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MUNICIPAL SOLID WASTE MANAGEMENT IN NCT OF DELHI: PRACTICES, ISSUES AND CHALLENGES

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ABSTRACT

Municipal Solid Waste (MSW) is a major environmental problem pertaining to urban and sub-urban areas. Management of solid waste continues to remain a neglected concern area of urban development in India. The adoption of an effective waste management technique has become an underlying essentiality for solving this problem. The present study is an attempt to reveal the magnitude and characteristics of MSW, the spatial aspects of waste management systems, while exploring the role of RWA's and the Bhagidari project in the WM as well as the existing legislation and institutional framework in place, in NCT of Delhi. The study draws upon primary and secondary data for its inferences supplementing the analysis with various statistical and cartographic techniques. Delhi generates from a minimum 6,000 metric tonnes to a maximum 8,000 metric tonnes of solid waste per day, which increases manifold during the festive season. There was a positive correlation found between MSWG, GDP and the population living in different zones. Spatio-temporal variations were observed in the quantity of waste generated in all MCD zones.

Municipal Solid Waste of Delhi was found to be bio-degradable and suitable for composting. A spatial analysis of the number of receptacles, vehicles and 'safai-karamcharies' or waste management personnel reveals that their availability tends to gradually decline from core to periphery areas. The Waste Service Index reveals that Rohini, Shahdara and Sadar Paharganj areas can be identified as Highly Served Zones whereas; Najafgarh, West and Central zones are the Least Served. The three existent landfill sites have reached full capacity and are overflowing. Further dumping of garbage at these sites should be stopped immediately. While the status of solid waste disposal was comparatively better in HIG colonies it was observed to be critical in LIG localities. Open sites and several of the receptacles in the MCD areas were found to be in a highly unhygienic and unsafe condition. The RWAs play a vital role in waste management and creating awareness among people for proper MSWM. In this context, it was significant to note that 40 per cent of the colonies had indicated that the level of success of community based SWM was just at medium level. Thus, Delhi's situation may by far be worsened from critical to dangerous, if the Integrated Solid Waste Management strategy is not adopted and adapted with commitment, precision and haste. The Planning process suggests the adoption of the integrated solid waste management hierarchy for deciding on processing or technology solutions for municipal solid waste.

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I.INTRODUCTION

The management of municipal solid waste in India has surfaced or continued to be a severe problem not only because of environmental and aesthetic concerns but also because of the enormous quantities generated every day. Even though only 31% of Indian population resides in urban areas, this population of 377 million (Census of India, 2011) generates a gigantic 1,43,449 metric tonnes per day of municipal solid waste, as per the Central Pollution Control Board (CPCB), 2014-15 and these figures increase every day with an increase in population. To further add to the problem, the total number of towns (statutory and census) in the country have also increased from 5,161 in 2001 to 7,936 in 2011, thus increasing the number of municipal waste generation by 2,775 within a decade. The management of municipal solid waste is one of the main functions of all Urban Local Bodies (ULBs) in the country. All ULBs are required to meticulously plan, implement and monitor all systems of urban service delivery especially that of municipal solid waste. With limited financial resources, technical capacities and land availability, urban local bodies are constantly striving to meet this challenge.

As we enter New Delhi, it's a land of towering Five Star hotels, government institutions & residences. But, whenever we pass through the roads of the National capital, one can never miss a paranoiac view of huge landfills & massive sight of more than 100 feet tall garbage of the decaying trash smelling like shit and we always pass by blocking our nose. Trash mountains are very close to five star Inn & Motel, multi-specialty hospitals, malls & well-renowned parks. These landfills display the darker side of a glittering city. People dwelling close to these garbage mountains cannot leave their places & can only hope for cleaning, which is not even close to possible."Life is hellfire here. In the event that you open the entryways and windows notwithstanding for a minute, you are hit by the foul odor & stinky smell.

