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Sample Material

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1. INTRODUCTION TO WASTE MANAGEMENT

1.1. Introduction

Today's increasingly modernized lifestyle, rising quality of life, rapid urbanization and advancement in technology, etc have all paved way for high rates of resource consumption all over the world. These consumption trends not only have a detrimental impact on the environment but are straining the existing waste handling capacities of governments and urban agencies. Cities are now faced with the problems of increasing volumes of waste, rising associated costs and the negative effect of wastes on the local and the global environment. This has led to a renewed focus on waste management and it is now a vital part of the infrastructure for cities, towns and countries. However, waste management practices are not uniform among countries. There is a vast difference in waste management practices between developed and developing nations as well as between urban and rural areas of a country. This presents a window of opportunity in the form of increasing awareness, applications of innovative technologies, joint ventures, etc.

For developing countries, waste management brings challenges such as lack of resources, weak government regulations, improperly managed waste systems, etc. In order to have an effective waste management system, it is imperative that there is a joint effort between government, industries and citizens. Many experts consider today's society as primarily a throwaway society where supplies are so inexpensive that it's easier to discard things rather than to repair or re-use them and the easy availability of disposable items have further added to this problem. Many households throw away large items without a second thought. Companies also often do not effectively manage their industrial and hazardous waste as well as harmful emissions that are caused due to their manufacturing processes. The generation of waste is to be expected in all industrial processes. Each industry is distinctive in its waste generation pattern. However, it is vital that these wastes are managed effectively and turned into resources whenever possible. Mismanagement of waste causes a huge burden on the resources as it costs governments to spend a lot of money on waste management methods.

Waste Management can ideally be defined as collection, transportation, disposal of garbage, sewage, and other waste products. Waste management includes management of all processes and resources for proper handling of waste materials, from maintenance of waste transport trucks and dumping facilities to compliance with health codes and environmental regulations.

An effective waste management system should ideally comprise of the following

- ✓ Provide an effective and customized handling of all waste with a minimum of effort for the various stakeholders.
- ✓ Ensure that there is minimal impact on the environment in terms of noise, air, water and soil pollution.
- ✓ Ensure that the maximum amount of resources are recovered from waste, while reducing the use of resources in waste handling
- ✓ Provide only minimum impact on the city with respect to traffic, vehicle exhaust, noise, traffic accidents and spill of waste
- ✓ Include architectural and infrastructure considerations in establishing waste collection and treatment facilities

- ✓ It should conform to all current laws, regulations and code of practice
- ✓ It should be economically viable
- ✓ Understanding the economics of waste management will lead to an understanding of the how's and why's of material flows

Along with the conventional solutions of waste management such as landfill and recycling, etc. There are also many alternative technologies such as anaerobic digestion systems, bio-drying, etc that are eco-friendly and are economically and operationally viable. These emerging technologies provide resolutions to not only deal with waste innovatively but also to lessen the social, economical and environmental costs traditionally associated with waste management. Reducing our trash output, recycling and composting our waste whenever possible as well as being environmentally friendly are some of the other ways we can make waste management effective as well as sustainable in the long run. These steps will go a long way in rejuvenating our cities and towns into environmentally friendly places with more green cover and cleaner air.

There is also a need to completely rethink the dynamics of waste management process. A rethinking that calls for waste to become resources those countries can benefit from. Waste can be reengineered to become another source of wealth for developing countries. It is essential that there is a shift from the existing method of waste disposal that concentrates on using high energy and high technology, to move more towards technology that uses low energy and low technology for waste processing and waste recycling. It is crucial that there is a higher public-private partnership to achieve waste management goals that are driven at the community level. The future of waste management depends on deeper community participation along with a multifaceted collaboration among the various stakeholders to full realise the economic, social and environmental benefits associated with it.

1.2. History of Waste Management

Ancient Times

Throughout most of history, the amount of waste generated by humans was insignificant due to low population density and low societal levels of the exploitation of natural resources. Common waste produced during pre-historic 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. The excavation of ancient rubbish dumps by archaeologists reveals only tiny amounts of ash, broken tools and pottery, telling us that these early civilizations reused and repaired what they could.

