Opportunities and Challenges associated with Waste Management in India

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Abstract-*India is the second largest populated country in the world. This huge population needs more energy to meet their needs. Now India faces major environmental challenges associated with waste generation and inadequate waste collection, transport, treatment and disposal. There are so many challenges associated with the waste management in India. This paper provides actual needs of waste management, challenges and opportunities. The waste must be managed to produce energy by thermal combustion and biological treatment processes. Initiates are taken by Government to set up power generation plants based on waste as a resource. These plants as well as waste management organization such as municipalities, State Pollution control boards are facing issues in treatment, waste management, conversion and energy recovery from waste. The challenges and opportunities are clearly described in this article.*

Keywords: Waste to energy Power generation, issues in waste management, recovery of energy, issues and challenges in renewable energy, sustainable development

I. INTRODUCTION

Industrial waste and Municipal waste are commonly termed as solid waste. Solid waste management (SWM) is a major problem for many urban local bodies (ULBs) in India, where urbanization, industrialization and economic growth have resulted in increased municipal solid waste (MSW) generation per person [7]. Effective SWM is a major challenge in cities with high population density. Achieving sustainable development within a country experiencing rapid population growth and improvements in living standards is made more difficult in India because it is a diverse country with many different religious groups, cultures and traditions.

We have reached the critical level of usage of conventional energy sources for the energy needs of this planet. The population growth and energy production technologies have forced us to give same quality of life to humans overall the world. This made huge demand for energy production. As the convectional energy sources are distributed throughout the world such as coal, oil resources, mines, forests, every nation wanted to boost its economic growth through industrialization. Unplanned Industrialization and population growth resulted burning of more convectional fuels which have caused global warming effect. The rapid industrial growth and energy needs also generated too much of waste which is now a big concern for the all nations in the world. Efforts are taken by many countries to reduce, recycle the waste, utilize the waste as source of energy. But problems still persist in the process of converting this waste into pollution less energy. Efforts are taken to identify the problems faced by India in the field of conversion of waste into clean energy and the solution for the problems in generation pollution less energy are described

Despite significant development in social, economic and environmental areas, SWM systems in India have remained relatively unchanged. The informal sector has a key role in extracting value from waste, with approximately 90% of residual waste currently dumped rather than properly land filled [8]. There is an urgent need to move to more sustainable SWM, and this requires new management systems and waste management facilities. Current SWM systems are inefficient, with waste having a negative impact on public health, the environment and the economy. The waste Management and Handling Rules in India were introduced by the Ministry of Environment and Forests (MoEF) [9], although compliance is variable and limited.

II.WASTE GENERATION IN INDIA

India is experiencing rapid urbanization while remaining a country with physical, climatic, geographical, ecological, social, cultural and linguistic diversity.

Estimating the quantity and characteristics of MSW in India and forecasting future waste generation is fundamental to successful waste management planning [10]. The quantity of MSW generated depends on living standards, the extent and type of commercial activity, eating habits and season. India generates approximately 133 760 tonnes of MSW per day, of which approximately 91 152 tonnes is collected and approximately 25 884 tonnes is treated [11]. MSW generation per capita in India ranges from approximately 0.17 kg per person per day in small towns to approximately 0.62 kg per person per day in cities.

The local economy impacts on waste composition, as high-income groups use more packaged products, resulting in higher volumes of plastics, paper, glass, metals and textiles. Changes in waste composition can have a significant impact on waste management practices. MSW may also contain hazardous wastes such as pesticides, paints, used medicine and batteries. Compostable organics include fruits, vegetables and food waste. Healthcare waste contains disposable syringes, sanitary materials and blood containing textiles and is governed by the Biomedical Waste (Management and Handling) Rules 1998 and the Amended Rules,2003, and should not be mixed with MSW. The average composition of MSW produced by Indian cities is approximately 41 wt.% organic, approximately 40 wt.% inert, with approximately 19 wt.% potentially recyclable materials.

Most available information is based on 'waste collected' data rather than 'waste generated' data. However, waste generated data is more useful since it includes recyclable secondary materials, and encourages more full-cost accounting of the overall MSW system.

III.WASTE MANAGEMENT

A. Waste Segregation

Waste segregation is a challenging task for the government. It should be segregated at the location where it has been generated, and then it will be easier to transport and process the waste. Awareness sessions, advertisements, promotional activities should carried out to bring awareness among the people so that they themselves can segregate waste which ultimately saves time and unnecessary processing of waste at power stations or recycling units.

B. Waste collection and transportation

Waste collection, storage and transport are essential elements of any Waste Management system and can be major challenges in cities. Waste collection is the responsibility of the municipal corporations in India, and bins are normally provided for biodegradable and inert waste. Mixed biodegradable and inert waste is often dumped, with open burning a common practice. Improvements to waste collection and transport infrastructure in India will create jobs, improve public health and increase tourism.

C. Waste disposal

Waste disposal is at a critical stage of development in India. There is a need to develop facilities to treat and dispose of increasing amounts of MSW. More than 90% of waste in India is believed to be dumped in an unsatisfactory manner. If not properly recycled or managed it is estimated that approximately 1400 km2 was occupied by waste dumps in 1997 and this is expected to increase in the future.