There are 3 major landfills in Delhi/ NCR region- Ghazipur, Okhla and Bhalaswa. Daily Waste Generated is more than 9000 metric tons. Ghazipur Landfill is Controlled by East Delhi Municipal Corporation and it is still one of the oldest landfills of New Delhi, since 1984.Ghazipur trash mountains are spread across 70 acres of land and the landfill contains no less than 12 million tons of waste. The landfill is currently assessed to be no less than 50 feet tall. It overshot its utmost of 15 feet in 2002, yet without an option site, the landfill keeps on working. In spite of the prohibition on the burning the waste, the three colossal garbage mountains of New Delhi release toxic fumes, which keeps on lying for months. In total, the three landfills of Ghazipur, Okhla & Bhalaswa surround an area of 150 acres of land and more than 10,000 metric tons of waste is disposed of daily in these smoldering landfills. Landfills must be sterile or sanitary yet none of these are clean they are simply dumped as decomposed solid waste (recyclable waste). The main useful waste to vitality plant close to the Okhla landfill makes 16 MW of electricity every day by blazing 2,000 metric huge amounts of waste. In any case, this exclusive adds to the contamination, say specialists. Alarming statistics about Delhi's solid waste:-

- **8,360** metric tonne: Garbage generated per day (Govt report).
- **18,000** metric tonne: Garbage per day by 2021 (HC-committee report).
- Only three landfill sites: Okhla, Ghazipur, Bhalswa. (Okhla closed; other two functional).

- No new landfill site has come up as per HC's directions.
- More than **650** metric tonne of plastic waste generated daily.
- **5000** tonnes: Construction waste produced daily.
- **500** tonnes: Recycling capacity per day

Many environmental specialists also analyzed that the small fires get ignited itself in the waste zone due to spontaneous combustion rate, which majorly occurs from the expulsion of methane gas from decomposition of un-segregated waste. If we start taking vital steps of segregating waste at home, then the waste generated in tons every day and thrown into landfills can be reduced. It's just a matter of time and it might happen any moment. It's in an alarming state, as we can see wastes burning continuously, which can break into a major fire. There is no basic safety at these landfill sites. Moreover there are residential localities close to these sites. It's not just about the fire because fire keeps burning due to production of methane within the garbage, but it's the smoke which is of concern due to its toxicity. This smoke is dangerous because we don't know the burning of what kind of waste – organic, e-waste, plastic, chemicals or batteries led to that smoke.

- The limits in these so-called landfills have exceeded and wastes are overflowing.
- Dumping of all kinds of wastes from organic to e-wastes take place.
- No system in place related to solid waste management – to get rid of the wastes. Resultantly, piled up garbage over the years has taken the shape of a hill.
- No safety measures in place to prevent outbreak of fire.
- Besides natural burning of wastes caused by inflammable methane gas generated within the dump, people also put fire to burn wastes. This may take the shape of a major accident.
- Groundwater contamination by the leachate generated in the waste dump and surface water contamination by the runoff from the waste dump.
- Acidity of surrounding soil.
- Spreading of epidemics and infectious diseases to people living in nearby localities.

II. SOLID WASTE MANAGEMENT PRACTICES IN DELHI

Municipal Corporation of Delhi do not have appropriate action plans for execution and enactment of the policies for solid waste management. Unfortunately, they can not claim 100% segregation of waste at dwelling unit and on an average only 70% waste collection is observed, while the remaining 30% is again mixed up and lost in the urban environment. Out of total waste collected, only 12.45% waste is scientifically processed and rest is disposed in open dumps. Environment friendliness, cost effectiveness, and acceptability to the local community are major attributes to achieve efficient solid waste management system. Critical examination of important parameters of MSWM practice with respect to Delhi's Scenario is delineated below:

2.1. Segregation: There is no organized and scientifically planned segregation of MSW either at household level or at community bin. Sorting of waste, is mostly accomplished by unorganized sector and seldom practiced by waste producers. Segregation and sorting takes places under very unsafe and hazardous conditions and the effectiveness of segregation is reasonably low as unorganized sector segregates only valuable discarded

constituents from waste stream which can guarantee them comparatively higher economic return in the recycling market. On a number of occasions, due to improper handling the segregated constituents got mixed up again during transportation and disposal. Lack of segregation deprive proper scientific disposal of waste.

