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"Effectiveness of Solid Waste Management Rules in Achieving Waste Segregation"

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Abstract

In India, where "urbanization, industrialization, and economic expansion" have increased the creation of MSW per person, "Solid Waste Management (SWM)" is a serious issue for many "Urban Local Bodies (ULBs)". In densely populated urban areas, effective SWM is very difficult to achieve. Negligible waste "collection, transportation, treatment, and disposal", together with excessive waste output, pose serious environmental problems for India. There will be negative effects on public health and the environment as a result of the inadequacy of India's current waste management systems brought on by the country's rapidly expanding urban population. While there are many obstacles to overcome, the possibilities are also substantial.

This paper examines the effectiveness of India's SWM Rules in achieving waste segregation. By analyzing regulatory frameworks, challenges in enforcement, and the role of the informal sector, the study highlights the need for better waste segregation at source to improve recycling and reduce environmental impact.

Keywords- urbanization, industrialization, economic, solid, waste, segregation and etc.

1. INTRODUCTION

Indian SWM systems have not evolved much despite the country's rapid "social, economic, and environmental growth". We need modern waste management facilities and management systems immediately so that we can transition to SWM that is more sustainable. Public health, the ecology, and the economy are all negatively impacted by waste due to the inefficiency of current SWM systems. In India, the "Ministry of Environment and Forests (MoEF)" established the "Waste Management and Handling Rules", however only a small percentage of the population really follows them.[1] The utilization of waste management techniques that keep valuable resources within the economy, rather than landfills that do little to safeguard the environment, should be a top focus.

A critical function is the separation of recyclables via the use of specialized waste processing facilities and the segregation of waste at the source. After material resources are extracted, the remaining waste must be disposed of using either specially designed landfills or waste-to-energy plants. One big opportunity is the possibility of generating energy from landfills by thermal treatment or methane extraction. However, a significant obstacle is the lack of experienced

[1] S Rathi, 'Waste Management in India: A Review' (2011) 31 Waste Management 1355.

environmental experts and trained engineers in India who can provide better waste management systems.

1.1 Research Questions

1. How effective are the current "Solid Waste Management (SWM) Rules" in promoting waste segregation at the source in India?
2. What are the challenges faced by municipalities in enforcing waste segregation practices under the existing SWM framework?
3. How can the integration of the informal sector improve the implementation of waste segregation and recycling in Indian cities?

1.2 Research Methodology

The methodology used in the paper is doctrinal in nature. The researcher has gathered information from both primary and secondary sources like statutes, case laws, commentaries, reports, books, journal articles and websites.

2. NEXUS BETWEEN SWM AND WASTE SEGREGATION

2.1 Solid Waste Management (SWM) in India

Integrating India's informal sector into official SWM systems is crucial due to the sector's significant significance in the country. Manufacturing or providing products and services on a small scale, relying heavily on human labor, and being mostly unregistered and uncontrolled are the hallmarks of the informal sector. "Thousands of people in India rely on waste collection for a living, despite the related health and social difficulties. Waste pickers gather home or commercial/industrial waste". Waste bins, trucks, streets, rivers, and landfills all have potential value for pickers. Cooperatives or waste picker groups own the recycling factories where some of them operate. Many families rely on waste picking as their only source of income. It offers a livelihood to many urban poor people and provides valuable resources to other businesses. Garbage collectors in India gather organic waste for the purposes of composting and producing biogas. City cleaners, or waste pickers, also play an important role.

A recent research conducted in six Indian towns revealed that waste pickers managed to collect almost 20% of the waste, with 80,000 individuals contributing to the recycling of around three million tons. The ULB saved over "INR 24,500 per year and prevented the emission of 721 kg of CO_2 for every tonne of recyclable material that was collected."[2]

The three pillars of a SWM system—"collection, storage, and transportation—can be particularly difficult for urban areas to implement. In India, municipal corporations are in charge of waste

[2] J Gupta, *Solid Waste Management in India: Policies, Strategies, and Technologies* 78-85 (Springer 2014).

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collection, and biodegradable and inert waste are often separated into separate receptacles". Open burning is a typical approach for dumping mixed biodegradable and inert waste. Cleaner transportation and waste management in India will boost the economy, the health of the population, and the number of tourists visiting the country. Local governments provide between 500 and 1000 rupees per metric ton for solid waste management, with "70% going toward collection and 20% for transportation".

