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SOILD WASTE MANAGEMENT RISKS AND PROBLEMS ASSOCIATED WITH SOILD WASTE

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Solid Waste Management

Solid *waste* can be defined as material that no longer has any value to the person who is responsible for it, and is not intended to be discharged through a pipe'. It does not normally include human excreta. It is generated by domestic, commercial, industrial, healthcare, agricultural and mineral extraction activities and accumulates in streets and public places. The words "garbage", "trash", "refuse" and "rubbish" are used to refer solid wastes. Solid waste management includes all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes', It involves collection, transport, processing, recycling or disposal of waste materials. Waste management is also carried out to reduce the materials' effect on the environment and to recover resources from them.

Waste management practices differ for developed and developing nations, for urban and rural areas, and for residential and industrial areas", Management for non-hazardous residential and institutional waste in metropolitan areas is usually the responsibility of local government authorities; while management for non-hazardous commercial and industrial waste is the responsibility of die generator.

Types of Solid Wastes

Solid waste can be classified into different types depending on their source[3]:

a) House hold waste is generally classified as municipal waste,
b) Industrial waste as hazardous waste and
c) Biomedical or hospital wastes as infectious wastes.

Simple or Complex?

Many people feel that solid waste management is a simple affair - simply putting waste into a vehicle and unloading it at a dump. If this were true, then why do so many towns suffer from uncollected refuse blocking streets and drains, harbouring flies and rats, and degrading urban environments? Successful solid waste management is rarely achieved without thought, effort and much learning from mistakes. Engineers may feel that' any engineer, without special training or experience, can solve solid waste management problems. There is much evidence to show that this is not true, perhaps mainly, because solid waste management is much more than a technological issue - it usually involves managing a large workforce and working together closely with the public. Problems with

maintenance and financial aspects are common. Engineers -often make mistakes in the 'selection of equipment, since vehicles and machines that work well in industrialized countries are often grossly inadequate in developing countries". The preparation and management of a good. Solid waste management system needs inputs from a range of disciplines, and careful consideration of local conditions.

Risks and Problems Associated with Solid Wastes

If solid wastes are not managed properly, there are many negative impacts that may result. Some of the most important are mentioned in the following list5,6,7,8. The relative importance of each depends very much on local conditions.

- Uncollected wastes often end up in drains, causing blockages which result in flooding and unsanitary conditions.
- Flies breed in, some constituents of solid wastes, and flies are very effective vectors that spread disease.
- Mosquitoes breed in blocked drains and in rainwater. Mosquitoes spread disease, including malaria and dengue.
- Rats find shelter and food in waste dumps. Rats consume and spoil food, spread disease, damage electrical cables and other materials and inflict unpleasant 'bites.
- The open. Burning of waste causes air pollution; the products of combustion include dioxins which are particularly hazardous.
- Aerosols and dusts can spread fungi and pathogens from uncollected and decomposing wastes.
- Uncollected waste degrades the urban environment, discouraging efforts to keep streets and open spaces in a clean and attractive condition. Solid waste management is a clear indicator of the effectiveness of a municipal administration - if the provision of this service is inadequate large numbers of citizens (voters) are aware of 'it. Plastic bags are a particular aesthetic nuisance and they cause the death of grazing animals which eat them.
- Waste collection workers face particular. Occupational hazards, including strains from lifting, injuries from sharp objects and traffic accidents.
- Dumps of waste and abandoned vehicles block streets and other access ways.
- Dangerous items (such as broken glass, razor blades, hypodermic needles and other healthcare wastes, aerosol cans and potentially explosive containers and chemicals from industries) may pose risks of injury or poisoning, particularly to children and people who sort through the waste.
- Heavy refuse collection trucks can cause significant damage to the surfaces of roads that were not designed for such weights.

- Waste items that are recycled without being cleaned effectively or sterilized can transmit infection to later users. (Examples are bottles and medical supplies).
- Polluted water (leachate) flowing from waste dumps and disposal sites can cause serious pollution of water supplies. Chemical wastes (especially persistent organics) may be fatal or have serious effects if ingested, inhaled or touched and can cause widespread pollution of water supplies.
- Large quantities of waste that have not been placed according to good engineering practice can slip and collapse, burying and killing people.
- Waste that is treated or disposed of in unsatisfactory ways can cause a severe aesthetic nuisance in terms of smell and appearance.
- Liquids and fumes, escaping from deposits of chemical wastes (perhaps formed as a result of chemical reactions between components in the wastes), can have fatal or other serious effects.
- Landfill gas (which is produced by the decomposition of wastes) can be explosive if it is allowed to accumulate in confined spaces.
- Fires on disposal sites can cause major air pollution, causing illness and, reducing visibility, making disposal sites dangerously unstable, causing explosions of cans, and possibly spreading to adjacent property.
- Former disposal sites provide very poor foundation support for large buildings, so buildings constructed on former sites are prone to collapse.

