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NON-BIODEGRADABLE WASTE – ITS IMPACT & SAFE DISPOSAL

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ABSTRACT

Waste is defined as discarded material which has no value in normal use or for ordinary use. Solid wastes are those undesirable, useless and unwanted materials and substances that come from human and animal activities. Generation of wastes is inevitable. The management of wastes assumes importance in view of the environmental hazards they pose.

According to UNICEF, the solid waste can be classified into biodegradable and non biodegradable waste. Biodegradable waste, that are completely decomposed by biological processes either in presence or in absence of air are called biodegradable. e.g. Kitchen waste, animal dung, agricultural waste etc.

Non- biodegradable waste, which cannot be decomposed by biological processes is called non- biodegradable waste. These are of two types - Recyclable: waste having economic values but destined for disposal can be recovered and reused along with their energy value. e g. Plastic, paper, old cloth etc. Non-recyclable: waste which do not have economic value of recovery. e.g. Carbon paper, thermo coal, tetra packs etc. Disposal of non-biodegradable waste is a major concern, not just plastic, a variety of waste being accumulated. There are a few ways to help non-biodegradable waste management. In the present study we have discus about the impact of non biodegradable waste on the environment and also focus on its safe disposal for sustainable environment.

Keywords: Non- Biodegradable Waste, Environmental Impact And Safe Disposal.

I. INTRODUCTION

India is developing country with 16 per cent of the world population and two percent of the total land area. The exponential increase in industrialization is not only consuming large areas of agricultural land but simultaneously causing serious environmental degradation. Industrialization and urbanization have resulted on discharge of large wastes is rich in organic matter as well as in nutrients. There are enormous quantities of industrial solid organic wastes available outside the farm from different sources and they are yet to be used judiciously in crop production. If, these wastes are properly disposed so that it do not contribute to the problem of pollution. Waste is defined as discarded material which has no value in normal use or for ordinary use. Solid wastes are those undesirable, useless and unwanted materials and substances that comes from human and animal activities.

Waste is any unavoidable material resulting from domestic activity or industrial operation for which there is no economic demand and which must be disposed of. (Uchegbu, 2002). Waste is also conceived as any unwanted material. Waste is also defined as materials which though may no longer be needed here may become feed stock or raw material elsewhere. Wastes do not, therefore, altogether apply to worthless substances. Wastes are generally categorized into solid and liquid waste, which are materials discharged in household dustbins, flushdown toilets and chemical processing. Several authors (Isirimah, 2002; Gobo and Ubong, 2001; Ucheghu,2002) have agreed that household wastes include: bottles, vegetable trimmings, cans, plastics, sludge and sewage, garbage, rubbish, large waste from homes such as old furniture. food wastes, paper, cardboard, textiles, leather, yard wastes, wood, glass, tins, aluminum, rags, beddings, feaces, urine etc.

II. ORIGIN OF WASTE

Waste generation is a natural outcome of many of the human activities. Generation of wastes is inevitable. The management of wastes assumes importance in view of the environmental hazards they pose. The different types of wastes are dealt in detail below:

2.1 Municipal Solid Waste

Municipal Solid Wastes are all those wastes arising from human and animal activities that are normally solid and which are discarded as useless or unwanted. The Municipal bodies are responsible for the collection and proper disposal of municipal solid waste as per the Municipal Solid Waste Management Rules, 2000 notified under Environment Protection Act, 1986. The PPCC is the nodal body overseeing the implementation of the Rules.

Rapid increase in population and urbanization and the consequent increase in the volume of Municipal solid waste making it difficult to manage with the existing infrastructure facilities.

Changing lifestyles and consumption patterns with ‘use and throw’ products result in increase in the per capita generation of waste. It is estimated that on an average there is generation of 400 gms of waste (garbage) per person per day. Increasing income levels and consumerism has lead to generation of more wastes. Obviously the proportion of non-biodegradable wastes such as plastics is on the rise.