2.2. Collection: Waste produced by houses is usually transferred into communal bins that are fabricated from metal, made from concrete or in combination of both. Street sweepings also find its way to community bins. These community waste bins are also used by other essential commercial sectors in the vicinity of disposal bins along with household waste except where some commercial complexes or industrial units engage municipal authorities for transfer of their waste to disposal site by paying some amount.

2.3. Reuse/recycle: This entails activities like collecting those materials from the waste, which could be gainfully retrieved and utilized for making new products. Since unsegregated waste is dumped at community bins, its optimal recycling is not possible. However, rag-pickers usually sorted out and took and sell recyclable material like plastics, glass, etc.

2.4. Transportation: Modes of transportation for MSWM practised in Delhi are: bullock carts, hand rickshaws, compactors, trucks, tractor, trailers, and dumpers. In smaller towns trucks having 5–9 ton capacity are used without adequate cover system. Stationary compactors, mobile compactors/closed tempos, and tarpaulin-covered vehicles are used in the transportation of MSW and about 65, 15, and 20% of waste is transported through these compacters, respectively. The maintenance of vehicles used in for transportation of waste is usually done in workshop run by MCD. But, most of these workshops can do minor repairs only. No wonder, in the event of breakdown of these vehicles, the overall collection, transportation, and disposal efficiency reduces drastically.

2.5. Disposal: Though there was an increase in population during the decade for these cities, no significant reason was indicated by author for reduction as well as equal amount in waste generation for these cities. However, the possible reason for reduction could be that the waste generated could not reach the designated dumping site and was lost in the cities peripherals, outskirts, along the road, low lying area, along the drain, green areas, etc. Data reveal that uncontrolled open dumping is a common feature in almost all cities. The most disposal practices are in use in hierarchy are like Open Dumping, Landfilling, Landfill gas-to-energy plants, Biological treatment of organic waste, Thermal treatment etc.

III.MAJOR ISSUES

3.1. Not landfills, but dumping grounds: The three landfills in Delhi are not landfills in the true sense. The environmentalists call it a garbage dumping ground, which makes these sites more prone to accidents. These are old dumping grounds and not landfills in the technical sense. The concept of landfill came only after 2005-06, when standards were set. Since then, no new landfill site has come up in Delhi. In a landfill site one can have control over solid wastes. There is process of segregation, recycling, minimizing wastes, etc in a proper landfill site. We can't have hectares of prime land in the capital dedicated for dumping wastes.

3.2. No progress yet: A Delhi High Court-constituted panel had asked Delhi Development Authority (DDA) to identify new sites for two new landfills. The panel had recommended implementation of a policy focusing on the conversion of wastes to energy, compost and useful byproducts. But till date there has been no progress in this direction. The solid waste of Delhi-NCR is getting dumped in Bhalswa and Ghazipur sites. There's a need to fundamentally alter waste management dealing in India and strict implementation of policies and regulations, or else it'll become a menace. We're already facing the heat. Dumping of wastes is continuing in two sites, without any management of the solid waste. Only dumps are getting created. There's a legal ban on burning of plastics in Delhi, but people don't care, which is adding to our existing air pollution level. The existing landfill approach is not sustainable, as there can't be infinite waste. It has to be reduced through solid waste management approach, which anyway is not happening.