Waste Management Methods

Waste management methods vary widely between areas for many reasons, including type of waste material, nearby land uses, and the area available[9],

Landfill

Disposing of waste in a landfill is one of the most traditional methods of waste disposal, and it remains a common practice in most: countries, historically, landfills were often established in disused quarries, mining voids or borrow pits[10]. A properly – designed and well-managed landfill can be a hygienic and relatively inexpensive method of disposing of waste materials in a way that minimizes

Older, poorly-designed or poorly-managed landfills can create a number of adverse environmental impacts such as wind-blown litter, attraction of vermin, and generation of leachate where result of rain percolating through the waste and reacting with the products of decomposition, chemicals and other materials in the waste to produce the leachate which can pollute groundwater and surface water. Another byproduct of landfills is landfill gas[11] (mostly composed of methane and carbon dioxide), which is produced as organic

waste breaks down anaerobic ally. This gas can create odour problems, kill surface vegetation, and is a greenhouse gas.

Design characteristics of a modem landfill include methods to contain leachate, such as clay or plastic lining material. Disposed waste is normally compacted to increase its density and stabilize the new landform, and covered to prevent attracting vermin (such as mice or rats) and reduce the amount of wind-blown litter. Many landfills also have a landfill gas extraction system installed after closure to extract the landfill gas generated by the decomposing waste materials. Gas, is pumped out of the landfill using perforated pipes and flared off or burnt in a gas engine to .generate electricity[11].

Methane a far more potent greenhouse gas than carbon dioxide that constitutes the gobal warming and climate change. Many local authorities, especially in urban areas, have found it difficult to establish new landfills due to opposition from owners of adjacent land. Few people want a landfill in their local neighborhood. As a result, solid waste disposal in these areas has become more expensive as material must be transported further away for disposal[12].

This fact, as well as growing concern about the impacts of excessive materials consumption, has given rise to efforts to minimize the amount of waste sent to landfill in many areas. These efforts include taxing or levying waste sent to landfill, recycling the materials, converting material to energy, designing products that use less material, and legislation mandating that manufacturers become responsible for disposal costs. of products or packaging[12]. A related subject is that of industrial ecology, where the material flows between industries is studied. The by-products of one industry may be a useful commodity to another, leading to a reduced materials waste stream. Some futurists have speculated that landfills may one day be mined: as some resources become scarcer, they will become valuable -enough that it. Would be economical to 'mine' them from landfills where these materials were previously discarded as valueless.

Incineration

Incineration is a waste disposal method that involves the combustion of waste at high temperatures. Incineration and other high temperature waste treatment systems are described as "thermal treatment", in effect, incineration bf1waste materials converts the waste into heat; gaseous emissions, and residual solid ash. Other types of thermal treatment include pyrolysis and gasification.

A waste-to-energy plant (WtE) is a modem term for an incinerator that bums wastes in high-efficiency furnace/ boilers to produce steam and/ or electricity and incorporates modem air pollution control systems and continuous emissions monitors. This type of incinerator is sometimes called an energy-from-waste (EfW) facility.

Incineration is popular in countries such as Japan where land is a scarce resource, as they do not consume as much area as a landfill. Sweden has been a leader' in using the

energy generated from incineration over the past 20 years. Denmark also extensively uses waste-to-energy incineration in localized combined heat-and power facilities supporting district heating schemes. Incineration is carried out both on a small scale by individuals and on a large scale by industry. It is recognized as a practical method of disposing of certain hazardous waste materials (such as biological medical waste), though it remains a controversial method of waste disposal in many places due to issues such as emission of gaseous pollutants.

Breaking down complex chemical chains such as dioxin through the application of heat usually cannot be done by simply burning the material at the temperatures seen in an open-air fire. It is often necessary to supplement the combustion process with gas or oil burners and air blowers to raise the temperature high enough to result in molecular breakdown. Alternately, the exhaust gases from a natural air fire may pass through tubes heated to sufficiently high temperatures to trigger thermal breakdown.

