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INDIA'S WASTE-TO-ENERGY PARADIGM

A POLICY, ENVIRONMENTAL AND SOCIAL PERSPECTIVE

Assessment of the Indian waste-to-energy blueprint reveals the compounding risk of an ecological, social, health, and economical catastrophe.

DECEMBER 2022

CENTER FOR FINANCIAL ACCOUNTABILITY

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R21, South Extension Part 2,
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Website: www.cenfa.org
Email: info@cenfa.org

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Centre for Financial Accountability
New Delhi, 2022

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EXECUTIVE SUMMARY

India's Waste-to-Energy Paradigm: A policy, environmental and social perspective is an earnest effort into objective, scientific, and environmentally conscious analysis of waste-to-energy technology and its current applications in India. This report begins by detailing the existing scenario across 12 states and analysing 20 waste-to-energy plants to identify trends in investment, administrative and governmental leeways, and efficiency of the underlying technology in the Indian context. The report then examines the existing governmental policies that support or otherwise influence the WTE landscape in India. A deeper dive into three specific scenarios of major WTE plants highlights the corporate-government nexus laying the foundation for the present and impending WTE failure. Finally, the report presents a commentary of the plastic waste management framework in the country.

CFA will continue to disseminate the report's contents across many stakeholder groups with the goal of inciting urgent and scientifically sound action at the state and national policy levels.

I. INTRODUCTION

Over the last few decades, the volume and toxicity of waste being produced in India has been increasing exponentially. A major cause has been the increased use and dispose of more manufactured materials by industrialised societies than their predecessors and less-industrialised societies. Further, rapid growth in human population has been increasing the total waste produced; with greater population densities in urban areas, there is also higher concentration of waste. According to the 2014–15 Niti Aayog Annual Report on waste-to-energy (WTE) technology in India, an estimated 62 million tonnes of municipal solid waste is generated annually by only the urban areas in the country. This number is expected to rise to 165 million tonnes by 2031 and 436 million tonnes by 2050.[1] This does not come as a surprise because waste is visible all around us, in unregulated dumpsites spreading a variety of diseases, clogging drains and gutters, burning in piles or littering the streets. Government efforts to manage the prevailing waste crisis has not focused on holistic, long-term solutions that address the root causes of overconsumption and use of unsustainable materials; instead, governmental programs targeting waste have centred around large-scale projects that have left more problems in their wake than solutions. WTE technology has been one such unreliable and specious solution. WTE projects are being aggressively promoted by government and private entities that stand to benefit from the installation of such WTE plants. WTE plants are designed to burn municipal solid waste as a form of waste processing and sometimes generating electricity. This technology found its way to India after being contested by the people of several countries on grounds ranging from health risks, environment and loss of livelihood. Despite this, the Indian government has funnelled large sums of money into the promotion of this technology, by hailing it as a form of renewable energy and an efficient method of waste management.

WTE plants are a false solution to the problem of excess waste because they–

- Pollute air, soil, and water through the release of emissions and leachate
- Cause major health problems in surrounding communities
- Place financial burdens on local and union governments
- Generate one of the most expensive forms of electricity
- Generate hazardous ash as a residue
- Undermine waste prevention, reuse and recycle
- Exclude local economies of recycling and waste management

[1] http://swachhbharaturban.gov.in/writereaddata/Task_force_report_on_WTE.pdf

This report documents and analyses the existing and upcoming WTE plants in the country and the financial, social and environmental impacts of their development. The last decade has witnessed rapid establishment of WTE plants across the country. Urban local bodies have released and re-released tenders for these plants, even if contracts have been violated by concessionaires. This is accompanied by the ever-increasing list of governmental schemes and policies that provide financial incentives for setting-up of these plants. The stage is set for India to host more than a hundred WTEs. This means that efforts to regulate, research, and stop these plants must also accelerate.

India, as a country, needs to reject WTE technology and focus on alternative solutions to the waste problem. Several municipalities in India have successfully adopted zero-waste models and proven that decentralised waste management is the only sustainable route to managing waste. Large-scale implementation of zero-waste models must be accompanied by diversion of governmental impetus and investment away from destructive proposed solutions like WTE plants. The purpose of this report is to document and analyse the WTE landscape in India and make an effort towards building a knowledge base that can factually challenge the industry's narrative of WTE plants in the country as an effective solution to the growing waste crisis.

II. ANALYSIS OF WASTE-TO-ENERGY PROJECTS IN INDIA

Ashi Datta, Upasana Sarraju

CONTEXT

As per the Ministry of Environment, Forest and Climate Change (MoEF&CC), municipal solid waste (MSW) generation in India will reach 4.5 lakh tonnes per day (TPD) by 2031 and 11.9 lakh TPD by 2050. Policymakers and urban governments aim to battle these growing waste quantities by establishing waste-to-energy (WTE) plants across vital municipal areas. Although its name suggests the positive conversion of the discarded into the essential, WTE technology involves the incineration of massive quantities of mixed waste. WTE plants typically burn mixed municipal solid waste to produce heat. The heat is then used to boil water to steam, which is redirected into electricity generators.

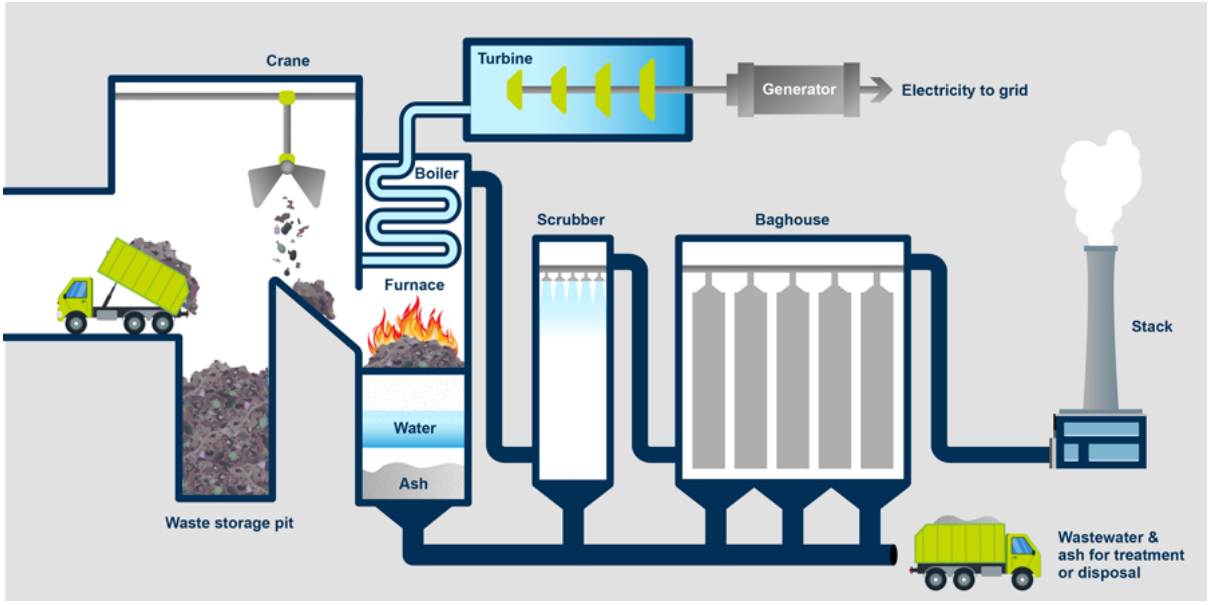


Figure 1. Internal functioning of an incinerator.

In a simplistic vision, the mounting waste problem is resolved while simultaneously adding electricity back into urban power grids. However, global experience with waste incinerators over several decades has proven the technology to be extremely toxic for surrounding communities and the environment. Not only is the incineration of mixed waste a major source of climate-relevant emissions, the process also involves the burning of reusable and recyclable materials. This leads to the

irreversible loss of materials that can otherwise be recovered and contribute to a reduction in the production of virgin plastic and paper.

Another relevant characteristic is moisture content of waste. WTE technology requires waste that has low moisture content to work efficiently. Several government studies have indicated that Indian municipal waste has a moisture content of 40–52%—very high for waste fed to a WTE incinerator.
Despite the promise of reduced costs and increased benefits to society, WTEs are more expensive than decentralised waste management systems and fossil fuel-based power plants, while not producing sufficient electricity to offset the high costs to the environment, human health, and the nation's economy.

Despite these risks to the environment and India's climate change pledges, the Indian government promotes the installation of WTE plants across the country. Under the Swachh Bharat Mission, NITI Aayog set a target of constructing WTE plants with capacities of 330 megawatts and 511 megawatts by 2017–18 and 2018–19, respectively. In 2017, the NITI Aayog also proposed the formation of a Waste to Energy Corporation of India that will set up WTE plants through the public-private partnership (PPP) model.

Establishment of WTEs should involve scientific, economic and environmental scrutiny at multiple levels to define the need for a WTE plant in targeted sites, the composition of the waste that is to be processed, existing formal and informal waste recycling and disposal economies, and impact on local wildlife, ecology, and human health (*Figure 1, Annexure*). As this report demonstrates, recent trends have revealed that implementation of important steps in the process, such as public hearings and impact assessments, are irregular and questionable.
Recent support from the Union government through lucrative incentives has encouraged the private sector to invest in a technology that is highly unsuitable, specifically for the Indian context.

Recent support from the Union government through lucrative incentives has encouraged the private sector to invest in a technology that is highly unsuitable, specifically for the Indian context.

DATA COLLECTION

To achieve a holistic view of the WTE landscape in India, we created a database that captures existing and proposed WTEs in the country. The data was collected from a variety of sources available in the public domain with preference given to

documents submitted to official monitoring bodies, such as MoEF&CC and State Pollution Control Boards. Where such data were unavailable, we used state monitoring committee reports, such as the Himachal Pradesh State Pollution Control Board Annual Report 2020-21, and Karnataka's compliance report to the NGT orders in the matter of OA number 673/2018. Information was also gathered from news reports of new WTE plant proposals and constructions, protests against existing WTE plants and WTE policy developments.

Most WTEs captured in our database are in different stages of the tendering process and hence several aspects of their functioning were either unplanned or undisclosed at the time of this study. For plants that are not yet operational, information such as electricity tariffs, investments, and waste management and electricity production capacities were documented from estimations made by developers of the WTE plant in their detailed project reports or environmental clearance documents.

