

Waste - To Create and Innovate a Sustainable Environment and Beginning a New Era

Prof. Anshu Mathur¹, Ms. Pooja Mathur², Ms. Priyanka Mehra³

¹Assistant Professor, Dept. of Humanities & Social Science, JIET;

^{2, 3} B.Tech Student, Dept. of Electrical & Electronics Engg; JIET College of Engineering, Jodhpur;

Abstract: *The useless and unwanted products in the solid state derived from the activities of the discarding them by society is termed as Solid Waste. It is produced either by product of production processes or arise from the domestic or commercial sector when objects or materials are discarded after use. In order to keep the urban centers clean, the municipalities practise the techniques of solid waste management. However, it is among the most poorly rendered services in the basket. With rapid urbanization, the situation is becoming critical. Waste is littered all over leading to insanitary living conditions. The system applied are unscientific, obsolete and inefficient; population coverage is low and the poor are marginalized. The solid waste management basically includes two stages. The first one is the collection of waste by the municipalities. The second stage includes management of collected waste by treating it to produce the useful product. The emerging need to manage the waste around us and to reuse it in the best possible way in order to yield better results is on a greater pace now. The new technologies have been developed to make sure that the present generation utilize the resources and does not hinder the posterity for the same. The idea of waste collection, its segregation and recycling to reduce the waste generated and utilize it has become the need of hour. The segregation of domestic waste includes the use of different bins colored in green, blue and black. The garden and food waste which includes grass, hedge and shrub cuttings leaves and weeds is collected using green bin. The mixed dry recycling material like paper, cardboard, food packets etc. is collected using blue bin. The waste collected in black bin is treated as left over waste and is the ultimate waste which cannot be recycled into a useful product. We can adopt following solutions to build a Sustainable Society. By reducing CO₂ emissions in energy production, enhancing energy efficiency of our products, preventing Global Warming, by conservation of Resources Preservation of Ecosystem, collecting products for reuse or recycling and reducing negative effect on air, water & soil. The paper focusses on the various means by which solid waste can be treated and recycled to yield a product of utility for creating a sustainable environment.*

Keywords: *Solid waste management, sustainable society, ecosystem, sustainable environment.*

I. INTRODUCTION TO WASTE MANAGEMENT

There is an ample amount of waste produced by the countries all over the world. Americans are responsible for producing about 220 million tons of waste each year. This accounts for a great amount of waste than any other nation in the world. So, both the government and other environmental organisations have adopted the various solutions to deal with the problem. Waste management is one such method. It refers to collection, transportation and disposal of other waste products.

The term 'waste' refers to the discarded product which is comes as a by-product after utilizing any product. Broadly, waste can be categorised into solid and liquid waste. They can be further grouped into organic, reusable and recyclable.

A. Solid waste

Solid waste refers to any garbage, refuse or rubbish that is produced in our homes and other places. These include old car tyres, old newspapers, broken furniture and food waste. It includes the waste which is non-liquid.

B. Liquid waste

It refers to the waste material which is in non- solid form. This also accounts for the solid waste converted into liquid waste form for disposal. This includes wash water from homes, waste detergent and liquid cleaners used in industries.

C. Hazardous waste

This type of waste potentially threaten public health and environment. Such type of waste could be inflammable, reactive, corrosive or toxic. Proper disposal of such hazardous waste must be ensured. Examples of hazardous waste include pesticides, fire extinguishers, old propane tanks etc.

D. Organic Waste

Organic waste are biodegradable in nature and can easily be broken down by organisms and converted into manure. This includes vegetable and fruit peels, flower trimmings and food waste.

E. Recyclable waste

The waste which can be potentially recycled is called as 'recyclable waste'. It includes aluminium cans, plastics, glass and paper. Waste management is defined as the process of treating the solid waste and then recycling to use it in some or the other way. To use a garbage as a useful and valuable resource is its first and foremost task. It refers to all the activities involved in waste inception to its final disposal. The treatment of waste management includes eight major processes namely, reducing source of waste production and reuse, animal feeding, recycling, composting, fermentation, landfilling, incineration and land application.