Thermal breakdown of pollutant molecules can indirectly create other pollution problems. Dioxin breakdown begins at 1000°C, but at the same time poisonous nitrogen oxides and ozone begin to form when atmospheric nitrogen and oxygen break down at 1600°C. This undesired oxide. Formation may require further catalytic treatment of the exhaust gases.

Pyrolysis & Gasification

Pyrolysis and gasification are two related forms of thermal treatment where waste materials are heated to high temperatures with limited oxygen availability. The process typically occurs in a sealed vessel under high pressure Converting material to energy in a sealed environment is potentially more efficient than direct incineration, with more energy able to be recovered and used.

Pyrolysis of solid waste converts the material into solid, liguid and gas products. The liquid oil and gas can be burnt to produce energy or refined into other products. The solid residue (char) can be further refined into products such as activated carbon.

Gasijication is used to convert organic materials directly into a synthetic gas (syngas) composed of carbon monoxide arid hydrogen. The gas is then burnt to produce electricity and steam. Gasification is used in biomass power stations to produce renewable energy and heat.

Resource Recovery

Resource recovery means the obtaining of some economic benefit from material that someone has regarded as waste. It includes

- reuse - being used for the same purpose again (such as refilling a soft drinks bottle);

- recovery – processing material so that it can be used again as the same material, such as the processing of waste paper to make pulp and then new paper;
- Conversion – processing the material to make something different (such as producing padding for clothing and sleeping bags from plastic bottles, or producing compost from food waste)
- energy recovery - usually referring to the burning of waste so that the heat can be used (for example, for heating swimming pools). Another method of energy recovery is to collect the gas that is produced in very large sanitary landfills and use it as a fuel or to generate electricity.

A relatively recent idea in waste management has been to treat the waste material as a resource to be exploited, instead of simply a challenge to be managed and disposed of There are a number of different methods by which resources may be extracted from waste: the materials may be extracted and recycled, or the calorific content of the waste maybe converted to electricity. The process of extracting resources or value from waste is variously referred to as secondary resource recovery, recycling, and other terms.

The practice of treating waste materials as a resource is becoming more common, especially in metropolitan areas where space for new landfills is becoming scarcer.

Some key factors that affect the potential for resource recovery are the cost of the separated material, its purity, its quantity and its location. The costs of storage and transport are major factors that decide the economic potential for resource recovery. In many low-income countries, the fraction of material that is won for resource recovery is very high, because this work is-done in a very labour-intensive way, and for very low incomes. In such situations the creation of employment is the main economic benefit of resource recovery. The situation in industrialized countries is very different, since resource recovery is undertaken by the formal sector, driven by law and a general public concern for the environment, and often at considerable expense.

Composting is an excellent method of recycling biodegradable waste from an ecological point of view. However, many large and small composting schemes have failed because composting is regarded as a disposal process, and not a production process.

Disposal

It appears that in most low-income countries, and many medium income countries, very little progress has been made in upgrading waste disposal operations. Open dumps, where the waste is unloaded in piles, make very uneconomical use of the available space, allow free access to waste pickers, animals and files and often produce unpleasant and hazardous smoke from slow-burning fires.

A sanitary landfill is a site where solid wastes are placed on or in the ground at a carefully selected location by means of engineering techniques that minimize pollution of

air, water and soil, and other risks to man and animals. Aesthetic considerations are also taken into account. In some major cities loans or grants have been used to construct sanitary landfills on sites that have been carefully chosen, but usually little attention is paid to the training of a site manager and to the provision of sufficient financial and physical resources to allow a reasonable standard of operation. As a result, some sites quickly degenerate into open dumps. It is crucial to good operations to have a motivated and trained site manager. It is recommended that the training for this position should include practical experience on wen-run sites.

Most sanitary land fill designs attach considerable importance to preventing polluted water (leachate) from escaping from the site. It has been shown that large quantities of leachate can be produced by landfills, even in semi-arid climates.

Most designs include expensive and carefully constructed impermeable prevent leachate moving downwards into the ground and drainage system to bring the leachate to a treatment plant or a storage tank. However, ie tank is not emptied before it overflows, or if the plant is not working, the leachate control system actually makes the pollution worse than from an open dump, because all the leachate is concentrated in one place, giving natural purification systems very little chance of reducing the pollution impact. This example shows that good design and construction can achieve nothing if they are not followed by good operation.

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