STATE-WISE DISTRIBUTION OF WTE PLANTS

Figure 2 shows the number of existing WTEs plants in Indian states. It is important to note that a state's total waste processing and energy generation capacities need not correspond with these numbers.

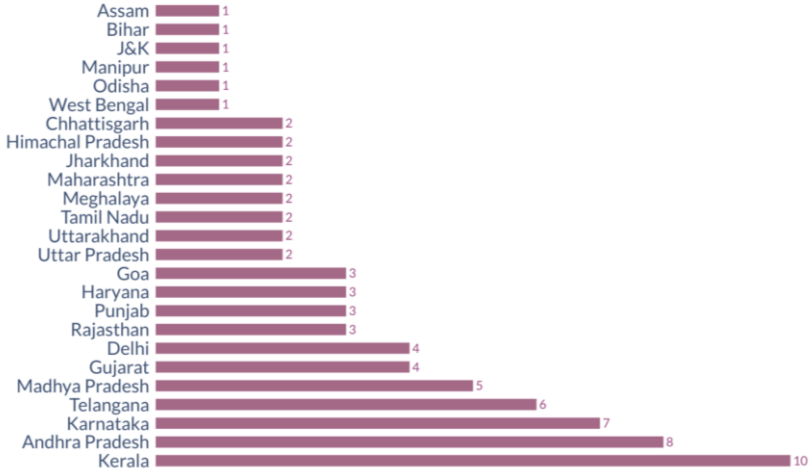


Figure 2. State-wise distribution of WTE plants.

STATUS OF WTE PLANTS

Figure 3 represents a high number of WTE plants being proposed and planned in the country, compared to those already in use. Of the 78 plants in the database, while only 10 are currently operational, 41 are proposed and 15 are already under construction. The 10 operational plants have a chequered track record of violating pollution norms, operating below proposed capacity and hence generating lesser electricity, and negatively affecting human health in surrounding neighbourhoods. Yet, the government has simultaneously proposed 56 WTE plants across the country, indicating a clear favourable interest in the WTE infrastructure.

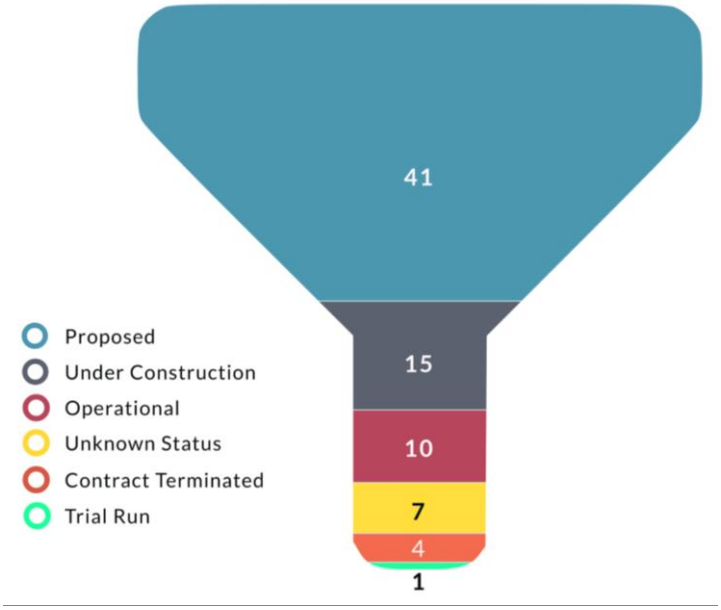


Figure 3. Current status of WTE plants.

Information on 78 plants has been collected and is included in the database. For the analysis presented in this report, only those 20 WTE plants were included for which data for 30% or more attributes are available.[2]

FINDINGS

Type Of Technology

Waste incineration includes all thermal treatments for discarded materials that emit pollutants and exhaust resources. This includes technologies based on combustion, pyrolysis and thermal gasification. There are two chief combustion-based technologies—mass incineration and refuse-derived fuel (RDF). While mass

[2] The 20 plants chosen for further analysis are listed in Table 1, Annexure.

incinerators burn waste directly, RDF-based WTE plants convert waste into small pellets that are burnt as fuel.

Pyrolysis is the thermal degradation of materials by heat in the absence of oxygen. Thermal gasification is similar to pyrolysis except that the thermal transformation of solid waste takes place in the presence of a limited amount of air or oxygen, producing a combustible gas. As shown in *Table 2* (Annexure) and *Figure 4*, Indian incinerators use either mass incineration technology or an RDF-based power plant.

Across the world, many gasification projects have failed because of financial non-viability and unreliable revenues.[3]

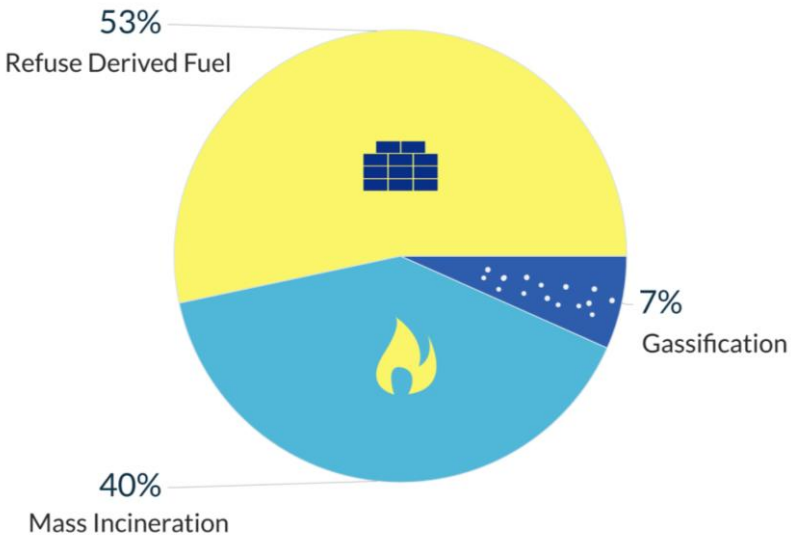


Figure 4. Type of technology used by WTE plants.

Year of Incorporation of Special Purpose Vehicles for WTE Plants

In India, WTE plants are established under a PPP model, which involves a long-term contract between a private party and a government entity, for providing a public asset or service. In India, PPPs are undertaken for infrastructure projects that require substantial capital. To establish a WTE plant, a municipal corporation enters into an agreement with a Special Purpose Vehicle (SPV) usually for a period of 20–25 years. An SPV is a subsidiary legal entity created by a parent company to isolate the financial risk of certain assets, projects, or ventures. The concession agreement

[3] Tangri, Wilson. (2017). *Waste Gasification & Pyrolysis: High Risk, Low Yield Processes for Waste Management,* GAIA. www.no-burn.org/gasification-pyrolysis-risk-analysis

signed between the municipal corporation and SPV is usually based on a Design, Build, Finance, Operate and Transfer ("DBFOT") model.

Figure 5 shows the range of years SPVs were established for the installation and operation of 16 of the 20 WTE plants included in the analysis. Between 2015 and 2018, 8 SPVs were established for the setting up and operation of WTE plants, showing a clear increase in the interest of the private sector in investing in WTEs and entering into contracts with Municipal Corporations.

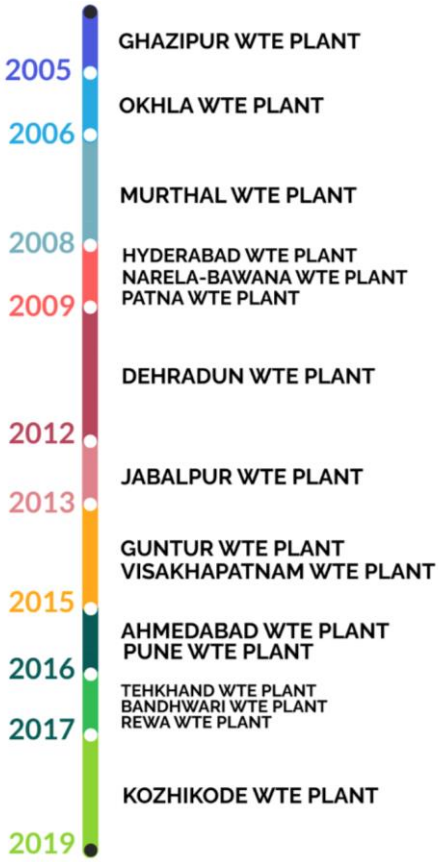


Figure 5. Year of incorporation of SPVs for WTE plants.

Land Area of WTE Plants

In India, WTE plants are established under a PPP model, which involves a long-term contract between a private party and a government entity, for providing a public asset or service.

WTE plants are built on public land granted to the contractor by the Municipality at staggeringly low costs, typically, Re. 1. The rationale provided by municipal corporations for installing a WTE plant often includes the lack of space in fast-growing urban areas to accommodate a landfill. But WTE plants also require large

setups that occupy vast expanses of land without significantly reducing the amount of waste going to the landfill. For instance, despite three WTE plants operating in Delhi, small garbage heaps occur in different parts of the city. Further, the city's four major dumping grounds still overflow with unsegregated waste and are a host to a range of accidents routinely.

Figure 6 shows the acres of land assigned to contractors hired to set up WTE plants. Except for the WTE plant in Patna, all use either RDF-based technology or directly burn waste through mass incineration. Yet the land area used by each plant spreads over a vast range of 4–48 acres. As *Figure 6* shows, the increase in land area does not necessarily correspond to an increase in the waste processing capacity of the plant. For instance, the plants at Murthal and Raipur both have a processing capacity of 500 tonnes of waste per day, but occupy 8.1 and 67 acres, respectively.

Then there is the Hyderabad WTE plant with a capacity of 2,400 tonnes per day, occupying 351 acres. Of this land area, 126 acres are allocated for a sanitary landfill that will store hazardous ash from the WTE. In comparison, the upcoming WTE plant in Mumbai is reportedly meant to process 3,000 tonnes of waste per day but will be built in an area of 35 acres.

There is no transparent reasoning for these vast differences in land area allotted to WTE plants nor do the detailed project reports prepared by contractors justify the need for the excess land.