- 1) fruit and vegetables
- 2) tea bags and coffee grounds
- 3) used tissues or paper kitchen towels
- 4) meat, fish and bone
- 5) rice, pasta and bread
- 6) plate scrapings

F. The garden waste includes the following waste products:

- 1) grass, hedge and shrub cuttings
- 2) plants and flowers
- 3) leaves and weeds

G. Mixed dry recycling (blue service)

This includes collection of dry recyclable waste. It includes following waste materials:

- 1) food tins and drinks cans
- 2) empty aerosol cans
- 3) cardboard boxes
- 4) cardboard food packets
- 5) greeting cards
- 6) toilet roll and kitchen roll inserts
- 7) food and drink cartons (with liquids removed)
- 8) newspapers and magazines

H. Non-recyclable waste (black service)

The waste which can neither be utilised into some useful form nor can be disposed off is termed as non-recyclable waste. This constitutes the ultimate waste products which cannot be recycled to form a useful product. They are to be disposed off. This includes collection of following materials:

- 1) disposable nappies
- 2) sanitary towels and incontinence pads (bagged)
- 3) polystyrene packaging
- 4) cotton wool pads and buds and make-up wipes
- 5) vacuum cleaner waste
- 6) textiles

I. Other Methods of Waste Disposal are as Mentioned as Given Below

- 1) **Landfills:** A wide area of land is used to bury in the waste and it is ensured that the odour and harmful contents of waste are removed before disposal. The biodegradable waste then buries with the soil and is disposed off. This is usually practised in developing countries. But landfills give rise to air and water pollution harming the human health and environment.

- 2) *Incineration/ combustion:* In this method of waste disposal, the municipal solid waste is burned at a very high temperature. This method has the potential of reducing the waste volume up to 20-30% of the original volume. This technology is utilised in the countries where large space for landfills is not available.
- 3) *Composting:* It is a natural method of treating biodegradable waste like leaves, vegetable peels etc. This method promotes organic farming by utilising the waste products in form of manure. It involves the microbial digestion of organic matter and converting into organic fertilizers. This method is practised in developing countries where agriculture is the backbone of the country.

J. Current Scenario of waste Management in INDIA

The urban population as per 2001 census is 285 million out of 1027 million overall population in India. The waste generated per capita is increasing by 1.3% per annum and with increasing urban population by 3-3.5% per annum, the increase in solid waste has accounted for about 5% every year. This accounts for 42.0 million tons of municipal waste generated per annum at present. Municipal authorities are responsible for implementing the strategies and developing the infrastructure for collection, storage, segregation, transportation, processing and disposal of municipal solid waste. The first city to develop Solid Waste Management (SWM) is Chandigarh. The present status of Solid Waste Management in India is poor because the best and most efficient methods for waste treatment have still not been developed. Lack of trained personnel in this field, undeveloped technology, insufficient budget and poor monitoring of government finance regulatory authority are the major barriers to achieving an efficient solid waste management in India.



Fig1. Solid waste management in India

K. Improving Waste Management in India

A strong regulatory authority to monitor and practise the waste management techniques in an efficient way must be established. Finance for proper functioning of waste management body infrastructure must be funded by imposing waste tax on waste producers. Awareness for waste management for promoting the sustainable development must be created among people through press, media and televisions.

L. Following Solutions are in Our Hands Which led us Towards a Sustainable Society

- 1) *Reduce CO₂ emissions in energy production:* Reduction in CO₂ emissions can be achieved by following solutions-
 - a) By capturing or scrubbing the carbon dioxide from the exhaust and flue gases, but this although technically feasible for some processes it would be prohibitively expensive for most processes, and certainly it is more costly than alternative measures.
 - b) By substituting lower-carbon fuels for the high-carbon fuels now in use, such as brown and black coal. The use of hydro-power or nuclear-generated electricity would produce no carbon dioxide, but there are other potential environmental problems with these fuels, and at the moment we could not readily substitute these sources for the petroleum products used in road and air transport.
 - c) By moving to machines, buildings, and industrial processes which produce the same services (heating, cooling, lighting, transport, electrolysis, etc.) with lower energy inputs; that is, to engage in greater levels of energy efficiency, such as more fuel-efficient motor vehicles or better insulated buildings.
 - d) More drastically by actually cutting back on the levels of economic activity per person, so that outputs, energy inputs, and carbon dioxide emissions are all cut.

