Science	***40***
TOTAL	***200***

Methodology

This research was conducted to know if Bulacan State University students are aware of waste management, its purpose, or if they were able to practice it, and the advantages of having enough knowledge in waste management.

The method used in this research is survey. The term 'survey' is commonly applied to a research methodology designed to collect data from a specific population, or a sample from that population, and typically utilizes a questionnaire or an interview as the survey instrument (Robson, 1993). We gathered the data from students of Bulacan State University. Selected participants answered survey questionnaire. The gathered data were then computed for interpretation.

Descriptive research is conclusive in nature, as opposed to exploratory. This means that descriptive research gathers quantifiable information that can be used for statistical inference on your target audience though data analysis. As a consequence this type of research takes the form of closed-ended questions, which limits its ability to provide unique insights. However, used properly it can help an organization

better define and measure the significance of something about a group of respondents and the population they represent.

Presentation, Analysis and Interpretation of Data

This chapter presents the findings based on the indicative data of the variables of the study. The presentation, analysis and interpretation of these data following the order of the statement of the problem set forth earlier are discussed in the following subsections.

Table 2 Shows the level of Awareness and Knowledge of the Participants about Waste Management

Awareness and Knowledge of the Participants about Waste Management	5	4	3	2	1
1. I know what waste management is.	44%	24%	28%	4%	0%
2. Segregation refers to the systematic sorting and separation of different solid waste materials in order to promote recycling and reusing.	36%	36%	28%	0%	0%
3. Disposables are waste materials that cannot be reused or recycled.	24%	16%	32%	20%	8%
4. Styrofoam, plastic straws, plastic wrappers, foil packs are examples of disposables.	40%	36%	20%	0%	4%
5. Recyclables are solid waste materials that can be sold, recycled or reused.	60%	28%	0%	12%	0%
6. Mineral water bottles, aluminum cans, glass bottles and metals are examples of recyclables	54%	28%	16%	0%	0%
7. Garden wastes (e.g. dried leaves, grass trimmings); used tissue, wet papers, and left over foods are example of biodegradable wastes.	54%	28%	16%	0%	0%
8. Throwing of garbage improperly is considered to be one of the major environmental problems in school.	40%	32%	28%	0%	0%
9. Used papers contribute a lot to solid wastes in school.	32%	28%	36%	4%	0%
10. Students are informed about environmental issues through media.	8%	44%	28%	16%	4%
11. Incineration, a method of turning wastes into ash which is usually practiced in schools is not a necessary process because it produces air	28%	40%	24%	8%	0%

pollution and toxic ash.					
12. I know that we will continue to produce more dangerous chemical wastes.	16%	44%	24%	12%	4%
13. We are headed towards a disposal crisis if new methods are not developed soon.	24%	40%	28%	8%	0%
14. Reusing disposed materials such as glass and plastic can reduce waste.	32%	36%	32%	0%	0%
15. The volume wastes could be reduced if recycling method could be adopted.	48%	28%	16%	8%	0%
16. Environmental events have raised public awareness about global environmental issues.	32%	40%	24%	4%	0%
17. Too much emphasis is placed on environmental problem rather than solutions to the problems.	32%	40%	28%	0%	0%
18. Bulacan State University has a Waste Management Program.	12%	36%	44%	8%	0%
19. It is important that I should know about the Waste Management Program of the University.	40%	36%	20%	4%	0%
20. There is an Ecological Waste Management Act that sets procedure for the control and disposal of solid waste in the country.	36%	20%	40%	4%	0%
21. There is a presidential decree which pertains to garbage disposal law, whereby prohibits littering in public areas and hold the institution proclaim to clean their surroundings and provide penalties for the improper disposal of garbage and other forms of uncleanliness.	36%	44%	20%	0%	0%
22. Knowledge appreciation and awareness are not enough solutions to reduce cleanliness issues in our environment.	44%	36%	16%	0%	4%

About 44 percent of the respondents answered that they know and they were aware on the waste management. With 36 percent on highly aware and moderately aware on how they will segregate the waste into recyclables materials and can be sold, recycled and reuse. On the other hand Most of them know what the examples of disposables and the students aren't

convinced that industries are going to produce more chemical wastes in spite of the growing technological society.

Averagely, around 54 percent of the respondents agreed that environmental events and activities through media have raised public awareness about global environmental issues. Most of the students believe that solutions to the environmental problems are less prioritized. Unfortunately, only 8 percent of the students are completely aware about the Waste Management Program of the University. With the number 0f students about 36 percent are not fully aware about the Ecological Waste Management Act of the country. Pleasantly, most of the students have knowledge about the presidential decree about garbage disposal law. Knowledge appreciation and awareness are not enough solutions to reduce cleanliness issues in our environment and most of the students believe that.