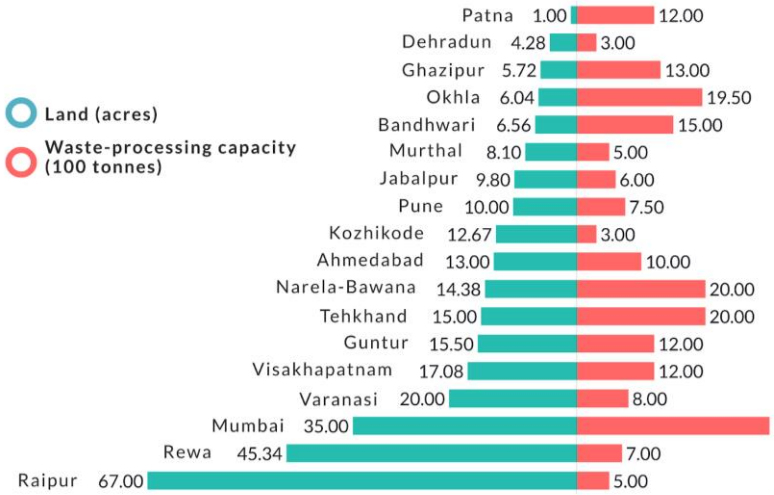


Figure 6. Land assigned for and waste-processing capacities of WTE plants.

Waste-Processing Capacities of WTE Plants

Advanced incinerator technologies like pyrolysis, gasification and mass combustion are designed to process only dry, highly combustible waste. High moisture content

causes biodegradable waste fractions to decompose more rapidly than in dry conditions. It also makes the waste rather unsuitable for thermo-chemical conversion (incineration, pyrolysis/ gasification) for energy recovery as excessive heat must first be supplied to remove moisture and maintain critical temperatures required for sustained combustion.[4]

The WTE technology used in India is not designed to handle waste that contains moisture. Several governmental and independent estimates have cited that the majority of municipal solid waste generated in India is biodegradable waste that is high in moisture content, and hence low in calorific value.[5,6] Presently, the installed capacity of 20 proposed and functional WTE plants in India is 19,990 tonnes per day. This means that Municipal Corporations are installing equipment to process far more dry waste than their municipality, or even the city, produces.

To be economically viable, WTE plants must be fed a quantity of waste as close to their optimum capacity as possible. Therefore, the amount of waste is increased by including unsegregated waste, the burning of which severely increases pollution while utilising excess fuel.

This practice of mass incineration of mixed waste may also disincentivise segregation of waste at source and use of biodegradable waste for the production of manure and biogas. WTE plants typically need a large quantity of waste to be able to function. A large proportion of municipal waste in India is composed of biodegradable content, which is fed into WTE plants. Contracts signed by Municipal Corporations (MCs) with incinerator companies promise a minimum quantity of waste to the WTE plant daily and if this clause is unfulfilled the MC will be in violation of the agreement. Subsidies or incentives for incineration thus encourage MCs to move away from composting and recycling; if only non-biodegradable waste is permitted to be fed, WTE plants would have to function far below capacity.

Power-Generation Capacities of WTE Plants

After tipping fee, sale of electricity is the main source of revenue for WTE plants; because of high capital and operation and maintenance costs, most WTE plants sell the power they generate at tariffs much higher than that of thermal, solar and wind power plants. *Figure 7* shows the tariff rates of 26 operating or proposed WTE plants across the country.

[4] http://cpheeo.gov.in/upload/uploadfiles/files/chap15(1).pdf
[5] http://swachhbharaturban.gov.in/writereaddata/Task_force_report_on_WTE.pdf
[6] https://mohua.gov.in/pdf/627b8318adf18Circular-Economy-in-waste-management-FINAL.pdf

WTE plants are permitted to sell power at high tariffs because they are seen as performing the indispensable function of managing urban waste. In 2016, an amendment to the National Tariff Policy mandated electricity distribution companies (DISCOMS) to purchase 100% of energy generated in WTE plants at the tariff mentioned in the power purchase agreements (PPA), while all other forms of renewable energy were to be purchased at a lesser, competitive price.

Figure 8 shows the power-generation capacity of different WTE plants across the country. *Figure 9* compares the average cost of one unit of power generated by solar, thermal and WTE plants. Thus, while relying on one of the most polluting and toxic forms of energy generation, WTE plants are also not economically viable as a power generation or waste management service.

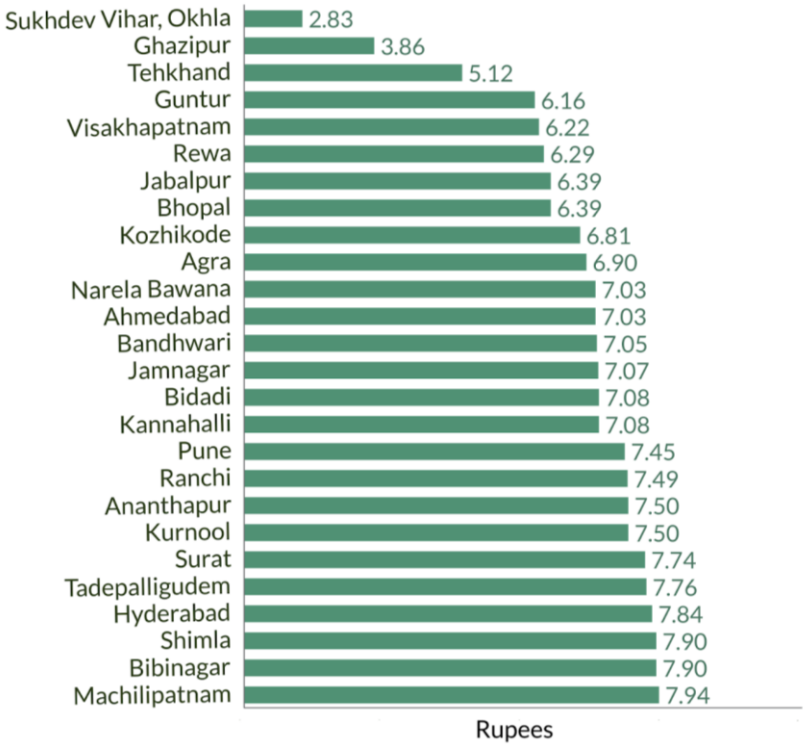


Figure 7. Power tariff per KWh for 26 operating or proposed WTE plants.

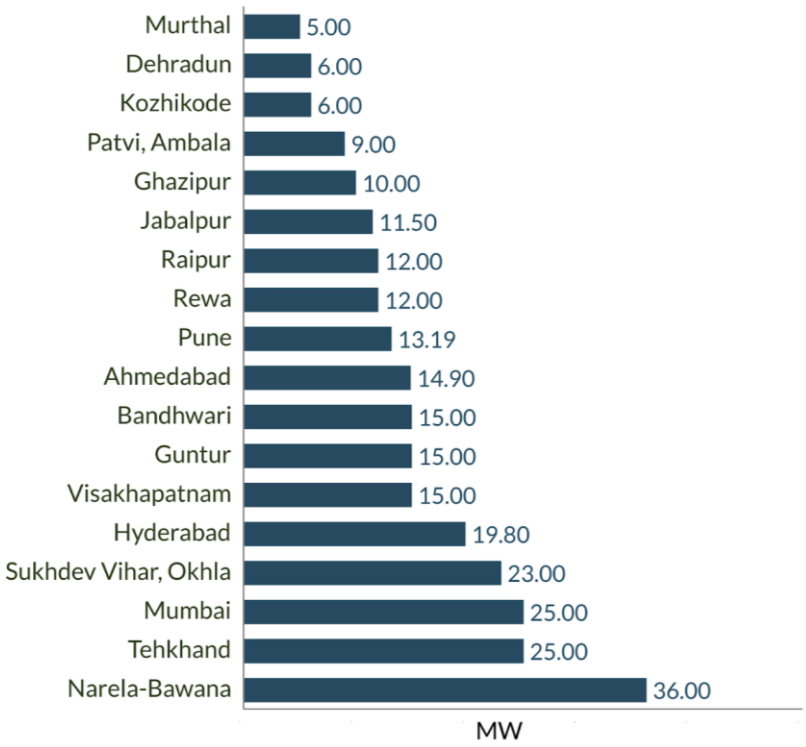


Figure 8. Power-generation capacities of WTE plants.

Figure 9. Average cost of one unit of electricity from different sources.

Investments

The capital investment for WTE plants or incinerators is typically very high because of imported and expensive machinery and technology. *Table 3* shows the capital investment listed by concessionaires in their detailed project reports (DPRs) and environmental clearances (ECs). The numbers listed by project developers don't include cost overruns that might occur during or after construction and the operational and management costs. WTEs are notorious for having very high O&M costs which are responsible for high tariffs for electricity generated by them and

even the shutting down of plants due to financial crises. In India, a major chunk of the investment in WTEs is provided by different departments of the government through different schemes.

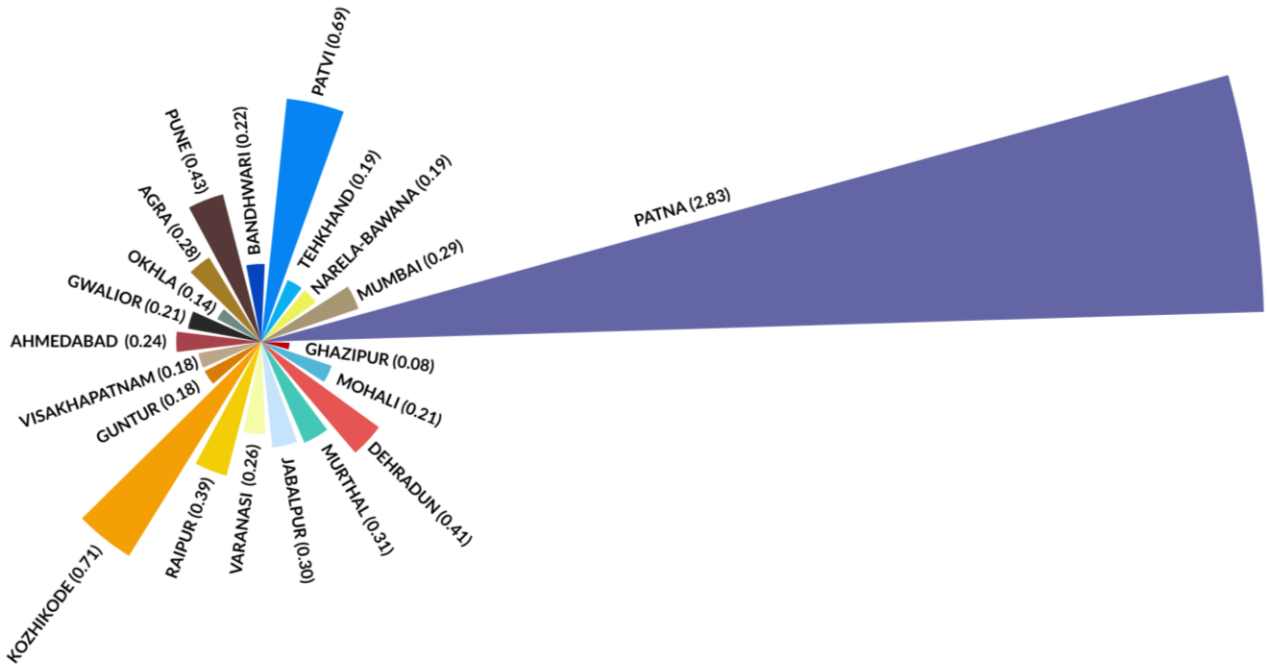


Figure 10. Investment (in crore rupees) per tonne of waste, at WTE plants in various locations.