Properly engineered waste disposal protects public health and preserves key environmental resources such as ground water, surface water, soil fertility and air quality

IV. ENVIRONMENTAL AND HEALTH IMPACTS OF WASTE DUMPING

Waste dumps have adverse impacts on the environment and public health. Open dumps release methane from decomposition of biodegradable waste under anaerobic conditions. Methane causes fires and explosions and is a major contributor to global warming. There are also problems associated with odour and migration of leachates to receiving waters. Odour is a serious problem, particularly during the summer when average temperatures in India can exceed 45°C. Discarded tires at dumps collect water, allowing mosquitoes to breed, increasing the risk of diseases such as malaria, dengue and West Nile fever. Uncontrolled burning of waste at dump sites releases fine particles which are a major causeof respiratory disease and cause smog. Open burning of MSW and tyres emits 22 000 tonnes of pollutants into the atmosphere around Mumbai every year. The impacts of poor waste management on public health are well documented, with increased incidences of nose and throat infections, breathing difficulties, inflammation, bacterial infections, anaemia, reduced immunity, allergies, asthma and other infections.

V. WASTE TO ENERGY IN INDIA

The problems associated with improper waste disposal could be significantly mitigated by requiring material recovery. Source separation of inert and high moisture content fractions would maximize the potential for thermal recovery and other treatment options in India. The waste processed in thermal recovery is residual waste that remains after all commercially viable recyclable materials have been extracted. Waste-to-energy technologies produce energy; recover materials and free land that would otherwise be used for dumping. The composition of residual waste is important for energy recovery and waste composition is changing in India, with the amount of high calorific waste generally increasing. A significant increase in the use of waste-to-energy technologies has been proposed, but this depends on location, climate, demographics and other socioeconomic factors.

The most widely used waste-to-energy technology for residual waste uses combustion to provide combined heat

and power. Adopting maximum recycling with waste-to-energy in an integrated waste management system would significantly reduce dumping in India. Waste-to-energy technologies are available that can process unsegregated low-calorific value waste, and industry is keen to exploit these technologies in India. Several waste-to-energy projects using combustion of un-segregated low-calorific value waste are currently being developed. Alternative thermal treatment processes to combustion include gasification, pyrolysis, and production of refuse derived fuel and gas-plasma technology.

Waste-to-energy development in India is based on a build, operate and transfer model. Increased waste-to-energy would reduce disposal to land and generate clean, reliable energy from a renewable fuel source, reducing dependence on fossil fuels and reducing GHG emissions. In addition, generation of energy from waste would have significant social and economic benefits for India. However, the track record of waste-to-energy in India highlights some of the difficulties.

VI. CHANGES REQUIRED TO IMPROVE WASTE MANAGEMENT IN INDIA

Core to the vision for waste management in India is the use of wastes as resources with increased value extraction, recycling, recovery and reuse. ULBs need to be responsible for waste management, with the ULB Commissioner and Chairman directly responsible for performance of waste management systems. Waste management needs to be regarded throughout Indian society as an essential service requiring sustainable financing. The case presented to a ULB for a properly funded system must demonstrate the advantages of sound investment in waste management.

A strong and independent authority is needed to regulate waste management if SWM is to improve in India. Without clear regulation and enforcement, improvements will not happen. Strong waste regulations can drive innovation. The waste management sector needs to include attractive and profitable businesses with clear performance requirements imposed by the ULB, with financial penalties applied when waste management services are not working effectively. Finance for waste management companies and funding for infrastructure must be raised from waste producers through a waste tax. An average charge of 1 rupee per person per day would generate close to 50 000 crores annually, and this level of funding would probably be sufficient to provide effective waste management throughout India.

Information on future quantities and characterization of wastes is essential as this determines the appropriateness of different waste management and treatment options. State-level procurement of equipment and vehicles is necessary for primary and secondary collection with effective systems for monitoring collection, transport and disposal.

Waste management must involve waste segregation at source to allow much more efficient value extraction and recycling. Separating dry (inorganic) and wet (biodegradable) waste would have significant benefits and should be the responsibility of the waste producer.

There is a need to develop training and capacity building at every level. All Indian school children should understand the importance of waste management, the effects of poor waste management on the environment and public health, and the role and responsibilities of each individual in the waste management system. This will develop responsible citizens who regard waste as a resource opportunity.

VII. MAJOR CONSTRAINTS FACED BY THE INDIAN WASTE TO ENERGY SECTOR

The growth of this sector has been affected on account of the following limitations/ constraints:

- Waste-to-Energy is still a new concept in the country;
- Most of the proven and commercial technologies in respect of urban wastes are required to be imported;
- The costs of the projects especially based on bio-methanation technology are high as critical equipment for a project is required to be imported.
- In view of low level of compliance of MSW Rules 2000 by the Municipal Corporations/ Urban Local bodies, segregated municipal solid waste is generally not available at the plant site, which may lead to nonavailability of waste-to-energy plants.
- Lack of financial resources with Municipal Corporations/Urban Local Bodies.
- Lack of conducive policy guidelines from State Governments in respect of allotment of land, supply of garbage and power purchase / evacuation facilities.

VIII. CONCLUSION

Population growth and particularly the development of megacities is making SWM in India a major problem. The current situation is that India relies on inadequate waste infrastructure, the informal sector and waste dumping. There are major issues associated with public participation in waste management and there is generally a lack of responsibility towards waste in the community. There is a need to cultivate community awareness and change the attitude of people towards waste, as this is fundamental to developing proper and

sustainable waste management systems. Sustainable and economically viable waste management must ensure maximum resource extraction from waste, combined with safe disposal of residual waste through the development of engineered landfill and waste-to-energy facilities. India faces challenges related to waste policy, waste technology selection and the availability of appropriately trained people in the waste management sector. Until these fundamental requirements are met, India will continue to suffer from poor waste management and the associated impacts on public health and the environment.

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