- e) Ultimately by reducing our rate of population growth, which might other things equal allow us to increase our per-capita energy use and carbon dioxide production, while reducing the aggregate production of the gas. Some of the facts regarding carbon dioxide emission is under mentioned
- f) 50% approximate reduction in carbon emissions when coal is replaced with gas in power generation.
- g) 70% approximate reduction in emissions when Brazilian ethanol made from sugarcane which is used instead of conventional fuels.
- h) 65% reduction in greenhouse gas emissions at BP's Zhuhai 3 petrochemicals plant in china compared to conventional technology.
- i) 15 universities working together on the effects of natural resource scarcities as part of BP's energy sustainability challenge.
- 2) *Enhance energy efficiency of our products* : There are some few effective ways by which enhancement of energy efficiency of products can be done in our home:
 - a) *Reduction of heat transfer & Turn beneath thermostat*: During months of cold, most of the people turn on heater as they have much knowledge that heat produced up to 30 % is abstaining through the windows. Minimization of heat transfer can be done by installing energy efficient windows & by this energy can be saved. Throughout summer, need of air conditioning is minimized as these windows slacken heat transfer into the house.
 - b) *By purchasing energy efficient products* : One of the ingenious ways to increase energy efficiency is by buying energy efficient products. Refrigerators, dryers, washers and other new electrical appliances uses lesser energy in comparison to older ones. While purchasing those electrical appliances you should figure out for those one which are rated with 'energy star'. Smaller items like light bulbs have more energy efficient options as compare to bigger one electrical appliances.
 - c) *Wind/solar* : Enhancement of energy efficiency can be achieved as solar is one of the greatest options. Installation of solar panels can be done for achievement of overall energy grid or just for the water heater. Wind energy may be a more preferable choice, it depends on where we live.
 - d) *Reduction of spare/vampire power*: Appliances like televisions, lamps as well as the cellphone chargers can continue consuming energy even when it is in off mode. Reduction of our electric bill up to 20% can be obtained by unplugging these appliances when these are not in use & this will save energy. Surge protector should be attached & unplug them completely. This is one of the effective way by which energy efficiency can be enhanced.
- 3) *Prevention of Global Warming*: These undermentioned steps will take you a long way toward reducing your energy use and your monthly budget and also less energy use means less dependence on the fossil fuels that create greenhouse gases and contribute to global warming and the raising of temperatures in our oceans.
 - a) *Reduce, Reuse, Recycle (RRR Mantra or 3R mantra)* : Instead of disposables, reusable products must be used to reduce waste & also that products must be purchased having minimal packaging. Recycling of paper, plastic, newspaper, glass and aluminium cans should be ceased. 1088kg of carbon dioxide every year have been saved by recycling half of household waste.

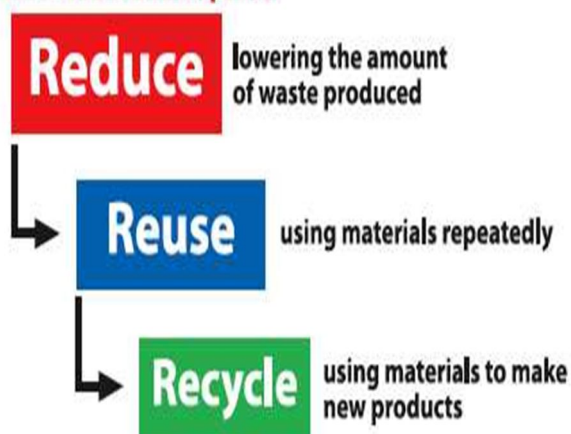


Fig2. RRR Mantra

- b) *Light bulbs alteration* : Replacement of regular light bulbs with compact fluorescent light (CFL) bulbs. CFLs last 10 times longer than incandescent bulbs, use two-thirds less energy, and give off 70 percent less heat.
- c) *Smarter & Scrimpy drives* : Go surfing with friends, Walk and ride your bike more and check out options for carpooling to work or school. When you do drive, make sure your car is running efficiently.