Subsidies

Due to high capital and operational costs, WTE plants require government subsidies and grants to function. Through several schemes and policies, the government has provided financial incentives to corporations for installing WTE plants, chiefly grants under the Swacch Bharat Abhiyan, programmes of the Ministry of New and Renewable Energy and viability gap funding by the Union Government. Information on the transfer of grants is usually recorded in bid documents which are typically not released publicly by the corporation.

The documents that were accessible revealed that the Municipal Corporation of Murthal was given Rs. 40 crores as a Swacch Bharat Mission grant for installing a WTE plant, and the Bandhwari plant was given Rs. 75 crores. Some WTE plants are set up by state-run agencies themselves. For instance, in Bidadi, the WTE plant is being set up by Karnataka Power Corporation Limited (KPCL), a company owned by the government of Karnataka. The urban local body in which the WTE plant is to be installed has agreed to provide Rs. 90 crores from the state sector scheme for power generation to KPCL. The WTE plant proposed in Kozhikode has secured a viability gap funding worth Rs. 48.44 crores from Government of Kerala.

Environmental Clearance

In India, 39 types of projects (like river valley projects, mining projects, thermal and nuclear power plants and physical infrastructure projects like highways and ports) require environmental clearance (EC) from either the Union government or the government of the state they are located in. This distinction is usually made based on the size of the project. The EC process typically consists of the preparation of an Environmental Impact Assessment (EIA) report, a public hearing, and approval from the State Pollution Control Board (SPCB) and the State Forest Department (if the location involves the use of forestland). In the case of WTE plants, if the plant is designed to generate more than 15 megawatts (MW) of electricity then clearance needs to be sought from the MoEF&CC. For plants that have a capacity of less than 15 MW, permission needs to be obtained from the state government. The documents submitted by the project concessionaire are then scrutinised by the MoEF&CC or State Environmental Impact Assessment Authority (SEIAA) and an Environment Appraisal Committee. Based on their judgement, EC is either granted or rejected for the project.

However, in a 2017 order, MoEF&CC exempted all projects related to solid waste management, including WTE plants upto 15 MW from requiring environmental clearance, unless they are located in an environmentally critical area.

Out of the 19 plants for which EC data was available, only 7 required clearance from MoEF&CC. Three WTE plants in Delhi and one in Hyderabad received EC from MoEF&CC and are currently functioning. The plants in Sonepat, Bandhwari and Mumbai have not begun construction activities yet but have been granted EC from MoEF&CC.

In case of the Patna WTE plant, a long-drawn process resulted in the plant becoming delisted. In 2014, Sunil HiTech Engineers Limited (SHEL) was awarded the project, but the Patna Municipal Corporation (PMC) cancelled its contract in May 2018. In September 2018, A.G. Dauters Private Ltd. was shortlisted for setting up the WTE. Still, according to 2019 news reports, a PMC official cited delay in the work by the company as a reason for the cancellation of the contract yet again. However, A.G Dauters claimed that the delay in getting environment clearance for the project was the reason behind its slow progress.[7] According to the Union government's environmental clearance portal Parivesh,[8] the EIA was submitted by A.G. Dauters on March 18, 2019. According to the minutes of the meeting of the Expert Appraisal

[7]http://timesofindia.indiatimes.com/articleshow/70982996.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
[8]http://environmentclearance.nic.in/onlinesearchnewrk.aspx?autoid=19871&proposal_no=IA/BR/THE/99725/2019&typep=TOR

Committee (EAC),[9] the process of conversion of waste into energy mentioned by the company in its proposal was unclear; hence in absence of clear details, it was difficult to comprehend the process and associated environmental and safety impacts. Additionally, there were no plants running on either commercial or pilot-scales available in the country for assessment. This was observed by the EAC with respect to the company's proposed 55 MW plant in Delhi. Since the plant in Patna was also based on the same technology, its approval was deferred till any decision was made on the plant in Delhi. The plant in Patna was delisted on July 22, 2019.[10]

Public Hearings or Jan Sunwai

Public hearings or Jan Sunwais are an essential part of the environmental clearance process and increase public participation in city planning and infrastructural development. These efforts are also meant to secure the rights of the people who will be affected by development projects and for them to learn the implications of having such plants in their vicinity. Public hearings are a forum for people to question the municipal authorities, contractors and local administration and highlight important public concerns. However, experience has shown that most public hearings are conducted hastily and inadequately.

Recently, the public hearing held for the upcoming WTE plant in Mumbai was conducted over video conferencing and was attended by only one person from the neighbourhood in the Deonar region, the site of the proposed WTE plant. The Deonar region has one of the lowest socio-economic indicators in the city. Conducting an online public hearing in an area where maximum people do not have access to computers or the internet is either sheer negligence or a tactic by the contractors and the government to avoid protest. It is the duty of local authorities to conduct public hearings in the most accessible way possible to ensure maximum participation and awareness.

Reports also mention that serious objections raised against projects are dismissed by authorities and not even recorded in the meeting's official minutes, thus leaving no trace of public concerns.

We found records of only 7 public hearings conducted for the installation of WTEs, even though 10 plants are already operational and 15 are under construction.[11,12]

[9]http://environmentclearance.nic.in/DownloadPfdFile.aspx?FileName=jXkkuUBrHM9gpLFjKk6p2EtKh67pGC0s2VRGbsZGynbYQLri32DRi99wLb51vR6G02zwrkJTS30Vj3zE8ZAAi3pr67BkqG7jz7fAAzmuTF8=&FilePath=93ZZBm8LWEXfg+HAlQix2fE2t8z/pgnoBhDlYdZCxzUI4D0y0DyH4SbeEYqwvEmbKB0lr4NZj6MQbHFNIIMs5wzksP96Voy7Me5jYvhzrD0=

[10]http://environmentclearance.nic.in/timelineA.aspx?pid=IA/BR/THE/99725/2019&type=TOR&proposal_id=19871

[11]https://citizenmatters.in/gurgaon-citizen-and-expert-arguments-against-bandhwari-waste-to-energy-plant-27548

[12]https://www.hindustantimes.com/cities/others/4mw-waste-to-energy-plant-at-deonar-mumbaiites-oppose-plan-101619551771556.html

In public hearings, complaints against the WTE plants ranged from complaints of pre-existing health ailments of residents to the contamination of the immediate environment and the impact on the livelihoods of those working in waste management. In the public hearing for the Jabalpur WTE, residents demanded that the plant provide them with employment and that measures are taken to address corruption in the plant's sanctioning process.

Questions have also been raised about the absent, incomplete or false information provided by concessionaires and their incompetence in managing the waste in the area. In the case of the WTEs in Mumbai and Gurgaon, complainants also shared that the EIA was not publicly shared at least 30 days before the public hearing as mandated by the MoEF&CC. Anecdotal evidence also suggests that written official records of the public hearings often do not register protests and comments by people who vehemently oppose the plant.

GAPS IN ANALYSIS

There were several kinds of information that were not available in the public domain and therefore could not be included in this analysis. First, there was no comprehensive list of WTEs in the country, both operational and non-operational and their status of operation, from any government source. Further, several WTE plants in India have a long and complicated history of repeated cancellations of contracts and re-appointment of concessionaires, which results in the EC process being restarted multiple times. Often, the reasons behind the cancellation of the contracts were unclear or unavailable. Since the establishment of a Public-Private Partnership is not transparent, details about the bidding process, financers of the project, and specially information about government grants and subsidies were not readily available.

Information about the financing of projects by Municipal Corporations was also unavailable in several cases. Further, since most projects have not begun installation or completed, aspects like tariff rate, tipping fee and, in some cases, the appointment of concessionaire has not been undertaken.

In case of operational plants, there was no information about operational capacities and electricity generation available. It was unclear if these plants operate at optimal capacity.

Information of public opposition to WTEs was available only through news reports.

III. WASTE-TO-ENERGY POLICY

A review of the Union government's policy framework

Ashi Datta

INTRODUCTION

In the past few decades, policy documents, waste management manuals and annual reports from central and state pollution control boards have told the same story. Due to an increase in urbanisation, quantities of municipal solid waste (MSW) generated across India have reached crisis levels. Rivers and water bodies are choked, dump–yards are overflowing and often on fire, and there is a need for a comprehensive system of waste management. The solution arrived upon was the centralisation and privatisation of waste management. Following in the footsteps of industrialised countries, India increased its investments in incinerators often masked as waste-to-energy (WTE) projects. These plants burn municipal solid waste as a form of waste processing, sometimes generating electricity. Thermal technologies for waste treatment like combustion, pyrolysis, and thermal gasification produce dioxins, furans, and other persistent pollutants that pose dire risks to human health, natural resources and ecosystems.

Experiences of communities around the world have proved that incinerators are huge liabilities for the government, citizens and environment as these plants–

- Pollute air, soil, and water through the release of emissions and leachate
- cause major health problems in surrounding communities
- Place financial burdens on local and central governments
- Generate one of the most expensive forms of electricity
- Generate hazardous ash as a residue
- Undermine waste prevention, reuse and recycle
- Exclude local economies of recycling and waste management

Despite the failure of several incinerators in India, the government has been pushing for policies that divert funds and resources towards their installation. In this report, we have attempted to list and analyse the union government's policies around WTE and incineration in India to chart the technology's proliferation in the country over the last few decades.