3.3. Present situation: Burn or Dump: Over 9,500 tonnes per day (TPD) of garbage is generated per day in the city. About 8,000 TPD of waste is collected and transported to three landfill sites at Bhalswa, Okhla and Ghazipur. Actual waste generation in the city could be much higher, as a bulk of the waste is managed by the informal sector. According to an estimate, there are about 150,000 rag pickers in Delhi. Worst, the three landfill sites are not designed as per specifications mentioned in the Solid Waste Management Rules, 2016. According to the Master Plan for Delhi, 2021, these landfill sites had exceeded their capacity way back in 2008. Most of these sites have contaminated the aquifers and groundwater in and around their neighbourhoods. As per the latest draft manual on municipal solid waste management prepared by the Union Ministry of Urban Development, three million tonnes of waste can be accommodated on 40 ha of land (keeping in mind that the life of a landfill is 20 years). Delhi needs 800 ha of land, which would cost Rs 80,000 crore going by the present circle rate! But the city simply does not have the land. In addition, municipalities are required to incur recurrent operating expenses on labour and machinery at the landfill, which comes to about Rs 300 per tonne of waste. Expenditure on transportation is nearly Rs 800 per tonne (according to Tufail Ahmed, who has been managing landfills in Delhi for almost three decades now). According to an assessment by the Centre for Science and Environment (CSE), every tonne of waste disposed of at a landfill would cost the MCD about Rs 14,500—a sum that is highly unsustainable. Landfills are clearly not the answer.

3.4. Technology - Centralised vs Decentralised: Waste-to-energy, as an idea, has been sold to urban local bodies like magic bullet. Burn and forget. But that is not happening. The residents of Sukhdev Vihar know the plight of a WTE plant right next to their houses. They have not opened their windows in years. The Okhla Waste-to-Energy plant is taking up close to 2000 TPD of garbage. Waste for this plant is largely collected from south Delhi: while the South Delhi Municipal Corporation (SDMC) sends in 1,800 metric tonnes per day (MTD), about 200 MTD is fed by the New Delhi Municipal Corporation (NDMC). Five MW of electricity can be generated by incinerating 450 tonnes of the solid waste in an hour. A total investment of Rs 250 crore has been made in the plant on a land of 5.6 hectares. As per the NGT order in 2015, states were directed to adopt a cluster approach for waste management. As more waste gets generated, more land will be required in this scheme of things. Many clusters will be required. It is evident that the cost of transport is a key component of waste management and farther the site, the higher will be the transportation cost. It is also clear that

decentralised solutions will cut costs of transport and make households and institutions part of the solution. But why aren't we keen to adopt them?

3.5. Segregation solution: The 10,000 tonnes of waste dumped in the landfills every day — much beyond their capacity—contains waste of all kinds, leaves, paper, metal, cloth and glass because the refuse is not segregated. There are no notified municipal waste rules that stress on the process either. Experts say at least 50% of the waste generated in the city can be turned into compost and 30% can be recycled. Only 20% should reach the landfills, they say. The Municipal Solid Waste rules, yet to be notified, make segregation of waste at the source mandatory. This is how countries over the world manage their waste. Kitchen waste is separated from paper and plastic. Glass and metals are also segregated. It is the responsibility of the citizen to segregate waste at home itself. Once paper, plastics and glass are separated a small component remains which goes to landfill sites.

3.6. Power from garbage: DPCC officials say installing methane gas plants at landfill sites will help contain fires. The design of these sites needs to be scientific and a methane gas plant is a must. To manage the remaining garbage, a waste- to-energy plan with superior technology must be installed as there is no way to get rid of waste without controlled burning. Three out of the four sanitary landfill sites – Bhalswa, Ghazipur and Okhla - have exceeded their life span. They overflow with garbage. According to officials the fourth site, Narela, too does not have an effective waste management plant, although 'plans' are still being made and 'consultations are being sought' for a world-class waste management site. Only Ghazipur landfill has a plant to capture methane and convert it into energy, though it was established after dumping began. It is of a much smaller capacity and can't contain the all the emissions, resulting in fires. The plant produces 12 megawatt of energy. Okhla has a waste-to-energy plant which produces 16 megawatt of energy.

IV.CHALLENGES AHEAD

4.1. Infrastructure for segregation: At present, mixed waste is usually collected and sent to the dump-sites/waste to energy plants/compost plants. Effective system of waste segregation is required at appropriate stages i.e. source of waste generation, collection, transportation, processing and disposal.