Archeological excavations of the dirt or clay floors of these earliest living quarters have found that bits of waste matter that fell on the floor was simply packed into the floor over time or brushed aside. Archeologists have referred to this as the "fringe effect." Households would bring in a supply of clean, fresh clay to spread over littered floors, resulting in the rise of elevation across early population centers. However, this solution became less viable as both population density and waste generation increased. As city populations grew, waste management systems became necessary to handle the waste stream. Crete, Athens and Rome are examples of ancient civilizations that began to establish rudimentary waste management systems. Rome established an organized waste collection teams to collect waste piled up in the streets. These workers transported the material in wagons to pits outside the city. 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. They also recycled.

Middle Ages

Until urban populations boomed, the garbage was not a threat. However, as cities grew, trash began piling up. When it piled up, it caused a stench, harbored rats and other pests, contaminated water supplies and led to the transmission of disease. The plagues that affected Europe from the 14th to the 16th centuries were often spread by the vermin that thrived in unsanitary urban conditions prevalent at that time.

The Bubonic Plague, cholera and typhoid fever, to mention a few, were diseases that altered the populations of Europe and influenced monarchies. It was not uncommon for Europeans to throw their garbage and even human wastes out of the window. They figured that stray dogs would eat whatever they threw out.

Some of the greatest plagues to curse humanity resulted from these unsanitary living conditions. Early waste management techniques developed during this period as a way to prevent the spread of disease. Reuse and recycling existed, too, as a normal part of everyday life. Early recycling included feeding vegetable waste to livestock and using green waste as fertilizer. Pigs were often used as an efficient method of disposing of organic waste. Timber was salvaged and reused in construction and ship-building. Materials such as gold were melted down and re-cast numerous times.

Industrial Revolution

During the Industrial Revolution in the 18th century, Europe and the United States were rapidly developing in areas of product innovation, machinery development, and trade. These advances were stimulated by the availability of raw materials and growing ranks of laborers. This time of growth also created significantly greater amounts of waste. Government officials and the public alike were concerned. To avoid the potential problems associated with unmanaged waste in urban areas, the ""Age of Sanitation"" began. Many communities organized waste collection and instituted disposal systems in this sweeping effort aimed at maintaining public health.

These efforts did not put an end to scavengers, who performed a recycling function by selling what they could find in 'the rubbish. They were even able to sell dog faeces, used by tanners for treating leather. Scavengers could be innovative. In England, scavengers were even classified by what they collected. They included:

- ✓ Toshers, who worked in the sewers and were able to find coins, bits of metal, ropes and sometimes even jewelry.
- ✓ Mud-larks, who scavenged river banks for salvageable material.
- ✓ Dustmen, who collected ash from coal fires. These men, women and children worked at dust yards to sieve the brieze (coarse section of the dust) from the finer portions so it could be used as a soil conditioner. The "fines" could be mixed with clay to make bricks

Modern Era

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 to dramatically improve the waste industry and in turn human health and well-being.

In 1900, there was still significant progress to be made. For instance, piggeries were facilities where swine were fed fresh or cooked garbage. This clearly had potential public health implications. An expert estimates that 75 pigs could consume 1 ton of refuse per day. Though efficient in processing garbage, the practice fell out of favor (so much so that some 400,000 hogs were slaughtered in the mid-1950s to prevent the spread of disease).

By 1910, nearly 80 percent of American cities had some sort of organized solid waste collection. The earliest of these involved men collecting waste with horse or mule-drawn carts. With the advent of the automobile, garbage trucks began to roll on American streets

By the 1920s, dumps became a popular waste disposal method in which wetlands were simply filled with layers of garbage, ash and dirt. They are a far cry from today's landfills. Modern landfills are highly technical enterprises that are built with safety and environmental protection in mind, carefully engineered and monitored to protect the groundwater, minimize odours and pests, control emissions, and increasingly, to serve as sources of energy generation.

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 emissions to minute levels while producing enough electricity to power more than 1 million homes.

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 American municipal 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.