THE GLOBAL EXPERIENCE OF INCINERATION AND WTE[13]

Historically, public health and disease prevention were the drivers behind the drafting of waste management policies.[14] For several urban centres, waste was a public nuisance that occupied precious city land and the main objective of local authorities was to banish garbage from sight.[15] In such a context, waste was transported out of the city and dumped in the suburbs till a new solution was found– lighting it on fire.

The first known waste incinerator which was called a destructor was built in Manchester, England in 1876 and is said to have operated for 30 years. The second country to use waste incineration was the US, which made its first incinerator in 1885 in the state of New York. With increasing urbanisation and industrialisation, hundreds of incinerators had been built in the USA and UK by 1910 and other industrialised nations followed suit. Until the 1970s, small and large waste incinerators were installed across Europe and America without any air pollution control measures. From the 1970s onward, however, the effects of dioxins on human health had become the subject of research across Europe and this resulted in widespread public opposition against the use of incineration. In the US, waste incinerators made a comeback in the 1970s during the US energy crisis as they were revamped as "waste-to-energy facilities," - a modern technology with the double benefit of making waste "disappear" while producing heat and/or electricity. Still, by the 1980s public opinion began to turn against incineration as a result of increased awareness of the health and environmental costs of burning waste along with the loss of resources in the process. Opposition from environmentalists and local communities, and the implementation of stringent standards of operation caused at least 280 incinerator projects in the US to be cancelled between 1984 and 1995. New pollution control regulations forced the closing of many existing incinerators. For example, new European Union guidelines implemented in 1996 resulted in the closing of 23 of the 28 operating incinerators in the UK. In Japan, 509 waste incinerators were slated to close because of stricter dioxin emission standards which took effect in 2002. From December 1998 to May 2002, 170 Japanese facilities were deactivated, unable to meet the new standards. Another 339 incinerators closed in 2002. With growing opposition to business expansion in industrialised nations, the waste incineration industry started exporting its toxic technology to the global south.[16]

[13]https://www.springerprofessional.de/en/recent-developments-in-waste-management/17538854?tocPage=1
[14]https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1537&context=gradreports
[15] https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1537&context=gradreports
[16] https://www.no-burn.org/wp-content/uploads/2021/03/Resources-up-in-Flames.pdf

WTE IN INDIA: DEVELOPMENT AND DRIVERS[17]

According to the 12th Schedule of the Constitution of India, urban local bodies (ULBs) are responsible for keeping cities and towns clean. Waste management thus has always been a function of the local government. Union government ministries like the Ministry of Urban Development, Ministry of Environment Forests and Climate Change and Ministry of New and Renewable Energy (MNRE) have regularly drafted rules, laws and guidelines on waste management along with Central and State Pollution Control Boards.

With increasing urbanisation and changed consumption patterns, Indian cities too began to face problems with managing their waste. And just when the waste-to-energy technology was losing credibility internationally and plants were being shut down due to violation of emission standards, India established its first WTE in 1987. The plant was set up by the Municipal Corporation of Delhi with financial support from the government of Denmark. The plant's waste processing capacity was 300 tonnes per day (TPD) to generate 3.75 Megawatts (MW) of electricity. The project's capital cost was Rs. 20 crores and was installed by a company called Volund Miljotecknik Ltd. from Denmark. The plant ran for 21 days of trial operations before shutting down due to the poor quality of incoming waste. It required waste with a net calorific value of at least 1,462.5 kcal/kg, but the supplied waste's calorific value was 600-700 kcal/kg. Plant operators tried to supplement the combustion with diesel fuel but were unsuccessful.

What followed was the failure of 3 more WTEs in India whose cost was borne through public money. The Selco plant in Hyderabad (1999), Sriram Energy Project, Vijayawada (2003), and the biomethanation plant in Lucknow by Enkem Engineers (2003) all failed due to the lack of financial viability of the technology, low calorific content of the municipal solid waste (MSW) and inefficient operations.

In 1996, environmentalist Almitra Patel filed a PIL in the Supreme Court against the open dumping of municipal solid waste which also had an additional petition against WTEs in India. As a result of this petition, the Ministry of Environment Forests (MoEF) released the Municipal Solid Waste (Management and Handling) Rules on 25 September 2000. The same year the World Bank published a toolkit titled 'Guidance Pack on Private Sector Participation in Municipal Solid Waste Management'. The toolkit recommended private sector involvement in waste management on grounds of efficiency - the logic went that since the private sector has better access to capital financing, it can use better equipment and specialists. In a different World Bank publication of 2006, titled Improving Management of

[17]https://www.springerprofessional.de/en/recent-developments-in-waste-management/17538854?tocPage=1

Municipal Solid Waste in India: Overview and Challenges, privatised solid waste management is promoted on the grounds that it costs two-thirds of government services in the sector. The report recognised that the role of the World Bank and other donors was to encourage investments from the private sector and introduce pilot projects that demonstrate new technologies.

But on May 6, 2005, the Supreme Court had prohibited the government. to sanction any further subsidies to WTEs and had also constituted a 14-member committee to look into the shutting down of the Lucknow plant. The Committee's report had two pivotal recommendations. That the technology used for waste management should be based on the quantity and quality of waste, and at the same time that the failure of the Lucknow plant did not necessarily mean that WTE technology is bound to fail elsewhere in India. While saying this the committee also ignored the failure of the other three plants and the international experience of WTEs. Perhaps taking inspiration from the World Bank's 2006 World Bank report, the committee recommended that five pilot projects be set up -: RDF Power Project (Hyderabad), Srinivasa Gayatri Resource Recovery (Bangalore), Rochem Pyrolysis Plant (Pune), Jindal's Okhla Plant (Delhi) and IL&FS Ghazipur Plant (Delhi). To make this possible, The Ministry of New and Renewable Energy launched the "Programme on Energy Recovery from MSW". Its main objectives were : (1) To set up five pilot projects for the recovery of energy from MSW; and (2) To create conducive conditions and environment, with the fiscal and financial regime, to develop, demonstrate and disseminate utilisation of MSW for the recovery of energy.

Fate of the five pilot projects

1. **Ghazipur, Delhi**: In 2007, the Municipal Corporation (MC) of Delhi conceptualised a WTE whose contract was won by a consortium of DIAL (GMR group of companies) and SELCO International. The closure of the SELCO plant in Hyderabad led to GMR retrieving from this consortium and the plant's installation falling through. In 2009, IL&FS took over the Ghazipur project which was completed in 2015. It generated Rs. 14 lakhs in revenue until 2016 following which the bankruptcy of IL&FS and the consequent sale of its assets resulted in a change in ownership and it is unclear whether the plant has restarted its operations as its consent to operate has not been renewed.

2. Nalgonda, Telangana: In 2008, RDF Power Projects Limited set up a WTE in the Nalgonda district of erstwhile Andhra Pradesh. The plant had a planned capacity of processing 800 tonnes of waste per day and would generate 11 MW of electricity

in the process. Initially sanctioned in 2000, this project was apparently revived in 2005 and has been claiming to be operational since 2008. However, in 2011 a Delhi High Court fact-finding team discovered the plant to be incomplete and non-functional. The plant was then handed over to IL&FS and there is no news of it after the firm declared bankruptcy in 2018.

3. Bengaluru, Karnataka: In 2005, Srinivasa Gayatri Resource Recovery Pvt. Ltd. won the contract to set up a WTE in Bangalore's Mandur village. In October 2013, Bangalore's Municipal Corporation served a notice to the firm asking them to commission the plant by December 2013. As per a project status report submitted in February 2014 by the developers, they had spent Rs 73.34 crores on the project and an additional sum of Rs 15 crore was required to complete it. Meanwhile, unscientific dumping of unprocessed Municipal Solid Waste (MSW) on the site had invited huge public protests by surrounding villages. Following this, as per the MNRE, the project proponent backed out from the project. In 2016, a report[18] by the Comptroller and Auditor General of India revealed that the state had paid Rs 73.34 crores to the private firm Srinivasa Gayatri for a plant which never materialised. In 2021, the local authorities were still looking for a solution to the Mandur waste dump.

4. Pune, Maharashtra: In 2009, Pune Municipal Corporation (PMC) decided to try its luck with a new waste-to-energy technology called Pyrolysis. Rochem Green Energy Pvt. Ltd. was selected to set up a plant with a waste processing capacity of 700 tonnes per day to produce 378 tonnes of refuse-derived fuel (RDF) which will generate 12 MW of power using pyrolysis. Though the plant imported machinery from the Netherlands, Finland and Germany, the plant was never able to process more than 250 tonnes of waste in a day. As per a visit of the MNRE, only the RDF plant in the WTE has been operational that sells its RDF in the market instead of using pyrolysis to produce electricity. In 2020, local residents filed a petition in the National Green Tribunal (NGT) demanding the closure of the plant. The petitioner claimed that the PMC is paying Rs 300 per tonne as tipping fees for mixed garbage, but there is no generation of energy to get the expenditure back to the state's treasury. It is further alleged that out of the total municipal solid waste (MSW), which is delivered to Rochem by the PMC, more than half is dumped at the premises as well as outside, thereby polluting the environment and generating foul odour.[19]

5. Okhla, Delhi: In 2012, the WTE set up by Jindal Ecopolis in Okhla, Delhi was commissioned. The plant's waste processing capacity was 2,050 TPD and its power

[18]https://www.deccanchronicle.com/nation/in-other-news/301116/mandur-waste-to-energy-plant-cag-trashes-karnataka-government.html

[19] https://punemirror.com/pune/civic/waste-to-power-plant-turns-into-dumping-yard/cid5142502.htm#:~:text=The%20Pune%20Municipal%20Corporation%20(PMC,garbage%20with%20no%20electricity%20production

generation capacity was 16 MW. In 2013, residents of the neighbouring communities of Sukhdev Vihar, Jasola Vihar, and Ishwar Nagar approached the High Court of Delhi by filing a Public Interest Litigation under Article 226 of the Constitution of India. The case was transferred to the NGT and in 2017 the principal bench of the NGT passed a decision in favour of the plant and declared that "the Principle of Sustainable Development leads to some inconvenience and thus causes some impacts on the environment. Unless such impact and effect is irretrievable within the limit of Sustainable Development, the Tribunal would be inclined to permit such plants to operate." Following the judgement, it was mandated that the Central Pollution Control Board (CPCB) collect and analyse the samples of ambient air quality once in four months. According to the report submitted to the NGT in September 2020, the dioxins and furans released by the Okhla WTE were 890% more than the permitted amounts. Similarly, levels of hydrogen chloride exceeded prescribed limits by 296%. Interestingly, the Online Continuous Emission Monitoring System (OCEMS) installed by the plant had recorded readings vastly different from what the CPCB's inspection found, showing figures closer to the stipulated norms. The plant also produces 250 metric tonnes of ash daily from the combustion process which is disposed of at a landfill in Tajpur.

