Indian garbage: should energy be the driving concern?

The composition of Indian municipal solid waste (MSW) is quite different from those of USA and European cities: demolition debris dominates the waste stream. However, the waste composition in Indian cities is changing rapidly due to the growing urbanisation. A study by Trivedi et al. (2007) revealed that the composition of waste in Indian cities is changing from demolition debris to waste from consumer goods and electronics. The changing waste composition poses a challenge for waste management in Indian cities. The new waste composition is characterized by a higher proportion of biodegradable waste, which can be converted into energy through various processes such as composting and anaerobic digestion. The changing waste composition also implies that the existing waste management technologies may not be adequate to handle the new waste composition. Therefore, the development of new and innovative waste management technologies is essential to address the changing waste composition.

Indian cities generate a large amount of waste, and the waste generation rate is increasing rapidly. The current waste management practices in Indian cities are not sustainable and cannot handle the growing waste generation. The existing waste management practices are mostly focused on waste disposal and landfilling, which are not only environmentally unsound but also economically unviable. The waste management practices need to shift towards waste reduction, recycling, and energy recovery. The energy recovery approach is particularly attractive because it not only reduces the waste generation but also generates revenue. The energy recovery approach can be achieved through various technologies such as waste-to-energy (WTE) plants, biogas plants, and anaerobic digestion plants.

WTE plants are the most common technologies used for energy recovery from waste. WTE plants generate electricity and heat from waste through various processes such as incineration, gasification, and pyrolysis. The WTE plants are highly energy-efficient and can generate electricity at a cost competitive with other renewable energy sources. However, WTE plants also generate toxic emissions, such as dioxins and furans, which can be hazardous to human health and the environment. Therefore, it is essential to design and operate WTE plants in an environmentally sound manner to minimize the environmental impacts.

In conclusion, the changing waste composition in Indian cities poses a challenge for waste management. The waste management practices need to shift towards energy recovery to address the growing waste generation. The energy recovery approach can be achieved through various technologies such as WTE plants. However, it is essential to design and operate WTE plants in an environmentally sound manner to minimize the environmental impacts.

Table 1: Composition of Indian MSW

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food waste</td>
<td>40%</td>
</tr>
<tr>
<td>Paper</td>
<td>25%</td>
</tr>
<tr>
<td>Plastic</td>
<td>20%</td>
</tr>
<tr>
<td>Metal</td>
<td>10%</td>
</tr>
<tr>
<td>glass</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: IndiaMART InterMédiaire
According to the second recent study, acidification of rain or fog and consequently the atmosphere, contributing to the formation of acidic precipitation, is a significant environmental concern. This phenomenon is primarily driven by the release of acidic compounds into the atmosphere, including sulfur dioxide and nitrogen oxides, which react with water vapor to form sulfuric and nitric acids.

These studies highlight the importance of understanding and mitigating acid rain. Efforts are being made to reduce emissions of sulfur dioxide and nitrogen oxides from various sources, including power plants and industrial facilities. Additionally, efforts are being directed towards developing more environmentally sustainable technologies for waste management and energy production.
Indian garbage: should energy be the driving concern?

The composition of Indian municipal solid waste (MSW) is quite different from that of US and European cities. Some European countries are serious in the environmental impact of waste; water-based incineration and simultaneous production of energy is possible in these countries. China has millions of people earning a livelihood out of recycling. The question is whether a city like Chennai can afford to switch to such an expensive and complex technology. The question is whether a city like Chennai can afford to switch to such an expensive and complex technology.

The Delhi Case

In an attempt to deal with this growing problem, the Delhi government has set up the Delhi Commission for Gastric, to collaborate with the Tamil Nadu Industrial Development Corporation (TIDCO), has initiated a pilot project in Perungudi. This plant has a capacity of 200 tonnes per day with 12-MW generation. The Delhi Case

The question is whether a city like Chennai can afford to switch to such an expensive and complex technology. The Delhi government has set up the Delhi Commission for Gastric, to collaborate with the Tamil Nadu Industrial Development Corporation (TIDCO), has initiated a pilot project in Perungudi. This plant has a capacity of 200 tonnes per day with 12-MW generation.

The technological options exact a high cost in terms of energy economics, but also distorts the treatment is not only unsustainable from the environmental viewpoint. The Delhi Case

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According to the latest studies, incineration and gasification are the same, since both have shortcomings that put alterations in the air as municipal solid waste. Although the amount of emission of toxic pollutants such as dioxins and furans is the same, these technologies are different. No testing facilities are available in India. According to the 1999 study, the concentration of dioxins in the order of country wild animals was 3,300 pg/g fat wt. In human fat tissues, the concentration was 30 times higher than reported in the general public of developed countries. This indicates that significant amounts of dioxins and furans are present in dumping sites in India, probably due to secondary formation caused by burning waste oils. The use of backup fuel not only increases the probability of undesirable materials being used as auxiliary fuel but also makes the process more uneconomical and unprofitable than it already is. Such technologies have larger environmental footprints than others, especially when they are applied to the generating of large quantities of simple hydrocarbons into nothing other than crude fuels, and ash residues.3 Gasification is a high-temperature process that is optimised to produce a fuel gas as the same. Gasification is a high-temperature process that is optimised to produce a fuel gas as the same. Gasification is a high-temperature process that is optimised to produce a fuel gas as the same. Gasification is a high-temperature process that is optimised to produce a fuel gas as the same.
Table 2:otoxic metals identified in garbage-to-energy emitters and ash residues

<table>
<thead>
<tr>
<th>Antimony</th>
<th>Copper</th>
<th>Nickel</th>
</tr>
</thead>
<tbody>
<tr>
<td>lowest at 1 ppm</td>
<td>50 ppm</td>
<td>400 ppm</td>
</tr>
</tbody>
</table>

**Recycling**
India has millions of people making a livelihood from recycling. It is imperative that their working conditions be improved and technology upgradation take place. Burning mixed waste will kill this sector instead of making it more sustainable.

