

Abstract

85% of global solid waste is dumped at landfills. It is known that these sites are breeding grounds for pests that spread diseases like Cholera and the Plague. The decaying waste also destroys vegetation, contaminates ground water and releases greenhouse gases.

The Rhino & Dedko Digester Systems treat organic waste at source; the most advanced method for organic waste management. These systems processes organic waste into organic fertilizer and fuel gas, thus contributing to economic and environmental health.

Introduction

Sanitation (defined as disposal of sewage and solid waste) is considered to have done more to increase human life span than any kind of drug or surgery¹. Poor sanitation is know to have disastrous effects; on the environment and community.

This paper details importance of waste management by going through the effects and drawbacks of the systems currently employed. It then proposes an advanced method to process organic waste; a decentralized model. It should be noted that a major portion of household waste is organic waste and adopting decentralized waste management has important advantages; some of which are described in this paper.

Centralized Dumping - current waste disposal method

It is estimated that upto 85% of global solid waste is "dumped" at landfill sites². Only a few places effectively processes their waste by adopting habits of segregation, recycling, composting and bio-digestion.

In places where centralized collection is available, waste is stored at various locations – in the house, restaurant or industry, common collection facility and dumping ground. It is also transported using a range of vehicles and trucks.

Figure 1 depicts the overall impact of dumping waste on the ecology and health of the city: it

NO SEGREGATION - DISEASED CITY

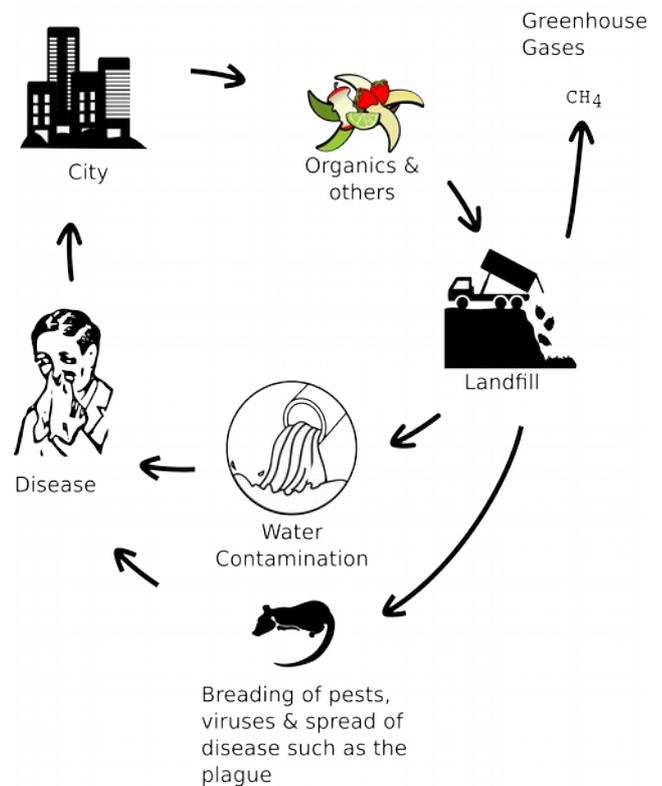


Fig. 1: The ecological cycle of dumping waste at a Landfill site.

destroys the environment and causes a diseased city. The effects may be classified as follows:

a. A breeding ground for viruses, pests and bacteria. It should be noted that the plague outbreak in Surat was attributed to poor management of organic waste. Waste when left without processing is a breeding ground for bacteria, viruses and pests such as cockroaches, flies and rats³. The waste also clogs rivulets and drains – leading to stagnant water and mosquitoes. Every storage facility and transport vehicle is a breeding ground. In fact, by moving the waste through city streets, we are also effectively spreading pests and bacteria around the city.

¹ Dr. Deepak Chopra. *Community Blog*. 23 July 2012. Web. 2015

² The Global Development Research Center. *Waste Management: Fact Sheet*. Web. 2015

³ Urban Development Sector Unit, East Asia and Pacific Region. *What a Waste: Solid Waste Management in Asia*. The World Bank. 1999. Article