In India, solid waste management is now at a crucial phase of growth. More and more "municipal solid waste (MSW)" is being generated, hence new facilities to handle this waste are necessary.

"It is estimated that more than 90% of India's waste is disposed of improperly. There were waste dumps covering almost 1400 km²in 1997, and that number is only going to rise."

2.2 Waste Management in India through Effective Segregation

Both the environment and human health are negatively affected by landfills. Under anaerobic circumstances, biodegradable waste decomposes in open landfills, releasing methane. Explosions and flames are caused by methane, which is also a big factor in the warming of the planet. The presence of water in abandoned tires at landfills provides ideal breeding grounds for mosquitoes, which in turn raises the danger of illnesses including "fever, dengue, and malaria". Fine particles released from the uncontrolled burning of waste at landfills contribute significantly to respiratory illness and pollution. The annual pollution surrounding Mumbai is 22,000 metric tons, mostly from the open burning of municipal solid waste and tires. There is enough evidence that improper waste management has negative effects on public health, including an increase in cases of respiratory infections, asthma, allergies, inflammation, bacterial infections, low white blood cell count, impaired immune system function, and a host of other illnesses.

Landfilling is described by the "United Nations Environmental Programme as the regulated disposal of MSW on land in a manner that dramatically reduces interaction between waste and the environment, with waste disposal concentrated in a well-defined region". A well-designed landfill not only provides a secure environment for the land-based disposal of residual MSW, but it also mitigates pollution of both surface and groundwater, as well as "fire dangers, odors, animals, birds, and other pests and rodents", and problems with slope instability and greenhouse gas emissions. India needs to replace its dumps with well-managed designed landfills.

The environmental effects of waste would be greatly reduced as a result.[3] "By mandating material recovery, the issues related to inappropriate waste disposal might be highly reduced. Thermal recovery and other treatment possibilities in India might be maximized by separating inert and high moisture content fractions at the source". After all economically viable recyclable elements have been recovered, the remaining waste is what is treated in thermal recovery. Technology that

[3] Sunil Kumar, 'Challenges and opportunities associated with waste management in India' (2017) 4(3) RSOS 146.

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converts waste into electricity not only recovers resources but also frees up space that would have been utilized for landfills. Waste composition is changing in India, with a rising percentage of high calorific waste, which is crucial for energy recovery. Several socioeconomic variables, including geography, climate, and demography, will determine whether or not waste-to-energy technologies see a substantial uptick in usage. Combustion, the most common waste-to-energy process, produces both heat and electricity from leftover waste. [4]

The "build-operate-transfer" paradigm underpins waste-to-energy initiatives in India. Reducing reliance on fossil fuels and GHG emissions, increasing "waste-to-energy would lessen disposal on land while generating clean, dependable electricity from a sustainable fuel source. The social and economic advantages to India of energy production from waste are substantial". But waste-to-energy in India has a checkered past that shows the challenges. Because of several operational and design issues, most facilities have not functioned efficiently. For instance, in 1987, a 250 million rupee (about $5.7 million) MSW incinerator with a daily processing capacity of 300 tonnes was constructed at Timarpur, New Delhi. Inadequate waste segregation, changes in waste composition and characteristics with the seasons, wrong choice of technology, and problems with operations and maintenance contributed to the plant's failure. Regardless of what happened, waste-to-energy will still play an important part in India's waste management strategy moving forward.

3. KEY CHALLENGES AND REFORMS IN SOLID WASTE SEGREGATION

Since the most effective and suitable techniques for waste collection and disposal are not being used, SWM in India is now in a terrible state. Few competent waste management experts are available, and few people get training in SWM. Present SWM systems in India also suffer from an absence of responsibility. In India, municipal authorities are tasked with handling MSW; however, their budgets fall short of what is needed to invest in efficient waste collection, storage, treatment, and disposal practices. Major obstacles to efficient SWM in India include a lack of waste collection and segregation systems, a government regulatory framework for financial matters, and strategic municipal solid waste strategies.

When it comes to waste management in India, innovation and the adoption of new technology have been hindered by a lack of environmental knowledge and motivation. Improving SWM in India is further hindered by public attitudes towards waste.[5]

Utilizing wastes as resources via enhanced "value extraction, recycling, recovery, and reuse is fundamental to India's waste management strategy". The onus for waste management should fall on ULBs, with the "ULB Commissioner and Chairman" bearing primary responsibility for the efficacy of such systems. "All segments of Indian society must see waste management" as a vital

[4] S Singh, 'Challenges in Solid Waste Management in India: An Insight' (2017) 46 Environmental Science and Pollution Research 12247.
[5] R P. Singh, *Waste Management: A Handbook for Developing Countries* 115-121 (Routledge 2015).