- d) *By using the "Off" Switch* : By turning off lights when you leave a room, and using only as much as light you need to lay upon electricity & also detract global warming. This can also employed to turn off your television, video player, stereo and computer when you're not using them. It's also a good idea to turn off the water tap when you're not using it. This will definitely help to conserve a vital resource by reducing your water bill
- e) *By Encouraging Others for conservation* : Sharing of information with friends, co-workers & neighbours about recycling and energy conservation and for the environment take opportunities to encourage public officials to establish good programs and policies.
- 4) *Conservation of Resources* -Consumption of natural resources is increasing day by day as the human population is growing continuously. In simple words conservation is the proper management of a natural resource for the prevention of exploitation, destruction or degradation. As a responsible citizen, we should specially conserve: Soil, Water, Biodiversity & Forests.
 - a) *Conservation of soil*: For minimization of soil loss the soil conservation measures should be done. Some methods of conserving soil are mentioned below:
 - i) *Mulching*: Weeds have been killed by inter culturing operations and soil mulches help the plants to be rooted firmly in the soil.
 - ii) *Strip cropping*: This is simply an agricultural practice of growing plants in suitable strips in the field
 - iii) *Crop rotations*: Not only increase in yield, but also increase in fertility of the soil simply by growing alternatively a cereal and a legume in the same field. It is also helpful for checking soil erosion.
 - b) *Dry farming method*: This may be practiced where rainfall is low, indefinite and variable. In dry farming methods only those crops that are grown that can sustain even in a very low rainfall.



Fig3. Soil Conservation

- c) *Conservation of water*: To secure the future a step should be taken forward to conserve water. Water is the most essential natural resources on earth. Water conservation is simply reduction of the scarcity of water. It simply aims to improve the efficiency of use of water, and reduce losses and waste for people usage & better future.

Tips regarding safeguard water: Avoid leakage of water from the taps especially when you brush your teeth or wash clothes. Another method to conserve water is Rainwater Harvesting.



Fig4. Water Conservation

- d) *Conservation of biodiversity:* Biodiversity endows as the base for farmers, fisher folk, forest dwellers and artisans. For a diversement of medicinal and health care systems, it provides raw material. For the continuous up-gradation of agriculture, fisheries, and for critical discoveries in scientific, industrial and other sectors it also endues the genetic base. For the last few decades biodiversity has impacted on the health of the land, water bodies and people.



Fig 5. Biodiversity Conservation

- e) *Conservation of forests:* People all over the world have stopped unnecessary deforestation keeping in view the importance of forests in their life. Prevention of unnecessary felling of trees diminished as several laws are made by Government. Government has encamp by declaring certain forests as protected areas which is termed as Reserves or wild Life Sanctuaries & hunting of animals is permitted here. In India we have 150 wild life sanctuaries.



Fig6. Forest Conservation

- 5) *Preservation of Ecosystem* –Interaction of living and non-living components can be termed as Ecosystem. Under mentioned steps can be taken for preservation of our ecosystem.
- a) *Control over the discharge procedure of factories* -Water and soil pollution both caused by dischargement of harmful chemicals from factories apparently into water bodies or in open lands. Many factory wastes are not treated properly and are just thrown away directly. The authorities should keep an eye on the discharge procedure of factories.
- b) *Garbage categorization* -Garbage categorization can help in dividing up the garbage and selecting those wastes which can be recycled. Biodegradable wastes do not cause harm to the environment. Ecological balance would be maintained as well as minimization of waste obtained by categorization of garbage.
- c) *Clean industries* -Minimization of the pollutants produced by them can be achieved by development of more & more environment friendly Industries.

- d) *Restriction on hazardous chemicals for household purposes* -Most of the country's people use DDT powder to kill insects and prevent them from getting inside their house as DDT is a very harmful chemical and its effect stays for a very long period of time affecting human health too. DDT has already banned in many countries like USA. Less harmful chemicals should be used as an alternatives.
- e) *Protection of forests & wildlife:* By growing more and more trees earth's temperature can be maintained & also prevention of soil erosion can be done. By re growing the trees in weathered lands (reforestation) or by growing new trees in barren lands (afforestation) that can be extinguished Animal hunt in many wildlife parks is illegal & also poaching has become very generic these days. Just for the sake of hunting or for trading animal's important body parts, people hunt down animals & for this strict actions should be taken.
- f) *Measurement on global warming* -Serious initiatives must be taken by government as its their duty because global warming is not under the control of ordinary people and not just take parts in global summits for the sake of discussion alone.
- 6) *Collect products for reuse or recycling* -Collection of used and discarded materials processing these materials and making them into new products termed as Recycling. By this amount of waste can be reduced which is thrown into the community dustbins thereby making the environment cleaner and more fresh air to breathe.