SEGREGATION & MANAGEMENT OF WASTE - VITAL FOR HEALTH

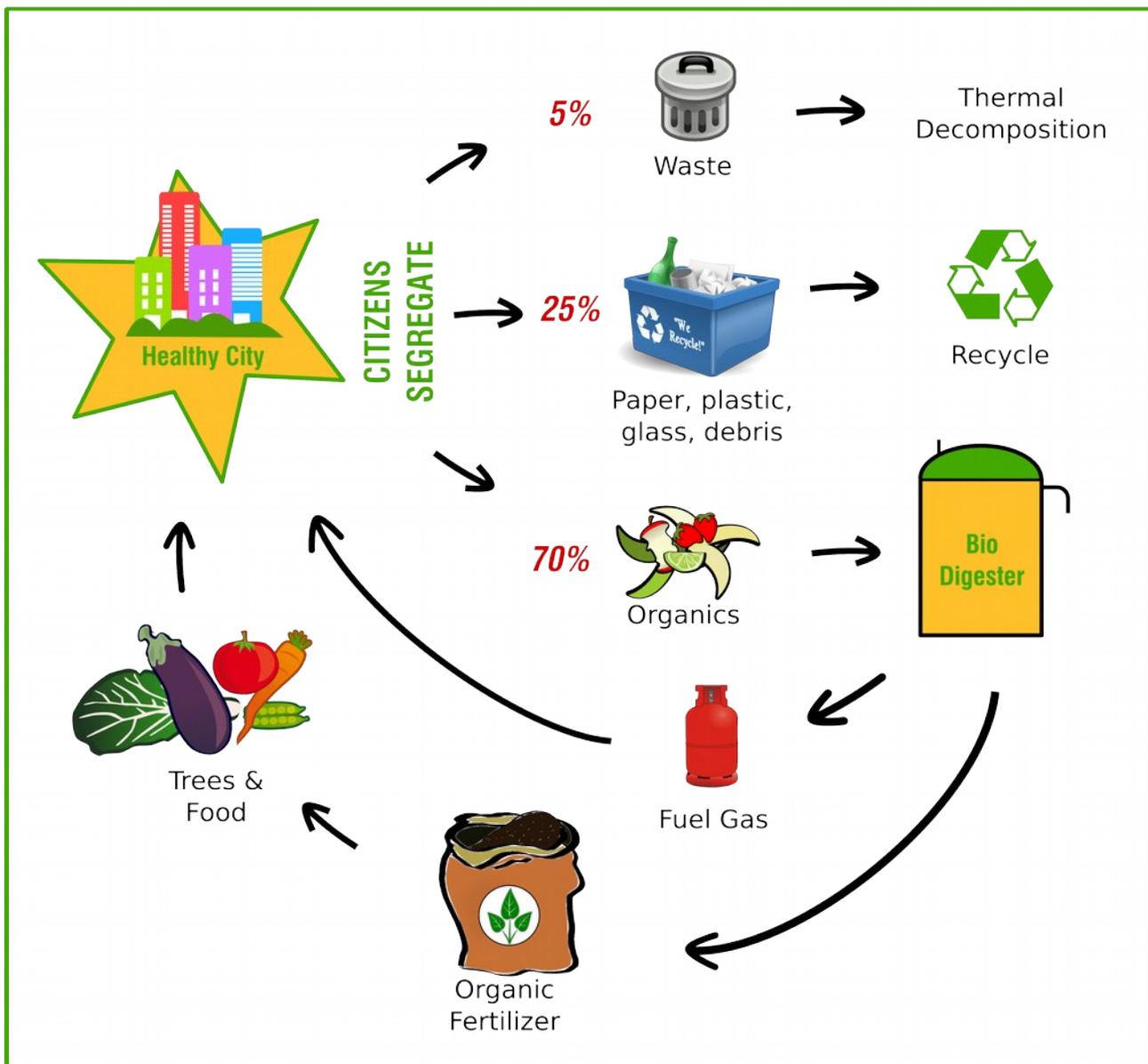


Fig. 2: The health of your community depends on how you manage your waste.

b. Generation of acidic leachate associated with the horrible smell of rotting waste. This leachate gets into the ground water and destroys vegetation. The contaminated water further leads to waterborne diseases⁴.

c. Release of methane gas into the environment. Methane gas is considered to contribute about 23 times more than Carbon Dioxide to global warming. Methane is released when waste is dumped to rot in landfill⁵.

If we are to ensure a healthy environment, we must adopt methods to manage and process our organic waste immediately.

Centralized collection has a fundamental flaw that the waste needs to be stored and transported. This process creates health hazards at every storage facility, including the house and restaurants. It is evident that these storage facilities are unhealthy and commonly avoided by all individuals.

When this waste is transported around the city, it carries viruses, pests and bacteria all around the city lanes. In many cases leachate is observed to be dripping from collection trucks and most people would prefer to keep their distance from these transportation vehicles – rightly so.

⁴ Upadhyay, et. al. *Eco Tools for Urban Waste Management in India*. J. Hum. Ecol. 18(4): 253-269 (2005)

⁵ Annepu, R. K. *Sustainable Solid Waste Management in India*. Columbia University. 2012. Thesis

Another hurdle to centralized waste management is that any waste needs to be segregated into organic and inorganic material to be processed. Centralized segregation puts personnel at a severe risk of both physical injuries as well as disease.

Decentralized Waste Management - the way forward

The fundamental requirement of waste management, is that waste needs to be segregated and processed – at source. This means that the individual or organizations need to separate their solid waste into a minimum of three parts⁶:

1. Organic matter (70%)
2. Recyclable matter (25%)
3. Hazardous matter (5%)

Organic matter is food waste, vegetable peels, bones, etc. This is the major portion of the waste and can be processed effectively using bio-digestion.

Recyclable matter is paper, plastic, cloth, metal and glass. This matter can be recycled through private business (Pastiwalla / Kabadiwalla) that buy these from generators. All that is required is that these be washed clean of organic matter. The recycling business is a worthy occupation and it is a source of revenue.