The fate of the five pilot projects ought to have made it clear to the government that WTE as a technology is not suitable for the composition of Indian waste. Private sector involvement in the sector has only yielded increased expenditure of public money on plants that do not materialise in the end. The only plant that has functioned out of the initial 5 is the Okhla plant, which would have undoubtedly gone into financial crisis had it followed pollution norms and controlled their emissions. The NGT verdict that allowed the Okhla plant to function further cemented the fact that the government is intent on turning a blind eye when it comes to the efficiency and viability of WTEs along with their effects on the environment and public health. The stalling and ultimate failure of the Hyderabad and Ghazipur, Delhi plants is further proof that the government is unable to ensure that the private sector fulfils its obligations and the case of Okhla and Pune shows that even after the plant is set up, contractors can escape accountability though it comes at dire costs to the people.

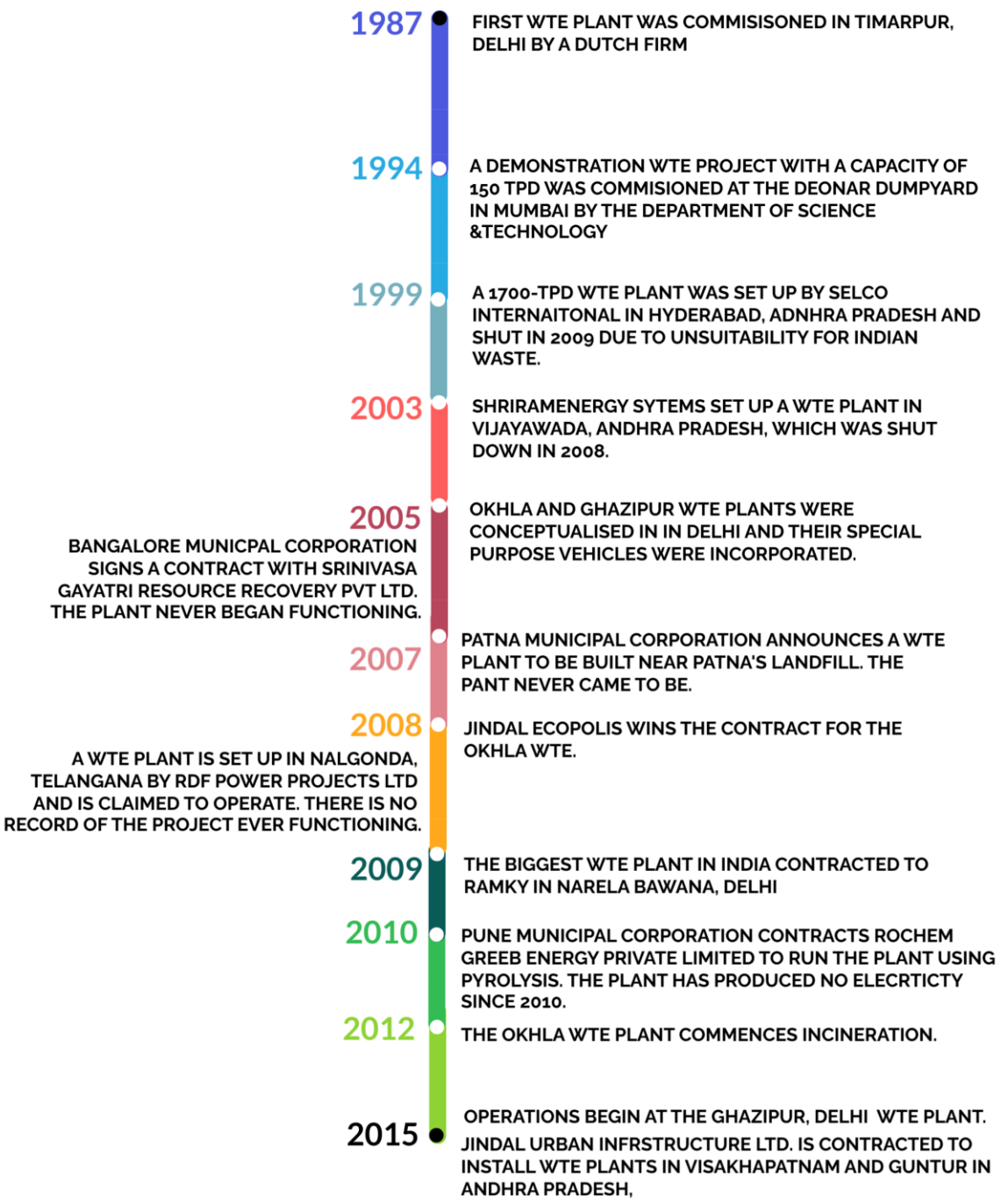


Figure 11. A timeline of WTE plants in India.

Figure 12. A timeline of WTE policies in India.

SUMMARY OF WTE POLICIES IN INDIA

1. Municipal Solid Waste Rules, 2000

MSW Rules, 2000 were a directive from the Ministry of Environment and Forest (MoEF) for municipal authorities for the collection, storage, segregation, transportation, processing and disposal of municipal solid waste.

- They prescribed municipal authorities to undertake awareness programmes for the segregation of waste and the promotion of recycling or reuse of segregated materials.
- For the processing of waste, appropriate biological processing for biodegradable waste and recycling for recoverable waste was mandated. The rules also say that "Incineration with or without energy recovery including pelletisation can also be used for processing waste in specific cases." However, these specific cases are not elaborated upon in the rules.
- Landfilling was restricted to non-biodegradable, inert waste, residues of waste processing facilities as well as pre-processing rejects from waste processing facilities.
- The following operating and emission standards were prescribed for incinerators

A. Operating Standards

i. The combustion efficiency (CE) shall be at least 99.00%.

B. Emission Standards

Parameters	Concentration (mg/Nm^3 at 12 % CO_2 correction)
i. Particulate matter	150
ii. Nitrogen oxides	450
iii. HCl	
iv. Minimum stack height shall be 30m above the ground.	
v. Volatile organic compounds in ash shall not be more than 0.01%.	

While the rules were ambitious even at the outset, their implementation has clearly failed spectacularly. The restriction of landfilling to specific materials only clearly didn't take fruition in any city or at any point till the present day.

2. National Master Plan for Development of Waste to Energy in India, 2007

In 2007, the National Bio-energy Board (NBB), Ministry of Non-Conventional Energy Sources (MNES), developed a National Master Plan (NMP) for waste-to-energy. The NMP was expected to also serve as a road map to cost-effectively implement, in a phased manner, projects for the next 15 years in the urban and industrial sectors to generate electricity. Through this policy, we see a paradigm shift in the perception of WTE in Indian policymakers. While earlier being touted as a technologically advanced method of waste management, WTEs were now being promoted as a 'green' source of energy. No longer limited to municipal waste, WTEs were also being used to treat industrial waste now. A new industry was being created and helped with subsidies to allow existing industries to shirk off the responsibility for the waste they generate while earning profits.

The NMP divided potential waste sources into 4 sources - Municipal liquid waste (MLW), Municipal Solid Waste (MSW), industrial liquid waste and industrial solid waste.

- It was estimated that by 2017 the country would generate 2,65,834 tonnes of MSW per day, potentially generating 4566 MW of electricity.
- The NMP ranked existing WTE technologies. Biological processes of biomethanation and landfill ranked first and second and gasification and incineration ranked 3 and 4 respectively.
- For funding, the NMP recommended gradually moving away from a subsidy regime towards sustainable development with self-sufficiency. The NMP recommends the introduction of a credit line for financing WTE projects.
- For the period 2004 - 2017, the NMP proposed:
    - Interest subsidy should be related to the commercial viability of the project
    - Gradual transition from subsidy regime to self-sustaining regime.
    - Preparation to achieve higher targets in the 11th and 12th FYP by carrying out policy reforms, Information dissemination, technical assistance, need-based R&D and focused pilot/demonstration projects, development of strategies to attract private initiatives and initiation of the process to move from subsidy regime to self-sustaining regime.
- Financial analysis of commercial viability showed that no subsidy would be required for MSW to Energy Projects during the 11th and 12th FYP. For the speedy implementation of the Waste-to-Energy projects, the NMP recommended a credit line for providing a loan of 33.33 % of the project cost to the proponent at an interest rate 2 % lower than the market rate. In

hindsight, this has been far from the case. Each WTE project has received substantial subsidies from the government up till 2022, with several defaulting on their committed deadlines and promised capacities.

- Based on the targets and timeframe and strategies emerging out of the financial analysis, the NMP estimated the cost to the Government for implementation of WTE projects as–

Period	Net cost to government (in crore rupees)		
	Urban		Industrial
	MSW	MLW	
2004–07	110	9	45
2007–12	1,270	-	891
2012–17	1,363	-	499
Total	2,743	9	1,435

- The NMP suggested using the Ministry of Environment and Forest (MoEF) and Ministry of Urban Development (MoUD) other than the Ministry of Non-conventional Energy Sources (MNES) to get funds for WTEs. Other than these, it suggested obtaining credit from international financial institutions and agencies. A line of credit can be obtained from these institutions through financing agreements between the Government of India and the Government of the lending country.

The NMP was just the beginning of charting out the plan to provide financial assistance to WTEs, several schemes followed with different provisions for grants and subsidies.

3. Ministry of Finance's Position Paper on the Solid Waste Management Sector in India, 2009

In 2009, the Ministry of Finance released a position paper on the solid waste management (SWM) sector in India. The paper delineated the ministry's intention to invite more private sector participation in waste management through public-

private partnerships (PPP). The paper expresses the need for urban local bodies (ULBs) and the concerned departments of municipal affairs/urban development and collectors to create favourable conditions for private investments so that the MSW rules of 2000 can be implemented in the country. While giving the excuse of the said rules, the Ministry conveniently forgot that the rules prioritise segregation and recycling and allow incineration only for non-recyclable, non-biodegradable waste. While inviting more private sector investment, the ministry also forgot the highly unsuccessful track record of the WTEs contracted before 2009.

- The paper mentioned that under the 12th Finance Commission, the government had provided assistance of Rs. 2,500 crores for solid waste management along with income tax relief to waste management agencies and tax-free municipal bonds. The 11th Five Year Plan envisaged an investment of Rs. 2,212 crores for SWM.