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function requiring long-term funding. Properly funding a system requires convincing a ULB of the benefits of waste management investments.

If SWM is to be improved in India, a robust and autonomous body is required to oversee waste management regulations. Progress will be elusive in the absence of well-defined rules and strict enforcement. Strict waste rules have the potential to spur innovation. Businesses in the waste management industry need to be appealing and lucrative in order to meet the ULB's performance standards, which include financial penalties for ineffective waste management services. A waste tax is necessary to collect money from those who generate garbage in order to pay for waste management services and necessary infrastructure. An annual revenue of about 50,000 crores, or 1 rupee per person, would likely be enough to cover the costs of proper waste management throughout India.

Because various waste management and treatment methods are based on predictions of future volumes and waste characteristics, accurate forecasts are crucial. For "primary and secondary collection, as well as efficient methods for tracking collection, transportation, and disposal", the state must acquire the appropriate equipment and trucks.

In India, public health is greatly affected by the prevalence of littering and waste on streets. Nagpur has instituted a new road-sweeping method whereby each worker is assigned a certain length of road to sweep.

In "2007, UN HABITAT highlighted the Swatchata Doot Aplya Dari (sanitary worker at your doorway) initiative by the Centre for Development Communication" as a model of effective practice.

In order to provide much more effective value extraction and recycling, waste management must include source-based waste segregation. The waste producer need to be held responsible for the separation of dry (inorganic) and moist (biodegradable) waste due to the substantial advantages that would result.[6]

ULBs, businesses, and NGOs must work together to create ambitious projects for long-term waste management planning. In order to provide sustainable systems, it is necessary to establish who is responsible for what, and then to monitor and evaluate performance. It will be beneficial for various socioeconomic groups and areas of India to exchange their experiences. The informal sector must be heavily involved in future waste management in India, and many institutions, groups, NGOs, and commercial corporations are attempting to address this issue by taking a systemic approach to SWM.

[6] P Jain, 'Impact of Solid Waste Segregation on Municipal Waste Management in India' (2019) 25 Environmental Impact Assessment Review 105.

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At all levels, training and capacity development must be developed. The significance of waste management, the consequences of ineffective waste management on public health and the environment, and the duties and obligations of every person within the waste management system should be ingrained in the minds of all Indian schoolchildren. Encouraging individuals to see waste as a resource opportunity will foster responsibility towards social justice.

4. CONCLUSION AND SUGGESTIONS

Until workforce from urban local bodies or designated contractors collect MSW for disposal, it should be kept at the site of generation. The process of primary segregation, which involves separating waste into distinct portions, is essential. Primary waste collection from the streets must be connected to the segregation.

A number of framework elements, including waste characterization, the capacity and capabilities of urban local bodies, community traditions, available space in residential areas and streets, and so on, should be considered while sorting waste into its many fractions.

The rise of megacities and the accompanying increase in India's population has made SWM an urgent issue in the country. As things are, India has to make do with dumping, the informal sector, and a lackluster waste infrastructure. Public involvement in waste management is fraught with difficulty, as community members seldom take personal responsibility for their trash. Building effective and long-lasting waste management systems requires raising public awareness and changing public perceptions about trash. Efficient and cost-effective waste management requires developing designed landfills and waste-to-energy plants to safely dispose of residual waste while maximizing resource extraction from waste. The availability of properly qualified personnel, waste technology choices, and waste policy all pose problems for India's waste management business.

Suggestions-

"Poor waste management and its effects on human health and the environment will persist in India unless these basic needs are addressed"-

- Ensuring households and businesses categorize waste into wet, dry, and hazardous types to facilitate efficient processing and reduce landfill dependency.
- Establishing local composting and recycling units to minimize waste transportation and environmental harm while encouraging community participation.
- Educating citizens through media, schools, and local events on the environmental and social benefits of waste segregation.
- Rewarding compliant individuals and businesses with financial or non-financial benefits to motivate responsible waste practices.
- Using digital tools to track compliance, ensuring transparency and accountability in waste management systems.