The Hazardous waste such as sanitary napkins, medical waste and diapers is the only component that needs to be disposed. It constitutes only 5% of the current waste can be disposed through thermal plasma decomposition.

The Dedko & Rhino Systems developed by Flycatcher Technologies *processing organic waste at source* through bio-digestion. By adopting these systems, health and economic benefits are directly obtained by the user. These systems when used along with segregation, potentially enable the community to reduce their waste to about 5% of current levels.

Bio-Digestion of organic waste at source

Thus Dedko & Rhino Digesters facilitate a healthy lifestyle and enables individuals and organizations to contribute towards their own health and that of their society and environment. The impact of these systems may be assessed by classification

⁶ Sustainable Solid Waste Management in India, R. K. Annepu, Thesis, Columbia University, 2012

into the following areas. Each of these area are of national and global importance:

- A. Waste Management
- B. Health Security
- C. Energy security
- D. Food security
- E. Employment generation
- F. Indigenous asset to the nation - developed in India, by Indians for the benefit of the world.

A) Waste Management

Individual households and organizations are encouraged to segregate and process their waste at source. With 95% of the waste processed, all problems observed with centralized collection of waste, cease to exist.

B) Health Security

A clear relationship between sanitation and our health has been established. By managing our waste at source, we play our part in the natural ecological cycle; which is otherwise disturbed by our carelessness.

The output generated is organic fertilizer and fuel gas. The fertilizer when put to use will generate organic fruits and vegetables; a boon to a healthy life.

The fuel gas is clean to burn and has no fumes, as is with other gaseous fuels like CNG or LPG. Hence is has major health benefits when compared to wood, coal or liquid fuels. As of 2011, less than 30% of Indian households use fuel gas⁷. The digester systems enable more people to enjoy the health benefits of using a clean fuel gas for cooking.

The waste if left in a landfill, generates methane gas that is released into the atmosphere. Methane is considered to be 23 times more harmful than CO₂ in terms of greenhouse gases. Hence we are alleviating Global warming by adopting these bio-digesters.

C) Energy Security

Expenses in Oil and Petroleum products account for almost 50% of Indian imports⁸. Most of these products are derived from areas of conflict and a

⁷ India Census Data. 2015. Web. 2011

⁸ Ministry of Petroleum & Natural Gas, Government of India. *Basic Statistics on Indian Petroleum & Natural Gas*. 2011

disturbance in the supply chain will cripple the economy.

Besides the raw material, the technology for refining and processing petroleum products is largely imported. This puts a strain on national resources and makes India dependent.

By adopting a digester, organizations reduce this dependence on imports to meet our energy needs. We will directly contribute to the strengthening our local economy.

C) Food Security

Healthy and abundant food is the right of every individual. Today we are faced with a situation where food prices keep rising. Also the quality of food has declined with widespread use of chemical fertilizers like urea and chemical pesticides.

One of the reasons for this phenomenon is that the technology and raw material for the production of fertilizers like urea are imported. Also these fertilizers are subsidized and account for over 50% of total subsidies⁹, putting a strain on the national economy. Further, it is also observed that the soil loses its fertility with consistent use of chemical fertilizers, leading to weak crops that are more susceptible to pests and disease. This forces farmers to use chemical pesticides – an import¹⁰.

The digester systems show a way forward to break this vicious cycle that results in poor food quality and dependence on foreign imports.

A digester generates organic fertilizer. This is supplied to meet farming needs completing the natural ecological cycle. The overall result is the availability of nutritious, organic and abundant food.

D) Employment Generation

The production, service and operation of digesters is a source of employment in a worthy cause. Being a decentralized solution, it offers work in an individual's preferred area of residence in any part of the nation.

Manpower is employed not only in waste management, but also effectively in the areas of health care, fertilizer production and energy generation.

E) Indigenous Asset

All Research & Development involved in making

⁹ Sharma, V. P. *Fertilizer Subsidy in India: Who are the Beneficiaries?*. IIM Ahmedabad. 2009

¹⁰ Mansata, B. *The Vision of Natural Farming*. Earthcare Books, 2010

Rhino a reality has been carried out in India, by Indians. It is dedicated to the health and prosperity of the world as a solution to waste management; a pressing concern the world over.

Dissemination of this Technology to the world is a source of revenue to the Nation and a symbol of pride and independence. We are proud to be part of the "Make in India" movement.

Internal Operation

The Dedko and Rhino Digester Systems work on the principle of Anaerobic Bacterial Digestion. The systems have millions of bacteria that work with the internal mechanisms. They process your organic waste into organic fertilizer and fuel gas

The fuel gas is stored in a balloon bag or cylinder and is available when required for cooking.

Conclusions

The current methods of dumping waste create health hazards for the community. We must move forward and manage our waste effectively. The Dedko and Rhino digester systems serve to effectively manage organic waste generated by individuals and organizations at source, by processing it into fuel gas and organic fertilizer. A wide range of economic and social benefits are realized by adoption of these systems.

Our houses and organizations do not generate waste, but outputs that need to be effectively and profitably processed.

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