- The Urban Development Ministry had formulated a Waste Management Scheme for class-I cities/towns indicating a need of nearly Rs. 2,500 crores and asked the 12th Finance Commission to deviate funds to ULBs. The 12th Finance Commission allotted Rs. 5,000 crores to the ULBs in the country out of which 50% was to be earmarked for SWM.

- The steering committee report on Urban Development for the 11th Plan (2007-2012) estimated investment of more than Rs. 129200 crores for achieving a 100% population coverage of drinking water supply, Sanitation and SWM, and drainage facilities in urban areas. The ministry recorded that for meeting these requirements there was a funding gap of Rs. 89,237 crores, excluding the gross outlay. For bridging this gap, the following sources were recommended–
    i. Central government outlay
    ii. State government outlay
    iii. Institutional financing through national financial institutions
    iv. Through external funding agencies viz. World Bank, JICA, ADB and other bilateral agencies
    v. FDI and Private Sector

- The ministry noted that "the major benefits of the recovery of energy from urban waste is to bring about a reduction in the quantity of waste by 60% to 90%; reduction in demand for land as well as cost for transportation of waste to far-away landfill sites; and a net reduction in environmental pollution, besides generation of a substantial quantity of energy."

While articulating this, the paper clearly ignores the amount of ash produced by WTE plants—a highly toxic substance that is almost 20 percent of the waste treated by the plants. In some cases, like Delhi's Okhla WTE, this ash is transported to another site and dumped at locations which are not equipped to deal with this substance. And substantial energy is a very long stretch when it comes to WTEs in general and especially those in India, because of the high moisture content in the waste, plants have regularly operated below capacity.

- The following instruments were recommended for developing PPP projects:

    i. Construction grant
    ii. Minimum revenue grant
    iii. Operational grant
    iv. Annuity payment mechanism

Thus, while the 2007 National Master Plan was confident about the ability of the sector to become self-sufficient and not require money from the government, the Ministry of Finance clearly felt that grants at almost all stages of project development were necessary to keep WTEs afloat.

- According to the ministry, the privatization of solid waste management in certain cities had improved services and there was a need for developing in-house financial and managerial capability to award contracts to the private sector. Experience around the world demonstrated tipping fees as a sustainable model. The estimated business potential (for MSW management) in India was reported as Rs. 32,000 crores by M/s Ramky Enviro Engineers Ltd.

The recommendation of tipping fees as an operation model further points to the ministry's insistence on putting the financial burden of a failing technology on public money while helping private contractors make hefty profits. The inclusion of Ramky's estimation of the business potential in the waste management sector clearly exposes the government's intention to allow an issue with massive ramifications on public health, climate and the environment be dependent on the profit-making interests of the private sector.

- The high-risk nature of the urban infrastructure sector and the institutional complexity of ULBs made PPPs challenging on a countrywide scale. Expanding opportunities through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was seen as a possible solution. The ministry mentioned how keeping in line with the mission's larger spirit of promoting

private investment, "JNNURM and Urban Infrastructure Development Scheme for Small and Medium Towns (UIDSSMT) are providing substantial grant components for the development of SWM in the country. So far, 28 Projects on SWM have been approved under PPP mode under JNNURM costing Rs. 1,512.53 crores. The PPP Models in SWM under JNNURM are generally Tipping fee-based models with private equity ranging from 15% to 30%. In fact, the ULB contribution is generally funded by the Private Operator. The remaining 70% is contributed by the Central and State Governments. The O&M contracts entered into are generally for 20-30 years."

- The paper also suggested that municipal corporations borrow from capital markets and enhance their creditworthiness. ULBs were also encouraged to take loans from banks, financial institutions, and multilateral agencies.
- The paper mentioned that the state governments should take responsibility for all permissions/ clearances and the onus of getting clearances should not fall on the private sector and land should be provided at a nominal cost or free. The private sector was thus handed over acres and acres of public land for free, some of it being right in the middle of densely populated areas. Further, if the Ministry planned to treat WTE as a sector for free the participation of the private sector, then it only made sense to ensure that contractors get all clearances necessary for the establishment of any industry/project. If the state governments are not responsible for choosing a technology or installing the plant, it remains unclear how they will be able to 'help' with clearances.
- In his budget speech for 2013–14, the Finance Minister announced financial support to cities and municipalities for taking up waste-to-energy projects in the Public-Private Partnership (PPP) model.

4. Programme on Energy from Urban, Industrial, Agricultural Waste/Residues and Municipal Solid Waste, 2012

The Ministry of New and Renewable Energy (MNRE) launched the "Programme on Energy from Urban, Industrial, Agricultural Waste/Residues and Municipal Solid Waste" in 2012 and in 2019 municipal waste-based projects were included in the scheme. The program was meant to be in place till 2021 but there is a proposal to extend it to 2026. The classification of energy from waste as being a renewable form of energy violates the basic principles of environmental conservation and moving away from the use of fossil fuels that renewable energy is meant to promote. With international pressure on India to fulfil the Sustainable Development Goals and shift to more sustainable forms of energy, MNRE was very keen to incentivise the setting up of renewable energy (RE) projects. By indiscriminately burning waste, WTEs

discourage a reduction in resource extraction through reuse and recycling. RE is defined as energy created from natural processes that do not get depleted, such as wind, wave or solar energy. Municipal waste is made up of discarded materials that come from finite resources like oil and gas, wood, silica and metal.

- The Program's main objectives include "setting up of projects for recovery of energy from Municipal Solid Waste (MSW) for feeding power into the grid and for meeting captive power, thermal and vehicular fuel requirements" and "creation of conducive conditions and environment, with the fiscal and financial regime, to develop, demonstrate and disseminate utilisation of waste and residues for recovery of energy"
- Under the scheme, power generation projects based on Incineration/Gasification/Pyrolysis or a combination thereof or any new technology as approved by MNRE shall be eligible for Central Financial Assistance (CFA).
- In MSW to Power projects, mixing of any waste of renewable nature or biomass may be mixed to the extent of 25% of the total waste used or as per SERC/CERC regulations.
- Projects which intend to add capacity to the existing plants (Waste to Energy or Biomass Gasifier) shall also be considered for grant of CFA.
- The scheme is open to Urban Local Bodies / Municipal Corporations, registered private or public sector enterprises or organisations, as well as Energy Service Companies (ESCOs).
- The CFA prescribed for power plants based on MSW/RDF is Rs. 5 crore/megawatt, with the condition that the maximum CFA can be Rs. 50 crore/project. Further, State Nodal Agencies are provided with an incentive of 1% of the eligible CFA in order to facilitate the development of projects and their monitoring during implementation/post Commercial Operation Date (COD).

Directing subsidies towards false solutions like WTEs also distracts much-needed funds that need to be directed towards RE.

5. Report of the Task Force on Waste to Energy, 2014

In 2013, the then Planning Commission constituted a task force on waste-to-energy projects under the chairmanship of Dr K. Kasturirangan, a member of the planning commission. In 2014 they submitted a report with recommendations.

- The committee recommended segregation at source and the employment of the principles of Reduce, Reuse, Recover, Recycle and Remanufacture.

Only non-recyclable high calorific value waste was recommended for combustion. Conversion of plastic waste to fuel oil by catalytic conversion and pyrolysis was also recommended.

- The committee further noted that a decentralised approach is appropriate for segregation at source, transportation, pre-processing of waste, biomethanation and vermicomposting. A centralised approach is recommended for technologies such as incineration, pyrolysis, gasification, RDF production, mechanical composting, construction and demolition (C&D) waste processing and managing sanitary landfills.
- The report cited that studies conducted by the National Environmental Engineering Research Institute (NEERI) showed that the waste composition changed rapidly from 1996 to 2011 and the proportion of high calorific value waste was increasing. It mentioned the presence of a large number of WTEs in Europe, China and Japan as an encouraging sign while only mentioning in passing the shutting down of incinerators in countries like the US after concerted public protests following violations of pollution norms. According to the task force, the lessons India needs to learn from the international experience with incinerators is –

    i. Cities with populations above 2 million and cities generating more than 300 tonnes per day (TPD) or more of a combustible fraction of MSW are suitable for setting up WTEs.
    ii. The concept of 5Rs should be actively promoted like in the European Union.
    iii. Tipping Fees should be introduced.
    iv. Beneficial electricity generated prices.
    v. WTE plants be given a feed-in tariff, which means a higher price for renewable energy.
    vi. Tax Incentives: WTE plants be exempted from corporate income tax for the first 5 years of operation and eligible for an immediate refund of value-added tax.
    vii. A target of setting up 215 plants that generate 1075 MW of power by 2031 be formalised.

- The task force recommended setting up WTE plants under the public-private partnership model so that "the benefits of the private sector's dynamism, access to finance, knowledge of technologies, managerial efficiency, and entrepreneurial spirit become available to local authorities."
- The task force noted that to support the setting up of WTEs the following schemes were made available by the union government –

i. Support under erstwhile JnNURM and UIDSSMT Schemes of MoUD
ii. 13th Finance Commission Grants from the Ministry of Finance
iii. Grants from MNRE for Supporting W to E Projects
iv. MNREGA and Nirmal Bharat Scheme Under MoRD
v. TAC-Tariff Advisory Committee
vi. Viability Gap Funding from the Ministry of Finance
vii. Support for Purchase of Compost from Ministry of Agriculture

- Under these schemes, the task force recommended that for centralised Plants 40% viability gap funding for capital investment may be provided from the Union Government of India and 10% support from the State Government. For decentralised plants, 40% may be given from the Union Government towards capital investment and 20% from the State and/or ULBs. To support defunct plants 50% capital subsidy from the union government and 20% from the state government may be given to private operators.
- On top of this, municipal authorities were asked to fix the tipping fees for each plant according to their financial health. Sanitary landfills, required to dispose of toxic ash leftover in incinerators, are also provided financial assistance in the form of a 33% grant limited to Rs. 2 crores.
- The report estimated that the number of MSW-based power plants can increase to 215 plants by 2031 and 556 power plants by 2050.

With the NDA government's rule beginning in 2014 and the launch of the very public Swachh Bharat Abhiyan, this planning commission task force further strengthened and increased the financial assistance and regulatory support given to WTEs. Starting with actually viable and sustainable ideas of waste reduction, material reuse and decentralised waste management, the report's main aim seems to be further formalising the huge monetary support given to private contractors for setting up WTEs.