2.2 Industrial Solid & Hazardous Wastes

Hazardous wastes are characterized mainly by their properties like ignitability, corrosivity, reactivity, toxicity and persistence. These wastes pose a substantial danger to our health and environment. Due to their distinct properties and by way of ingestion, inhalation, contact etc. they affect human beings adversely. The Hazardous Wastes (Management and Handling) Rules, 1989 (as amended in 2003) envisage a proper mechanism for handling, treatment and disposal of the Hazardous Wastes. Under the Rules it is the responsibility of the individual industries to collect, store, transport & dispose of the industrial solid & hazardous wastes. PPCC is the regulatory body.

With the increase in number of industries and the consequent rise in the industrial output the industrial waste generation also has increased. The main industrial sectors that are generating hazardous wastes in the U.T. are those manufacturing chemicals, pharmaceuticals, Paints/ Pigments, Electronics, Engineering, Textiles, Tiles, Distilleries and Waste re-processing units. Certain processes like electroplating generate more hazardous wastes.

III. BIOMEDICAL WASTE

Wastes being generated by the hospitals/nursing homes can broadly be grouped into three categories i.e. (1) domestic wastes (2) hazardous wastes and (3) infectious wastes.

Domestic wastes generated are similar to the municipal (domestic) solid waste and if properly segregated (without being contaminated) these can be collected, transported and disposed of along with the municipal solid wastes. Hazardous wastes generated in hospitals primarily comprise of discarded and off - specification chemicals and consumables, the packaging of the medicines, radioactive materials and other such materials which are hazardous. Infectious wastes being generated in hospitals and nursing homes are a matter of concern as there is a danger of spread of diseases. Under the Biomedical Wastes (Management & Handling) Rules, 1998 it is the responsibility of the individual generator to safely dispose of the biomedical waste. PPCC is the regulatory agency overseeing the implementation of the Rules.

Increase in population and the consequent need for more health facilities, incidence of disease, occupational health disorders, etc., are the main pressures. Lack of adequate health facilities in the surrounding areas of the neighboring states also creates pressure in the sense that people from those areas come to the U.T. for treatment. Changing lifestyles and consumption patterns coupled with sedentary lifestyle is also an important pressure.

Increased awareness regarding health, hygiene and the fear of spread of infectious diseases has lead to the use of disposable syringes in place of reusable glass syringes. This has significantly increased the waste generation.

IV. IMPACT OF DIFFERENT TYPES OF WASTES

The possible impacts are detailed below:

4.1 Municipal Solid Waste

Unscientific disposal of collected municipal solid waste poses the following problems:

- The food and other organic wastes attract insects such as flies, which in turn cause a menace to the nearby residents. This also results in emission of bad odour. The main reason for vehement opposition of the nearby residents for the disposal of municipal solid waste is the problem of bad odour and flies.(In the U.T. land is a scarce resource)
- Improper disposal of plastics often leads to blockage of sewer pipes etc. leading to unhygienic conditions.
- Inadvertent consumption of plastics among the solid waste by animals, thereby affecting them.
- Improper disposal attracts pigs, which may lead to incidence of diseases like brain fever etc.
- Leachate from the disposal site may contaminate ground water.

4.2 Industrial Waste

The major problem with the industrial waste is that its improper disposal may result in the contamination of ground water. In a study carried out by PPCC on the impact of Acid Slurry Units on ground water it is noted that improper handling of raw materials and indiscriminate disposal of effluents in some of the Acid Slurry manufacturing units has resulted in contamination of ground water (pH and Conductivity are affected).

4.3 Biomedical Waste

If incinerators are not operated properly to maintain sufficient residence time, residence temperature and turbulence, there is more harm caused in the form of emission of toxic gases including dioxins (in case of chlorinated plastics). Improper disposal of disposable syringes etc. results in illegal recycling. Similarly disposal of sharps without shredding often causes injuries to the persons handling the same. If the biomedical waste is not disinfected there is possibility of spread of infections.

