3R's Concept: Reduce, Reuse & Recycle

Shaikh Umar[1] Patel Sehab[2] Patel Yagnik[3]
[1,2]Research Scholar [3]Professor
[1,2,3]Department of Civil Engineering
[1,2,3]Sardar Patel College of Engineering, Anand, India

Abstract— It is major problem in India, to manage and dumping of solid waste. Due to these problems like air pollution, ground water pollution, bad smelling &mosquitoes generated which create diseases. Overall its bad hallmark on city map. In particulars Ahmadabad population is 55.6 lakh and spread over an area of 466 sq. km. All most 3500 metric tons of solid waste is generated on daily basis including 300 metric tons of construction & demolition debris.

Key words: Solid, Waste, Management, Reduce, Reuse, Recycle, Materials

I. INTRODUCTION

Management of solid waste reduces or eliminates adverse impacts on the environment and human health and supports economic development and improved quality of life.

India is the second largest nation in the world, with a population of 1.21 billion, accounting for nearly 18% of world's human population, but it does not have enough resources or adequate systems in place to treat its solid wastes. Its urban population grew at a rate of 31.8% during the last decade to 377 million, which is greater than the entire population of US, the third largest country in the world according to population. India is facing a sharp contrast between its increasing urban population and available services and resources. Solid-waste management (SWM) is one such service where India has an enormous gap to fill. Proper municipal solid waste (MSW) disposal systems to address the burgeoning amount of wastes are absent. The current SWM services are inefficient, incur heavy expenditure and are so low as to be a potential threat to the public health and environmental quality. Improper solid waste management deteriorates public health, causes environmental pollution, accelerates natural resources degradation, causes climate change and greatly impacts the quality of life of citizens.

The present citizens of India are living in times of unprecedented economic growth, rising aspirations, and rapidly changing lifestyles, which will raise the expectations on public health and quality of life. Remediation and recovery of misused resources will also be expected. These expectations when not met might result in a low quality of life for the citizens. Pollution of whether air, water or land results in long-term reduction of productivity leading to a deterioration of economic condition of a country. Therefore, controlling pollution to reduce risk of poor health, to protect the natural environment and to contribute to our quality of life is a key component of sustainable development.

II. PER CAPITA MSW GENERATTION

The per capita waste generation rate is strongly correlated to the gross domestic product (GDP) of a country (Table 1). Per capita waste generation is the amount of waste generated by one person in one day in a country or region. The waste generation rate generally increases with increase in GDP. High income countries generate more waste per person compared to low income countries due to reasons discussed in further sections. The average per capita waste generation in India is 370 grams/day as compared to 2,200 grams in Denmark, 2,000 grams in US and 700 grams in China.

Waste generation rate in Indian cities ranges between 200 - 870 grams/day, depending upon the region's lifestyle and the size of the city. The per capita waste generation is increasing by about 1.3% per year in India.

Cities in Western India were found to be generating the least amount of waste per person, only 440 grams/day, followed by East India (500 g/day), North India (520g/day), and South India. Southern Indian cities generate 560 grams/day, the maximum waste generation per person.

Country	Per Capita Urban MSW Generation (kg/day)
Low Income Countries	0.6 - 1.0
Middle Income Countries	0.8 - 1.5
High Income Countries	1.1 - 4.5

Table 1: Comparison between the Per Capita MSW Generation Rates in Low, Middle and High Income Countries

III. IMPACT ON MSW GENERATION & DISPOSAL

The waste generation rate generally increases with increase in GDP during the initial stages of economic development of a country, because increase in GDP increases the purchasing power of a country which in turn causes changes in lifestyle. Even a slight increase in income in urban areas of developing countries can cause a few changes in lifestyle, food habits and living standards and at the same time changes in consumption patterns. Therefore, high income countries generate more waste per person compared to low income countries due to the difference in lifestyles.

Population growth and rapid urbanization means bigger and denser cities and increased MSW generation in each city. The data compiled for this report indicate that 366 cities in India were generating 31.6 million tons of waste in 2001 and are currently generating 47.3 million tons, a 50% increase in one decade. It is estimated that these 366 cities will generate 161 million tons of MSW in 2041, a five-fold increase in four decades. At this rate the total urban MSW generated in 2041 would be 230 million TPY (630,000 TPD).

Year	Population (Millions)	Per Capita	Total Waste generation
2001	197.3	0.439	31.63
2011	260.1	0.498	47.30
2021	342.8	0.569	71.15
2031	451.8	0.649	107.01

2036	518.6	0.693	131.24
2041	595.4	0.741	160.96

Table 2: Population Growth & Impact on Overall Urban Waste Generation & Future Predictions Until 2041

IV. REDUCE, REUSE & RECYCLE

This chapter highlights the 3R concept—reduces, reuse, and recycle— as the state-of-the-art philosophy in waste management. Waste is reduced, reused, or recycled in order to minimize the amount that ends up in landfills. Waste must be regarded as a potential resource, so it is essential to make the best use of this material. Through minimization, recovery, and recycling, society not only saves scarce resources but also protects the environment and alleviates the burden on the public authorities that are responsible for managing waste.

The rapid pace of urbanization and change in people's lifestyles—especially for those with higher incomes—increases the consumption of products that have shorter life spans and higher volumes (paper, plastics, and the like). These products, as well as changes in food choices, are adding to the volume of waste burdening municipal authorities.

The still high fraction of organic waste in India suggests the need to develop strategies for recycling organic waste. Organic waste that can be segregated easily at the household level for further treatment can significantly reduce the amount of waste that must be disposed of. It also increases the value of that waste by facilitating the recycling of other materials in the waste stream.