Table 3 Shows the Attitudes of the Participants about Waste Management

Attitudes of the Participants	**5**	**4**	**3**	**2**	**1**
1. Having a clean environment is a vital health.	64%	24%	12%	0%	0%
2. It is alright to litter anywhere around the school building.	0%	20%	16%	0%	64%
3. Throwing of garbage not in their designated trashcan is okay; anyway I won't be sanctioned or fined from doing so.	0%	20%	4%	28%	44%
4. I can throw my trash into any of the garbage bins; it is the job of the janitors to sort it out.	8%	16%	16%	16%	44%
5. I am busy; I don't have time to participate in any waste management programs.	12%	16%	32%	8%	32%
6. There is no point in segregating wastes because it goes into one garbage truck.	20%	16%	12%	28%	24%
7. It concerns me if I see garbage scattered around buildings.	16%	36%	28%	16%	4%
8. Segregating garbage will be good for me and for the other students.	48%	24%	16%	12%	0%
9. I am willing to practice waste segregation in the school buildings.	32%	32%	20%	12%	4%

10. If I recycle, I can save materials and earn money.	40%	40%	16%	4%	0%

With a 64 percent of the students believe that having a clean environment is a vital health. Sadly, most of the students are not disciplined enough to throw garbage in their designated trash bins because they do believe that they won't be punished for that. Also, the students believe that it is the janitors' job to segregate the garbage.

The students who said that they are quite busy to participate in any waste management program and those who believe that they are not just equal but sadly, there are students who are busy to do so. Large number of students agrees that segregating garbage is good for everyone. Students who are willing to practice waste segregation are in great number. Majority of the students credits recycling as a help to save and earn money.

Table 4 Shows the Level of Participation of the Respondents

Level of Participation of the Respondents	**5**	**4**	**3**	**2**	**1**
1. Do you practice waste segregation in the campus?	4%	24%	56%	8%	8%
2. Do you participate in Waste Management Program of the University?	0%	28%	44%	20%	8%
3. Do you see faculty members or students practicing waste segregation?	4%	24%	32%	36%	4%
4. Do you see the janitors or garbage collectors putting different types of garbage into one garbage bin?	4%	24%	28%	16%	8%
5. Do you involve yourself to the school's environmental activities?	0%	32%	40%	24%	4%
6. Do you encourage your friends to participate in the school's environmental program?	4%	28%	28%	36%	4%
7. I keep used papers, old newspapers and magazines for recycling purposes.	4%	32%	44%	16%	4%
8. I segregate bio-degradable from non-biodegradable wastes.	0%	28%	12%	56%	4%
9. I do practice waste segregation in our school.	0%	24%	60%	12%	4%

10. I try to reuse water bottles/containers, cans, papers and plastics.	12%	44%	36%	4%	4%
11. I am participating in waste management programs whole-heartedly.	8%	36%	44%	8%	4%
12. I am very much against illegal environment activities.	24%	44%	28%	4%	0%
13. I promote maintenance of cleanliness in the classrooms and school surroundings.	12%	64%	16%	8%	0%
14. I encourage other students to preserve and protect the environment even in little ways.	12%	44%	28%	16%	0%
15. I am willing to educate others especially out-of-school-youths about waste management.	16%	20%	36%	16%	4%

Table shows that the students fairly see the faculty members or other students practice waste segregation. Large number of the respondents sees the janitors put the garbage in one garbage bag. No one completely involves themselves in the school's environmental programs. Fair number of students slightly encourages their friends to participate in the school's environmental programs. Some of the students slightly encourage their friends to participate in the school's environmental programs.

Most of the students slightly participate in waste management programs whole-heartedly. Only few of the students are very much against illegal environmental activities. Several, students only promote maintenance of cleanliness in the classrooms and school surroundings. Few students admitted that they encourage their schoolmates to preserve and protect the environment not most of the time. Some of the students are averagely willing to educate others about waste management

Summary

Waste management is the generation, prevention, characterization, monitoring treatment, handling, reuse and

disposition of solid wastes. These are various types of solid waste including municipal, institutional, commercial, agricultural and specially health care and household wastes. The term usually relates to the materials produced by human and in process is generally undertaken to reduce the effect on health and environment or aesthetics.

It is not something that should be discarded or disposed of with no regard for future use. It can be a valuable resource if addressed correctly, through policy and practice. With rational and consistent waste management practices there is an opportunity to reap a range of benefits.

Conclusions

The researchers therefore concluded that:

1. Not all of the students are fully aware in waste segregation and waste management, but some of the students here in Bulacan State University, especially the first-year to fourth-year students know the principle of waste management and the implication of improper waste management.
2. They say that waste management is not their priorities because they are just simple students. They prioritize their studies more.
3. The students are aware of what waste management is and what to do about that but they are not totally practicing it.
4. Students are fully knowledgeable about the serious effects of environmental problems if we do not practice waste management processes.
5. The students are willing to include themselves in environmental activities that can help to lessen environmental problems especially the NSTP programs.

Recommendation

1. Researchers recommend to the college students not only to be students but to know more about waste segregation by joining some school campaign about the matter or simply by being well-disciplined on how to recycle the garbage that can be used and turn into more useful things. By that simple act, students can help lessen waste pollution and maybe the professor or instructor may start with the freshmen for they are the future young leaders of the school.
2. Based on this foregoing study, researchers found that many of us is not aware of what waste pollution is so we want to help in lessening this problem by encouraging the youth to have knowledge about it by listening to their professor's campaign against waste pollution. The youth can help lessen waste pollution by their own if they are really willing to do so.

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