

# An Analysis of Innovations in Waste Management

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## ABSTRACT

Waste Management means all the activities associated with collecting, cleaning up and managing the waste, from its inception till its disposal. With the growing technology and the day to day changing environment, it becomes very necessary for the people and the Government to manage waste properly. As the technology grows faster day by day, a lot of waste is being generated and not being disposed off in any proper means. This results in a lot of problems. So, managing waste is as important as maintaining health. One of the ways in managing waste is by using a kind of bacteria, Ideonella sakaiensis. Our paper focuses on various innovations that has occurred and being occurring in waste management and also includes certain ideas and suggestions by us, for a proper waste management system.

**“FROM NATURE AND BACK TO NATURE”.**

## 1. Introduction

Waste generation is increasing day by day with the growing technologies. Approximately 1.3 billion tonnes of waste are produced every year and is also expected to increase to around 2.2 billion tonnes per year by 2025<sup>[1]</sup>. This increasing waste generation leads to a lot of problems. So, it becomes very necessary to manage wastes generated, at least partially. Various methods have been adopted to manage wastes efficiently and a lot of innovations are being made by several countries in the field of waste management.

## 2. Recycling

The foremost waste management activity adopted by all the countries is recycling. Governments of all countries, being developed, developing or under developed have adopted recycling methods as the major waste management activity. Recycling is the process of converting waste products into other new products. It serves a two-way purpose such as to prevent consumption of fresh raw materials and at the same time protect the environment. Awareness is also being created to recycle products among the common public. E.g.: Instead of disposing off newspapers in the shops and roads, they are being converted into paper bags, which is used as an alternative to plastic bags.

## 3. Sustainable Buildings

Approximately 3 billion tyres are disposed in the world every year<sup>[2]</sup>. These tyres stand as a place for mosquitoes to breed which leads to a lot of health problems. This scenario emerged for the development of a new type of building construction, known as ‘Earthships’. This type of building can be one of the best examples of waste management, because most of the materials used for construction are scrap materials. These earthships or sustainable buildings, as they are called

are built with the help of scrap tyres. The scrap tyres are used to build outer walls and it is compacted with rammed earth to seal the tyres. Tyres are natural insulators of heat which keeps the house warm inside. Since several tyres are used for the construction of this house, it has reduced environmental pollution to a great extent. The inner walls are constructed with tin cans and glass bottles, whose recycling takes time normally. When tin cans and glass bottles are used, it becomes an easy way to manage these kinds of wastes. Also, the flooring is done with pieces of tiles and marbles, which are considered as waste after making proper shapes of tiles. Water which is used in earthships is either rain water or underground water, which after usage is properly treated and is sent to exterior botanical cells or the garden to water the plants. This kind of earthship serves as the best example of a proper waste management system.

## 4. Smart Wi-Fi Bins

In the present scenario garbage bins placed at public places in the streets are seen overflowing due to increasing waste every day. This shows the attitude of people towards dumping wastes into bins. Here emerged the idea of smart bins. These smart bins, once when trash is being dumped into them, flashes a unique code which can be used to gain free access to free wi-fi<sup>[3]</sup>. It is 4 feet in height and 1.5 feet in width. It is being set up with Wi-fi routers, LED lights, Aluminium rods and IR Sensor for detecting the object thrown into the bin [Fig.1]. The IR sensor (Infrared sensor) first identifies the trash thrown into the bin and after that it sends signals to the wi-fi router through the aluminium rods. After that a unique id is displayed to the user in the LED display, which he can use to connect his device for a free wi-fi. The generated wi-fi can be used only for a limited time of 15 minutes. This system hopes to cultivate the habit of throwing trash into bins rather than littering on the streets.