This chapter provides information on the current practices of organic waste recycling in India and strategies for further improvements. It discusses the amount of recyclable materials currently available in the waste stream and informs on current and recommended measures and practices to strengthen the recycling sector, including its stakeholders (such as the informal sector of rag pickers). The goal is to show pathways that lead to improved reduction, reuse, and recycling and thereby to obtain more and better secondary raw material for the production sector. This chapter brings to the fore the unacknowledged services provided by informal rag pickers in conserving national resource and discusses various ways to enhance their contribution in this sector.

V. 3 R'S CONCEPT

The 3R concept is reduce, reuse, and recycle. The concept is based on the waste management hierarchy. This hierarchy classifies waste management strategies according to their potential to minimize waste. Waste reduction, reuse, and recycling are the main categories that we need to focus on regarding the 3R concept. As stated before, the main objective is to reduce the amount of waste that is disposed of in landfills.

The 3R concept fosters cooperation among waste generators, waste collectors, processors, and manufacturers. It aims at reducing waste to be disposed of in landfills, thereby reducing the deterioration of the environment, reducing the emissions that landfills produce, and saving energy and natural resources.

A. Waste Prevention, Reduction, or Minimization

Ideally, waste should be avoided. Waste that can be avoided stops being a burden for the municipality. Waste prevention is most effective if it is considered in the product design and production processes. By optimizing production processes, manufacturers can reduce waste or even allow it to be reused by another manufacturer. Valuable natural resources can therefore be saved.

B. Reuse

Reuse happens when something that already fulfilled its original function is used for another purpose. However, reuse does not involve reprocessing or transforming the item. For example, typical reuse strategies are the deposit refund system for glass bottles or polyethylene terephthalate (PET) water bottles, old tires that are used in fences or as boat fenders, steel drums that are reused as compost bins, or plastic bags that are reused as liners for household waste bins.

C. Recycling

Recycling means the reprocessing of used materials that would otherwise become waste. It breaks material down to its main component and produces new products. Recycling is most common for valuable materials or materials that are costlier if produced from virgin raw materials (such as metal, plastic, glass, and electronic waste). Recycling of organic matter produces compost, which can be used as a soil enricher in gardens and horticulture and which contributes to improved agricultural production.

D. Recovery

Recovery relates mainly to energy recovered from waste. Waste that cannot be reused or recycled can be, for example, incinerated to generate heat or electricity. Another option for organic waste is anaerobic digestion to produce biogas. The appropriateness of such recovery strategies depends on the composition and calorific value of waste.

VI. RECYCLING MATERIAL

Almost every material can be recycled; however, the value of the recycled material can vary significantly depending on the demand and uses for it. Indeed the value of a material is the driving factor for private recycling initiatives or—in the case of many developing countries—the informal sector. If and how a material is recycled depends not only on local policies but also on the availability of a buyer, processing facilities, and a transport chain.

Advantages of recycling are as follows:

– For the managers of waste
1) Reduction of waste volume
2) Cost savings in collection, transport, and disposal
3) Longer life span for landfills
4) Reduction of adverse environmental impacts

– For the economy
1) Reduction of imports (for fertilizers or soil amendments)and thus less foreign currency required
2) Job opportunities and income for the people
3) Cheap products (made from recycled materials) for the poor

– For the environment

1) Sustainable use of resources: for example, less energy
2) consumption and thus less pollution
3) Reduced amount of waste going to storage sites,resulting in a more man-ageable system

VII. TYPES OF BUILDING MATERIALS

A. *Newspaper Wood*

This design comes from Norway, where over 1m tons of paper and cardboard are recycled every year. The wood is created by rolling up paper and solvent-free glue to create something not dissimilar to a log, then chopping it into usable planks. The wood can then be sealed so it's waterproof and flame-retardant, and used to build anything you would normally build with wood.

Fig. 1: Newspaper Wood

B. *Bottle Bricks*

Fig. 2: Bottle Bricks

This proposal is a little different, as it relies on producing a consumer well specifically so it can later be used as a building material. Lots of companies now make bottles in cuboid or other tesselative shapes, to make them easier to transport.

But the practice of doing so to create construction materials actually started with beer company Heineken in the 1960s – Alfred Henry Heineken, owner of the brewery, visited a Carribean island and was dismayed at both lack of shelter, and the number of discarded Heineken bottles scattered everywhere. So the company landed on a new, brick-shaped design for the bottle, shown in the images above. The bottleneck slots into the base of the next bottle, forming an interlocking line.

REFERENCES

[1] Maria Gaviota Velasco Perez Alonso, Nickolas Themelis. Generation and Disposition of Municipal Solid Waste in Mexico and Potential for Improving Waste Management in Toluca Municipality. Waste-to-Energy Research and Technology Council (WTERT). [Online] 2011.
[2] Division of Technology, Industry and Economics. State of Wase Management in South East Asia, Types of Wastes - Sources and Composition. United Nations Environment Programme. [Online].
[3] Assessment of the Status of Municipal Solid Waste Management in Metro Cities, State Capitals, Class I Cities and Class II Towns in India: An Insight. Kolkatta: Central Pollution Control Board (CPCB), National Environmental Engineering Research Institute (NEERI), 2008.
[4] Ministry of New and Renewable Energy, MNRE. National Master Plan for Development of Waste-to-Energy in India. Ministry of Environment and Forests. [Online] 2003.
[5] Census of India, 2011. Census of India. [Online] 2011.