**Reasons for ‘burn technologies’ dangerous?**
In theory, a properly designed thermal process can be as clean as the use of simple food industry reactors that are not powered by fossil fuels. In practice, the garbage contains chemicals that cause pollution control devices to break and chemicals that are allowed to contaminate air, soil, and water. The risks of burning food waste are not dispersed, they can be concentrated in small areas, and they can be a serious threat to human health.

**Emission factors**

- **Solid wastes:** Dust, smoke, gases, and smoke; gases, nitrogen oxides and products of incomplete combustion; chlorine; phosgene; organic compounds and, with all combustion processes, water vapor.
- **Liquid wastes:** Chlorinated hydrocarbons; heavy metals; polynuclear aromatic hydrocarbons; mercuric compounds; formaldehyde; and asbestos, and situations, and the presence of flammable and flammable materials.

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Uma Iyer produces an estimated 30,000 tonnes of waste per day. Is the urban setting a problem? The question is whether a city like Chennai can afford to dabble with such an expensive and uncertain option. Even though many stakeholders do have a role in mitigating the problem, it must be realised that it is not a natural resource and it is sustainable only in generous space and good winds. Hence instead of treating it merely as an alternative good, we must examine the constraint of waste management, environmental effects and social impacts. As an economic good, any intervention must be considered and it is unsustainable to generate more and more waste. Hence instead of treating it merely as a revenue generator, why should we in India go for it, is a question that no Ministry official is willing to answer.

The Chennai Case

The question is whether a city like Chennai can afford to shackle with such an expensive and retentive project. Of the Rs 30 crore, Ministry of Non-conventional Energy Sources and the Indian Renewable Energy Development Agency (IREDA) will subsidise Rs 18 crore. No environmental study has been conducted on this project. There has been virtually no public consultation in relation to plans. Needless to say, the project lacks transparent and no information about the project has been forthcoming from the project proponents or the local civic body, the Chennai Corporation.

Waste-to-Energy Technologies

The technological options cost a high cost in terms of energy recycling and compounding.

Alternatives

The most realistic management strategy for sustainable solid waste is to avoid its generation in the first place. This implies changing production and consumption patterns.

Indian Waste-to-Energy Technologies

The composition of Indian municipal solid waste (MSW) is quite different from US and European waste fractions due to large urban areas.

iii. Vermicomposting

The biodegradable component consisting mainly of food waste, industrial waste, etc., and the non-biodegradable component consisting of plastics, metals, etc. are fermented in the composting tanks. The food becomes compost if high-heat thermal treatment is not used.

v. Biomethanation technology

vi. Composting

The stabilization of the organic material into a humic substance requires high energy inputs. Hence it is a good option for smaller towns and cities. The process is a pilot project run by company called Sids. It is located next to the Gadkhadaghe Municipal land fill (20 acres), which covers 1.338 tonnes of garbage every month. The project has been running since 1998.

Dr Sanat Mohanty, doctorate in Chemistry, Jawaharlal Nehru University, New Delhi

vii. Fish Waste

However, biodegradable low energy feedstock like oil cakes and coffee husks, etc., is processed into fish meal. The process will be continuous with cleaning, heart meat like luxury meal and other new substances will be introduced.

Ravi Agarwal, Solid Waste Expert, Beijing, China

Dr Sanat Mohanty, doctorate in Chemistry, Jawaharlal Nehru University, New Delhi

The Delhi Case

The Danish incinerator at Timarpur, Delhi was expected to produce 144 tonnes of energy per day, which will cut down the existing waste in 14.5 days. We can get rid of the waste and also the employment of the people who has been living in this recycling maintenance area.

The project is located near Delhi with 16 acres of land. The project has already been delayed due to the absence of a reliable combustible waste fraction.

The Danish incinerator, Operative Technologies for Solid Waste Management (Otis) at Delhi for a cost of Rs 44 crore, has been lying idle, incurring maintenance costs. When WTE has failed to prove itself as an effective technology, why should we indulge it, when it is a question that no Ministry official is willing to answer.

Biodegradable waste (MSW) is quite different from that of US and Europe; its distinctive features are the following:

iv. Recycling

Handling) Rules

The Delhi Corporation has said that gasification is not incineration is nothing but jugglery of words. We demand a public hearing and environmental impact assessment of the project.

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Treating energy as the sole focus for waste management, since it does not automatically lead to waste minimisation and sustainable treatment is not only unsustainable from the point of energy economics, but also distorts the theory of solid waste management, since it does not automatically lead to waste minimisation and sustainable treatment is not only unsustainable from the point of energy economics, but also distorts the theory of sustainable waste management.

The following are the options for waste recycling:

i. Waste reduction

Indian Waste-to-Energy Technologies

The composition of Indian municipal solid waste (MSW) is quite different from US and European waste fractions due to large urban areas. Therefore, an Indian waste-to-energy project should focus on the appropriate technology for solid waste treatment. Hence instead of subsidising energy and fertilisers, it would be sustainable to subsidise energy recycling and composting technology. We demand a public hearing and environmental impact assessment of the project.

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