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Towards Sustainable Waste Management through Technological Innovations, Effective Policy, Supply Chain Integration & Participation

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Abstract

This paper explores the performance of sustainable waste management through effective policy, legislations, supply chain integration and participation in technology. It compares a standalone impact analysis of the aspects and the hazards of the municipal solid waste. Considering the practical difficulties and issues on site of the waste disposal in the Cities, this paper does an matrix based analysis to arrive at the solution.

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Keywords: Sustainability; Hazards; Risks PDCA; PPP; Attitude;

1. Introduction

'Waste is a left-over, a redundant product or material of no or marginal value for the owner and which the owner wants to discard (Christenson Thomas H, 2006).

We generate waste as an output of our consumption lifestyle. Management of Solid Waste in India, more so in the Bangalore, is in crisis. In the advanced countries, we find that the Solid Waste Management (SWM) is comparatively better managed. The waste management in Indian cities is still considered to be a challenge. It seems to be a small issue for the ignorant few. But, in fact, it is an issue with multi-dimensional impact and concerns. If we

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work on a systematic process with right technological mix, the same could be tackled effectively. The prevention, segregation, recycling, composting, incinerating, and land filling of waste are the few ways of managing the solid waste. But how efficiently, we define our policies and plan, draft laws and procedures for the use of technology in solid waste management, will be the one which will ensure effectiveness and that we will discuss in this paper.

As per the estimation of the World Bank Report, presently, the municipal solid waste amounts to have increased to about 3 billion residents generating 1.2 kg per person per day (1.3 billion tonnes per year). By 2025, it is likely to increase to 4.3 billion urban residents generating about 1.42 kg/capita/day of municipal solid waste i.e. 2.2 billion tonnes per year(Daniel Hoornweg, Perinaz Bhada,2012).The statistics enumerated in the Central Pollution Control Board (CPCB) status report is given in Table 1.

Table 1. CPCB Status Report of waste generation

Year of Survey	1999-2000	2004-05	2010-11
The waste generated in 59 cities in India	30058	39,031	50,592

As per the same status report the total municipal solid waste generated in India during the year 2009-12 is 127485.107 MT/day. As per the IITK report, the per capita waste generation ranges between 0.2 kg to 0.6 kg per day in the Indian cities amounting to about 1.15 lakh MT of waste per day and 42 million MT annually.

Table 2. CPCB Status reports Citywise waste generation

City	Bangalore	Kolkata	Chennai	Delhi	Mumbai
Area (Sq. Km)	226.16	187.33	174.00	1484.46	437.71
Population as per 2001 Census	4301326	4572876	4343645	10306452	11978450
MSW Generation (Tonnes /day)	1669	2653	3036	5992	5320
MSW per capita (Kg/day)	0.39	0.58	0.62	0.57	0.45
Garbage pressure (tonnes/sq.km)	9.728	16.548	17.529	4.042	13.708
Pressure on landfill	1400	2500	3050	5000	6000

(P.U.Asani, 2006).Indian solid waste still comprises mostly, of large proportions of organic matter as well as inert material. The CPCB status report gives the figures as mentioned in Table 2

From the above, it could be inferred that the waste quantities are increasing gradually. The municipal authorities are not matching up to the increase to mitigate the risk of solid waste. Therefore, it is easily noticeable that garbage is littered on roads and foot paths in many cities and towns. The main reason could bethe lack of organised system of waste management, as well as the commitment from all, including the residents and the authorities, with reference to compliance with the requirement of Municipal Solid Wastes (Management and Handling) Rules, 2000 in ‘totality”.

The solid waste management has generated considerable amount of disturbances and concern in the society. The issue came to public notice, when the affected persons started revolting. The impacts of unscientific solid waste management are many, among which the few are mentioned below and are charted in the aspect and impact matrix below in Table 4.

1. Ground water contamination by the leachate generated by the waste dump
2. Surface water contamination by the run-off from the waste dump
3. Bad odour, pests, rodents and wind-blown litter in and around the waste dump
4. Generation of hazardous gases and greenhouse gases (e.g. methane) within the waste dump.
5. Epidemics through polluted atmosphere and stray animals