4.2. Waste management in unauthorized areas and slums: Delhi has 1634 unauthorised colonies in three MCDs' jurisdictional area. These unauthorised colonies are not developed in accordance with the city planning norms. These unplanned colonies pose a major challenge for waste collection and transportation as well. Even though, by the statutory provisions, the municipal bodies are responsible for extending waste management services to these households. In SDMC, there are 932 unauthorised colonies where the corporation presently provides only sanitation related activities. As per the orders of GNCT of Delhi, the development works in unauthorised colonies is entrusted to the Delhi State Industrial & Infrastructure Development Corporation (DSIIDC). Until road construction, drainage, sewerage and other allied works are undertaken, the waste collection would remain a major issue in these colonies. Moreover, no bins are placed and no dhalaos exist in such areas. Hence, issues of littering and blockage of drains persist in these areas.

4.3. Waste generation on roadside by street vendors/hawkers: Hawkers and roadside eateries generate garbage throughout the day and dump them on the roadside. Poor vigilance and monitoring by the local authorities aggravates the problem.

4.4. Waste from fruit and vegetable markets: There is no in-house treatment of wet waste generated in fruit and vegetable markets including mandis.

4.5. Inventorisation of waste: There is no clear idea about how much waste Delhi generates. Further, figures do not keep into account the quantum of garbage managed by the informal sector.

4.6. Optimisation/Increased participation of informal sector: Waste pickers/informal waste collectors form a vital part of solid waste management. But they are not authorized/registered yet. Local Authorities should integrate informal sector in their waste management systems to strengthen their collection systems.

4.7. Processing of mixed waste: As per abovementioned order dated 22nd December 2016 of the Hon'ble National Green Tribunal, a Waste to Energy plant based on mass incineration, besides having low efficiency of waste to energy conversion, is contrary to the Rules of 2016 which requires segregation at source. Rule 21(1) of SWM Rules mandates that 'non-recyclable waste having calorific value of 1500 K/cal/kg or more shall not be disposed of on landfills and shall only be utilized for generating energy either or through refuse derived fuel or by giving away as feed stock for preparing refuse derived fuel'. The above said order of NGT and Rule 21(1) of SWM Rules, 2016 need to be followed by the local authorities while processing mixed waste.

4.8. Grim status of dumpsites: All the three existing landfills of Delhi (Okhla, Bhalswa, Gazipur) have exceeded their capacities way back in 2008. The dumping sites in Delhi do not have any methanisation or gasifiers to control the methane being produced naturally by the biodegradable garbage. There are no fire protection systems at these sites, thus making them a potentially flammable location. As per experts present in the committee, most of these sites have contaminated the aquifers and groundwater in and around their neighbourhood. There is urgent need to promote decentralized processing systems and minimise the use of land for dumping garbage.

4.9. Bye-laws as per SWM Rules: Unauthorised disposal of waste in vacant plots and open areas is a big issue in the Municipal Areas. Construction material and malba on account of construction activities stacked on the roads of other agencies like PWD, DDA etc. causes hindrance on the roads for collection and transportation of the waste. So far, a fine of Rs. 50/- is imposed for littering under the DMC Act, 1957, which is too low and needs to be revised.

4.10. Availability of land: There is an issue raised by the local authorities that they do not have appropriate land for processing and disposal of solid waste.

4.11. Public awareness and behaviour change: There is lack of public awareness about sanitation and cleanliness of the city. So far, no aggressive campaign has been undertaken by the local authorities to encourage people to keep their city clean. There is an urgent need to start such campaigns and encourage behavioural changes amongst the public.

4.12. Lack of compliance and enforcement capacities: There is lack of supervisory staff to oversee operations of solid waste management which is a big challenge. Also, there is no Nodal Officer/s designated by local

authorities to monitor the progress of waste management i.e. to oversee segregation, efficient Collection and Transportation (C&T) systems, processing of segregated waste and proper disposal which is in accordance with SWM Rules.