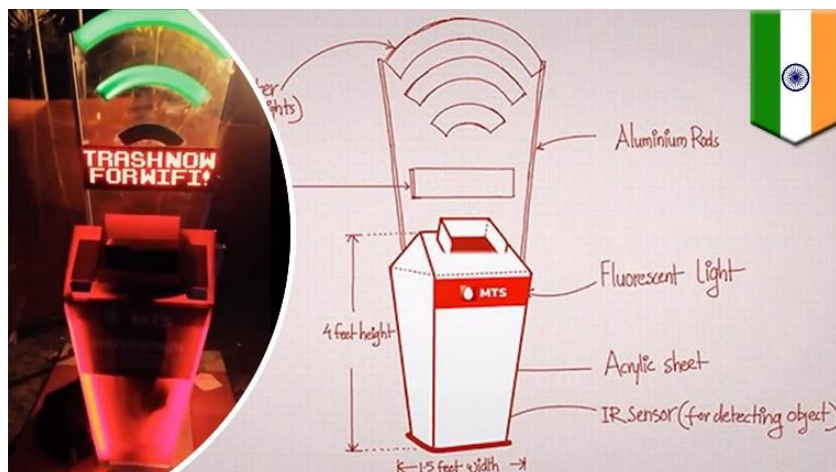


Fig.1 Smart wi-fi dustbin

## 5. Bio – Degradable Plastics

Every year around 6.3 billion metric tons of plastic waste is being produced, out of which only 9% is being recycled. Majority of plastic waste is being accumulated in landfills or littered in the environment, which creates serious environmental issues<sup>[4]</sup>. Today India is one of the places in the world where most garbage is disposed, especially plastics<sup>[5]</sup>. To avoid various problems, bio degradable plastics have come into use. Bio degradable plastic bags are made from tapioca, a kind of starch extracted from cassava root. These bio-compostable bags have a life of 3 months. Cassava roots are biodegradable and compostable, which decomposes them in the soil within a few months. They do not cause any pollution to the environment because they are soluble in hot water and will turn into ash when burnt, like newspapers<sup>[6]</sup>. Another biodegradable plastic invention is bottles made from algae. When powdered agar is mixed with water, it makes a jelly-like consistency. This mixture is then heated at a certain temperature and poured into a cold mould. After a few minutes of refrigeration, the bottle takes a definite shape, after which liquids can be poured in. This bottle stays in shape until it is fully empty. Once when it is emptied it begins to break and starts to decompose<sup>[7]</sup>. At present this technique is used only for manufacture of water bottles, but it has not come into daily use. Researchers are going on to manufacture such kind of plastics to be used when something is packed for one-time use. Recently a team of researchers have identified a kind of bacteria, *Ideonella sakaiensis* which digests plastic used to make them. Further researches are going on how to use this bacterium for various other purposes.

## 6. Bio – Bus

The world's first bio-bus is powered by biomethane gas, which is generated through treatment of sewage. Sewage water without proper treatment is often left into water bodies which pollutes them, resulting in a lot of water-borne diseases. One of the solutions to this problem is treating sewage water and using it to power vehicles. Biomethane gas is produced by treating sewage, using organic matter that breaks down bio-waste into methane and carbon dioxide. Throughout the process all impurities are removed to produce odour-free emissions. All the sewage from different places is first collected in large tankers which undergoes aerobic digestion and

produces biomethane gas. This biomethane gas so produced is filled in bus through pipes which powers them and makes them run on road like other normal vehicles. Experts estimate that biomethane produced from sewage could replace around 10% of domestic gas needs, if utilised properly.

## 7. Bioethanol

Fuel for vehicles are generally derived after processing crude oil. Crude oil is generated by drilling the earth, which creates vibrations and disturbs the natural environment of the earth. An alternative solution to this problem has been found. Bioethanol is a type of fuel derived from organic biomass such as sugarcane, maize or wheat and represents 80% of global biofuel production. This type of fuel can be produced without drilling any holes or wells onto the earth's surface. Bioethanol is obtained from sugarcane bagasse (i.e.) the dusty pulp left out after juice is extracted. The bagasse is dried at a temperature of 60 degree Celsius and undergoes further processes called as 'thermochemical conversion'. Bioethanol is thus produced at a production facility and then transported to a fuel terminal. It is then blended with petrol and then sent to fuelling stations. Bioethanol when mixed with petrol, has very less Carbon dioxide emissions and ensures fuel security all over the world. It also reduces greenhouse gases which is a major drive to global warming. In case of oil spills, it doesn't affect the environment because this fuel is biodegradable or diluted to non-toxic concentrations, naturally. It is also less toxic when compared to fossil fuels. Bioethanol when mixed with petrol can be used in all type of engines, whereas pure bioethanol can be used only in specifically designed engines. In fact, Henry Ford regarded bioethanol as 'The Fuel of the Future'.

## 8. Our Ideas And Suggestions

People are generally motivated to do acts when they get some rewards for doing them. So, in order to encourage proper waste management system, here are our few suggestions. Waste collecting centres can be set up in all areas, where people can be asked to put their trash by segregating them into degradable and non-degradable wastes. Rewards such as shopping vouchers, eatables or e-cash can be given to the people, according to the waste put up there (measured in kgs). Cloth wastes have not yet seen proper disposal methods.

Shops can be encouraged to collect used clothes from public which are in good condition. People who give such clothes in good condition can be rewarded with vouchers, cash discounts, etc. The shops then can use such collected clothes to sell them as second-hand clothes at concessional rates or reuse it for some other cleaning purposes. The Government can encourage this by announcing special exemptions (like tax concessions, etc...) to such shops which provide this service. **"REWEAR, REUSE, RECYCLE"**. Awards and tax concessions or subsidies can be announced to Municipalities that has a proper waste management system.

## 9. Conclusion

Proper management of waste is very necessary in this modern world, because waste if not managed properly leads to a lot of problems. Several innovations and researches are taking place to have an efficient waste management system. Various steps are already implemented and are yet to be implemented regarding this issue. Waste management is very much needed to lead a peaceful life and create a good future for the Earth.

**"CLEAN EARTH FOR A GREEN FUTURE"**

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