4.4 Impact of Poor Disposal of Refuse on Human Health

The importance of health to man can never be over emphasized. No man can function beyond the state of his health. Whatever is capable of affecting the health of man adversely should be adequately addressed. One of such problems is improper refuse disposal. Man can never be disassociated from refuse generation. Refuse emanates from the activities of man It therefore becomes necessary to educate man on proper disposal of these refuse. Improper disposal of refuse constitutes a threat to human health (Lucas and Gilles, 1990). Poor disposal of refuse is a public health problem and thus impacts negatively on human health. Heaps of improperly disposed refuse enhances the breeding of rodents, vectors and emission of bad odours which are transmitters of various forms of diseases. Where refuse are not properly stored and disposed, insects, rodents and bad odours abound (Lucas and Gilles, 2003). A nuisance condition becomes the outcome. Components of refuse include empty tins, bottles, tyres, plastic containers and even drums (Ojo and Briggs, 2002). All these are capable of holding water thus serve as a very good breeding ground for mosquitoes. Where drains are turned into dumping grounds for refuse, it also becomes a very good breeding ground for mosquitoes. The outcome of this is human infestation with malarial parasites. Vectors include flies which are implicated in the transmission of feco-oral diseases, culex mosquitoes transmit microfilaria and aedes mosquitoes transmit dengue and yellow fever (Ojo and Briggs, 2002). Rodents are capable of transmitting various forms of diseases such as plague, salmonella and leptospirosis (Lucas and Gilles, 2003). Rodents also attract snakes whose bite can even kill especially where immediate intervention with anti-snake venom is not easy to come by (Lucas and Gilles 2003). . The air also becomes polluted giving rise to diseases like tuberculosis and other forms of respiratory tract infections (Mishra 2003). Surface or underground water is capable of being contaminated through the washing of the refuse by storms and floodwater into these sources of water. Water becomes contaminated and unfit for human consumption (Williams, 1997). Unfortunately in places where water supply is not proper, people will still consume this water and thereby become susceptible to one form of water borne disease or the other. Those that live in the water side empty their human waste into the same water that they use for drinking and cooking. The end result of this ignorant act is water borne diseases. Typhoid fever has become like a household name in this city. Water borne diseases include cholera, dysentery, and typhoid fever and as well as guinea worm infestations (Williams, 1997). The aesthetic aspect of poor refuse disposal cannot be missed out. The improperly disposed refuse might be further scattered and littered all over the area by animals and birds thereby producing an ugly sight. The odour from the decomposed stuff depending on the components of the refuse pollutes the air around the area making it unhealthy for inhalation. Inhaling this polluted air which is inevitable tantamount to inhaling various forms of micro-organisms which cause different types of diseases. In this instance it is the poor that will be affected most. This so because in the developing countries, the poor live in the slums, polluted and congested areas. The poor, the undernourished, the very young, the very old and those with pre-existing respiratory tract diseases and other illnesses are more vulnerable to the health effect of air pollution (Mishra, 2003). Heaps of improperly disposed refuse further narrows roads, increases traffic congestion, blocks the views of drivers and predisposes to road carnages. This further puts human lives at risk.

V. METHODS OF SAFE DISPOSAL OF NON-BIODEGRADABLE WASTE

(a) Recycling-

Biodegradable plastics that enter the municipal waste stream may result in some complications for existing plastic recycling systems. For example, the addition of starch or natural fibres to traditional polymers can complicate recycling processes (Scott 1995; Hartmann & Rolim 2002). Although it is feasible to mechanically recycle some bioplastic polymers such as PLA a few times without significant reduction in properties (Claesen 2005), the lack of continuous and reliable supply of bioplastic polymer waste in large quantity presently makes recycling less economically attractive than for conventional plastics. Finally, for certain applications such as food packaging (e.g. in modified atmosphere packaging of meat products), multilayer lamination of different biopolymers may be necessary to enhance barrier properties, just as in conventional plastics (Miller 2005), and this will compromise recyclability of the scrap during packaging manufacture and of post-consumer waste. The recycling of plastics is considered in more detail elsewhere in this volume (Hopewell *et al.* 2009).

(b) Incineration with energy recovery-

Most commodity plastics have gross calorific values (GCV) comparable to or higher than that of coal (Davis & Song 2006). Incineration with energy recovery is thus a potentially good option after all recyclable elements have been removed. It is argued that petrochemical carbon, which has already had one high-value use, when used again as a fuel in incineration represents a more eco-efficient option than burning the oil directly (Miller 2005).