V.VARIOUS STAKEHOLDERS

5.1 Government's role and take: The responsibility of solid waste management in Delhi is with the five municipal authorities. Right from generation, collection, storage, transfer, transport, processing to disposal of solid waste is done by different zones of the municipal corporation. According to the Delhi government's waste management plan, in the absence of a proper landfill site, these five municipal bodies have been using the three garbage dumping sites. The waste generated by North and East Delhi are dumped at Bhalswa and Ghazipur respectively; whereas that of South Delhi was dumped at Okhla. But, with the shutdown of the Okhla site, all the waste is dumped at the other sites. Looking at the condition of the three landfills, with garbage overflowing beyond its demarcated areas, the Delhi HC asked the Delhi government to look for sites for two new landfills, an order that has been stuck due to non-availability of land. Due to scarcity of land in Delhi, as it's a premium commodity in the national capital, it's very difficult to find land for a new landfill. Few locations were identified by the DDA but due to environmental, safety, legal and other issues, it couldn't be pursued. So, the government's focus is on waste-to-energy, waste-to-compost and waste-to-byproducts models. At Okhla and Bhalswa we have waste processing plants and electricity generation plant at Okhla. Construction and demolition malba (waste) is recycled in India's only plant at Burari to make bricks and tiles. These are the only ways we can solve this solid waste management issue. As far as preventive and safety measures are concerned, to utilize methane gas that emanates from decomposition of garbage, a bio-methanisation plant is in the pipeline. To prevent spreading of fire in solid wastes, a process of regular sprinkling of water has been adopted.

5.2. Citizens at the receiving end: The conditions of people residing close to these three dumping sites are beyond imagination. Through the day and night there's a foul odour in air. Whenever a strong wind blows, ashes and wastes from the dumping ground start floating in the air and land in our houses. Earlier, municipal corporation workers used to come and clean the locality. Now no one bothers to visit. The quality of groundwater of this area has also gone bad and we can feel it.Due to continuous burning of garbage, choking smoke engulfs the area. You can see the smoke all around accompanied with a pungent smell. Even the water smells so bad. There seems to be no solution to this problem.

VI.CONCLUSION

With India littering its waste without sufficient treatment, it needs to set aside about 88 sq. km of precious land - the size of New Delhi - for landfills by 2050. Considering that most of the waste in India is dumped without treatment, it would require an estimated 88 square kilometre (sq km) of precious land to be brought under waste disposal through landfilling by 2050, which is equivalent to the size of the area under the administration of the New Delhi Municipal Council. This will eventually render the land unfit for any other use for as long as a half century before it can be stabilised for other uses. The major head is solid waste management. Environmental

experts opine that citizens need to adopt the practice of segregating wastes at source. Segregation of wastes should take place at the source—organic waste should be separated from plastic and e-wastes; absence of it is leading to dumping of all kind of wastes together at one site. Like in Mysore or Aurangabad, we don't have any facility of segregation of wastes and no systematic recycling in Delhi. Secondary segregation is must. There's no recycling of 60% of the organic wastes that can be used for making compost. Some private companies are paid to recycle wastes, but that's not sufficient. There's need for upgradation. Delhi government should create awareness and encourage citizens for primary segregation of wastes at home. There should be strict policy for manufacturers of battery, consumer packaged foods etc, to take back the packet of chips, drained batteries etc at their own cost, as these can't be recycled further more for other uses.

We need hybrid solutions. We need a landfill, but only for rejects and inerts. We need waste to energy, but then such plants should ensure that they run on segregated waste only. With over 50 per cent biodegradable waste, there is high potential to compost or generate biogas out of the segregated wet waste. And all this cannot work, unless we segregate at source. With over thousands of crores being spent on collection and transportation, time has come to think out of the box. We can learn from our neighbours and cities across India that are doing commendable work on waste management. Look at the Alleypey model, where residents have taken it upon themselves to segregate and treat waste at source. It is the best model in the country on decentralised waste management. We can even look at Panjim; the municipal corporation not only ensures segregation at source, but also segregates dry waste into 30 different categories. And then there is Mysuru, Suryapet, Bobbili and a lot of other cities that are doing commendable work. They have adopted local solutions, not global to become zero-waste cities. We need to take waste management in our hands. Time has come to make it a habit. Just like brushing our teeth. Every day! Think broadly, how we can bring a change to our society applying some basic waste management strategies beginning it from our home.

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