SEGREGATION IS A MUST



Fig7. Segregation of different products

Several surveys are carried out by which importance of recycling wastes is recognized by Government and non-government agencies in the country. However, the methodology for safe recycling of waste has not been standardized. 7 %-15% of the waste is recycled revealed by studies. Problems of waste or garbage gets easily solved if recycling can be done in a proper manner. Initiative in segregation and recycling of waste (EXNORA International in Chennai recycles a large part of the waste that is collected) have taken by a large number of NGOs (Non-Governmental Organizations) and private sector enterprises at the community level. It is being used for composting, making pellets to be used in gasifiers, etc. Plastics are sold to the factories that reuse them.

Recycling process involves undermentioned steps:-

- a) Collection of waste from doorsteps, commercial places etc.
- b) Collection of waste from community dumps.
- c) Collection of waste from final disposal sites.
- 7) *Reduce negative effect on air, water & soil*

M. Undermentioned Are The Solutions For Air Pollution

- 1) *Utilization of public mode of transportation:* Pollution can be reduced easily by encouraging people to use more and more public modes of transportation . Also, usage of carpooling should be enhanced. There are several options to save energy & money for example, if you and your colleagues come from the same locality and have same timings you can explore this option to save energy and money.
- 2) *Energy conservation:* Fans and lights must be switched off when you are going out. Electricity can easily produce by burning large amount of fossil fuels. The amount of fossil fuels that is to be burned can be reduced to save environment.

- 3) *Usage of energy efficient devices:* CFL lights consume less electricity as against their counterparts. Lower electricity bills can also help you to reduce pollution by consuming less energy.
 - 4) *By understanding the concept of 3R (Reduce, Reuse and Recycle):* Reuse the waste items for some other purpose instead of throwing them. For e.g. for storing cereals or pulses you can use old jars.
 - 5) *By emphasizing on clean energy resources:* Solar, wind and geothermal are some of the clean technologies that are on high these days. Consumers who are interested in installing solar panels for their home have been provided grants by the governments of various countries & by this air pollution will be curb in a long way.
- N. *Next list considers both practical solutions and also those being implemented in different parts of the world regarding water pollution-*
- 1) Usage of what is needed resourcefully – For example, when the sink is full then only that time the utensils must be washed.
 - 2) Water restrictions should be enforced to obey – For example, while washing the car hose pipe shouldn't be used.
 - 3) By increasing water tariffs make consumers more budget conscious and this will deter them from using water excessively.
 - 4) By recycling used water as much as possible for reducing water pollution.
 - 5) Requirement of more stringent regulation for industrial processes.
 - 6) There is a need of great importance to repair and improve existing sewerage systems.
 - 7) Clean water initiatives, usually taken by NGOs and other active role players by promoting, supporting and funding.
- O. *Soil pollution have following settlements*
- 1) *Solid Waste Treatment must be suitable* -Soil pollution must be avoided by disposing waste properly. Before disposing the waste lobby your community to adopt ways to treat it to prevent pollution.
 - 2) *By using Herbicide, Pesticide and Fertilizer* -Herbicides are the chemicals which are used to kill weeds and unwanted plants while pesticides are the substances that kill unwanted insects and pests. Food and Fertilizer Technology Center says that fertilizers supply nutrients to plants that help them to grow but can contain heavy metals which are harmful for the animals, humans that eat the plant. According to the National Science Digital Library, soil pollution can be prevented by reducing the use of natural alternatives to toxic substances
 - 3) *Reuse and Recycle* -Soil pollution should be prevented by contributing less waste. Instead of throwing away plastic or paper regularly people must purchase glass and other reusable containers. Waste Management Company in each locality should recycle paper and plastic to reduce the amount of waste that is to be sent to a landfill. With the use of waste management techniques in an efficient way and implementing them properly can enhance sustainability. It will lead to the beginning of new era with greenery and cleanliness everywhere. Also it will promote the healthy environment over the entire globe.

REFERENCES

- [1] https://en.wikipedia.org/wiki/Waste_management
- [2] <https://www.learner.org/exhibits/garbage/solidsolut.html>
- [3] <https://www.conserve-energy-future.com/waste-management-and-waste-disposal-methods.php>
- [4] <https://www.sciencedirect.com/science/journal>