Reports by the Environment Committees of the UK Parliament (House of Commons 1993; House of Lords 1994) have supported the view that energy recovery for some types of household plastic wastes is an acceptable waste management option. Trials conducted by the British Plastics Federation demonstrated that modern waste-to-energy plants were capable of burning plastic waste, even those containing chlorinated compounds such as PVC without releasing dangerous or potentially dangerous emissions of dioxins and furans (BPF 1993). In 2005/2006, around 8 per cent (approx. 3 million tonnes) of UK municipal waste was processed through 15 incineration facilities (www.defra.gov.uk/environment/statistics/waste) and over 40 million tonnes were incinerated within the EU in around 230 incineration facilities (Musdalslien & Sandberg 2002). It is envisaged that incineration will face continued resistance in the UK unless the public is convinced about the safety of incineration and its contribution to renewable energy supplies (Miller 2005).

Energy recovery by incineration is regarded as a suitable option for all bioplastic polymers and renewable (bio)resources in bioplastic polymer products are considered to contribute *renewable energy* when incinerated (www.european-bioplastics.org). Natural cellulose fibre and starch have relatively lower GCV than coal but are similar to wood and thus still have considerable value for incineration (Davis & Song 2006). In addition, the production of fibre and starch materials consumes significantly less energy in the first place (Patel *et al.* 2003), and thus contributes positively to the overall energy balance in the life cycle. At present, the lack of scientific data on GCV of bioplastic polymers (e.g. relative importance of moisture content (MC), etc.) makes it difficult to accurately determine their value for energy recovery by incineration—further research in the area is required.

(c) Landfill-

Landfill of waste plastics is the least favoured option in the UK waste hierarchy. It was attractive historically as it was extremely simple and cheap without necessary separation, cleaning or treatment. Western Europe sent 65 per cent of the total recoverable plastics in household waste (8.4 million tonnes annually) to landfill in 1999 (APME 2002). However, suitable sites for landfill across Europe are running out and public concerns are increasing about the impact of landfill on the environment and health from the amount of toxic materials in land-filled municipal waste and their potential leaching out of landfill sites (Miller 2005). Reducing the quantities of waste that ultimately ends up in landfill has become explicit government policy (e.g. Landfill Directive European Commission 1999/31/EC) in the UK and represents a particularly difficult task to achieve (e.g. approx. 60% municipal waste in England is still landfilled in comparison with approx. 37% in France and approx. 20% in Germany (EEA 2007)).

The landfill of biodegradable materials including bioplastic polymers, garden and kitchen waste presents a particular problem in that methane, a greenhouse gas with 25 times the effect of CO_2, may be produced under anaerobic conditions (Hudgins 1999). While such a ‘landfill gas’ can and is captured and used as an energy source, The Landfill Directive (99/31/EC) seeks to reduce the total amount of biodegradable municipal waste (BMW) going to landfill in three successive stages eventually to 35 per cent of the 1995 total of BMW by 2020.

(d) Biological waste treatments: composting or anaerobic digestion-

Unlike conventional petrochemical-based polymers, biodegradable and compostable bioplastic polymers can be composted. This can be via aerobic waste management systems such as composting to generate carbon- and nutrient-rich compost for addition to soil. In the UK, there are now more than 300 composting sites that collectively compost about 2 million tons of waste annually (roughly 75% of which is household waste, 5% municipal non-household waste and 20% commercial waste: http://www.organics-recycling.org.uk/). Certain BDPs are also suitable for anaerobic digestors whereby bio-wastes can be converted to methane, which can be used to drive generators for energy production.

VI. RECOMMENDATIONS FOR FUTURE WASTE MANAGEMENT PRACTICES

Throughout discussions on waste disposal practices, recommendations were provided to improve current waste management practices in their communities. Their suggestions concentrated on two main areas of waste disposal; segregation and recycling. They pointed out for example that, separating garbage at home into recyclable, compostable, and toxic materials would be important steps in decreasing the amount of garbage sent to the community waste site. It was also indicated that the recycling of plastics, papers and batteries could be introduced as a first step for waste reduction. Today we were in favor of incorporating recycling at the household and community level. They indicated that special recycling bins could be distributed to individual homes in the community or could be located in designated locations where community members could then drop off their recyclables.

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