6. Swachh Bharat Mission, 2014

In 2014, the Union government launched the Swachh Bharat Mission (SBM) to promote a change in the sanitation sector. SBM - Gramin was financed and monitored through the Ministry of Drinking Water and Sanitation (since converted to the Department of Drinking Water and Sanitation under the Ministry of Jal Shakti) whereas SBM- Urban was overseen by the Ministry of Housing and Urban Affairs. The two main aims of the mission's strategy were the provision of household, community, and public toilets, and solid and liquid waste management.

- The 2014 guidelines stipulated that under SBM, Union government incentive for solid waste management (SWM) projects will be in the form of a maximum of 20% Grant / VGF (viability gap funding) for each project. The remaining funds have to be generated through private sector involvement, user charges or state governments. However, in 2017, the revised guidelines said that "Union government incentive for the SWM projects will be in the form of a maximum of 35% Grant / VGF for each project. The state share will be 23.3% of the project cost. For UTs without a legislature, the Union government incentive for SWM projects will be 35% of project costs, and the UT share will be 11.67% of project cost, which will also be borne by the Centre. For UTs with a legislature, the Union government incentive for SWM projects will be 35% of project costs, and the UT share will be 11.67% of the project cost. For North Eastern and hilly states, the Union government incentive for SWM projects will be 35% of project costs, and state share will be 3.89% of the project cost."
- The guidelines also clarified that "in order to promote projects of waste to energy, it is clarified that the central government Grant/ VGF may also be used for such projects, either upfront or as a generation-based incentive for power generated for a given period of time."

7. National Action Plan for the management of MSW by CPCB, 2016

In its verdict on the Almitra H. Patel Vs Union of India case, on 5 February 2015, the National Green Tribunal directed that "The Central Pollution Control Board shall submit its independent comment in relation to the formulation of a national policy with regard to collection and disposal of municipal solid waste as a National policy to be adopted." As a result, the CPCB submitted a National Action Plan (NAP) for the management of MSW. The NAP noted that –

- Municipalities do not keep/maintain regular data on waste generation and its composition. But according to data collected by the CPCB, on average, garbage is composed of 40–45% of organic fraction and 20-30% inert fraction, the rest being plastics, paper, rags and other components. This information ought to have proven critical for the sanctioning of future WTEs as the MSW rules 2000 specifically prescribed WTE only for waste with 99% combustion efficiency.
- Many cities/towns have set up waste processing plants, but they are not self-sustaining. Some of them are closed and the remaining waste processing plants are running at loss due to a lack of policy. The municipalities face problems in identifying new landfill sites. Each town/city has 2-3 open dumping grounds which have already been exhausted. The collected waste

from cities goes directly to the dumping ground. The dumped waste is mixed in nature. Despite the failure of existing waste management systems, the NAP recommends forming clusters to better utilise waste processing units, which ignores the experience of higher success rates of decentralised waste management.

- The States were asked to follow the following waste management hierarchy in preparing their action plans–

    i. Waste prevention or minimisation
    ii. Waste utilisation
    iii. Waste recycling
    iv. Waste processing
    v. Waste-to-Energy
    vi. Landfilling

- Each municipal body will prepare an action plan in consultation with the State Urban Department after assessing the status of waste generation and composition. The local body would work out the requirements of tools and equipment to ensure proper; segregation, material recovery, storage, transportation, processing and disposal of waste; and document it in the form of DPR. This plan will meet the provisions as per Solid Waste Management Rules, 2016.
- For waste processing and disposal, the NMP recommended a regional/cluster-based approach to avoid over-installation of plants.
- The bigger cities having a population of more than a million and generating waste of more than 1,000 tonnes per day would have to opt for higher waste-consuming technologies like WTE so that the waste processing plants become as sustainable and economically viable.
- For WTE projects operating based on thermal technologies, adequate waste of high calorific value should be ensured by adopting proper segregation practices. However, mass burn technologies utilising biomass were discouraged.

The waste management hierarchy makes another appearance in a policy document, with WTE again ranking very low, yet the same document recommends opting for WTE when it comes to cities with a large population.

8. Solid Waste Management Rules, 2016

In 2016, MoEF&CC updated its rules for solid waste management.

- Under these rules, the waste generator must segregate their waste at the source, and residences, institutions and commercial establishments must process, treat and dispose of biodegradable waste within the premises as much as possible.
- Combustible waste was defined as "non-biodegradable, non-recyclable, non-reusable, non-hazardous solid waste having a minimum calorific value exceeding 1500 kcal/kg and excluding chlorinated materials like plastic, wood pulp, etc."
- The criteria for the WTE process was the use of non-recyclable waste having a calorific value of 1500 Kcal/kg. This provision is necessary to ensure efficient resource recovery and prevent the use of excess fuel to burn waste yet how this can be reconciled with the setting up of new plants, with large capacities is hard to guess. The amount of high calorific value, non-recyclable waste produced by a city as large as even Delhi is only 10.10% of the total waste produced.
- The rules also pushed for the setting up of WTEs in their allocation of tasks to various departments.

i. The Ministry of Urban Development (MoUD) was given the mandate to "formulate national policy and strategy on solid waste management including policy on waste to energy in consultation with stakeholders within six months."
ii. The Ministry of Power was asked to "(a) decide tariff or charges for the power generated from the waste to energy plants based on solid waste and (b) compulsory purchase power generated from such waste to energy plants by the distribution company."
iii. It was also prescribed that the Ministry of New and Renewable Energy Sources through appropriate mechanisms shall "(a) facilitate infrastructure creation for waste to energy plants; and (b) provide appropriate subsidy or incentives for such waste to energy plants."
iv. The Secretary–in-charge, of Urban Development in the States and Union territories were asked to "prepare a state policy and solid waste management strategy that lay emphasis on waste reduction, reuse, recycling, recovery and optimum utilisation of various components of solid waste to ensure minimisation of waste going to the landfill."

- The following emission standards were prescribed for incinerators–

Parameters	Emission Standard
Particulates	50 mg/Nm^3
HCl	50 mg/Nm^3
SO_2	200 mg/Nm^3
CO	100 mg/Nm^3
Total Organic Carbon	20 mg/Nm^3
HF	4 mg/Nm^3
NO_x	400 mg/Nm^3
Total dioxins and furans	0.1 ng TEQ/Nm^3
Cd + Th + their compounds	0.05 mg/Nm^3
Hg and its compounds	0.05 mg/Nm^3

The emission standards mentioned above are far more lenient than European standards (listed under the section "*Ignoring the real impacts of WTEs*") but even these are not followed by WTE plants. In 2021, the Delhi government fined the three WTEs in Delhi merely 5 lakh rupees for grossly violating standards.

9. Manual on Municipal Solid Waste Management, 2016

In 2016, the Central Public Health and Environmental Engineering Organisation (CPHEEO) released a Municipal Solid Waste Management Manual under the Swachh Bharat Mission.

- The manual prescribes the following hierarchy for the selection of waste management technologies with an aim to maximise resource conservation and efficiency and minimise health and environmental impacts.

    i. At source reduction and reuse
    ii. Waste recycling
    iii. Waste to composting
    iv. Waste to Energy
    v. Waste disposal

- The hierarchy implies that all options of waste minimisation should be exercised before treatment and disposal technologies are selected and implemented. The manual also prescribes clear directions for the development of source reduction, reuse and recycling procedures and infrastructure.
- On the topic of incineration, it notes that "WTE plants are an expensive option for managing MSW, requiring skilled staffing and adoption of high-level

technologies. They also have the potential to cause significant environmental impacts through emissions and fly ashes if plants are not operated efficiently and if appropriate emission control mechanisms are not adopted. Since the capital investment is very high, the planning framework of the community should be stable enough to allow a planning horizon of 25 years or more. Before commissioning an incinerator, a pre-feasibility study for the technology must lead to positive conclusions for the respective community."

This manual released under SBM, clearly warns against installing WTEs without stringent planning yet the same mission has released several crores over the years to plants in different parts of the country.

10. Revised Tariff Policy, 2016

In 2016, the Union Government made revisions to the Tariff Policy of 2006. The new policy said that "Distribution Licensee(s) shall compulsorily procure 100% power produced from all the Waste-to-Energy plants in the State, in the ratio of their procurement of power from all sources including their own, at the tariff determined by the Appropriate Commission under Section 62 of the Act." The energy produced by WTEs is one-third costlier than thermal energy and almost thrice the price of solar energy. The power tariff of most WTEs in the country ranges between Rs. 6-8 per unit (or per kWh), and scarce resources are spent by DISCOMS on procuring energy generated from a highly polluting source.

11. Plastic Waste Management Rules, 2016

The MoEF&CC released the Plastic Waste Management (PWM) Rules in March 2016 to replace the Plastic Waste (Management & Handling) Rules, 2011.

- The 2016 rules recognised the dangers of single-use multi-layered packaging plastics. Waste generators were instructed to take steps to minimise the generation of plastic waste and segregate plastic waste at the source and the local body was made responsible for ensuring the handling of plastic waste from collection to disposal of the non-recyclable fraction.
- It was prescribed that producers, within a period of six months from the date of publication of these rules, shall work out modalities for the waste collection system based on Extended Producers Responsibility. Primary responsibility for the collection of used multi-layered plastic sachets or pouches or packaging is of Producers, Importers and Brand Owners who introduce the products in the market.

- Clause 9(3) of the rules stated that; "manufacture and use of non-recyclable multi-layered plastic (MLP) if any should be phased out in two years' time". If the MoEF was serious about implementing these instructions then it was all the more reason to stop financing WTEs as the proportion of combustible waste would decrease drastically once MLPs and other packaging stops circulating.

12. Standing Committee on Energy, MNRE publishes a report on power generation from MSW, 2016

On 5th August 2016, the Standing Committee on Energy presented a report on Power Generation from Municipal Solid Waste to the parliament. The committee noted that the abysmal condition of solid waste management in the country could be dealt with by utilising the waste that was currently being left untreated for generating electricity.

- The Committee noted that the waste generated in the country is mixed waste, comprising a large amount of inert material and a very high moisture level unlike in other countries. To enable proper combustion, the committee recommended enforcing segregation through training, awareness and sensitisation. Yet despite segregation how the installation of an exceedingly higher capacity of WTEs will be justified was not specified in the report.
- The committee recommended that the Government provide proper policy and technological support for the WtE sector as the existing technologies do not appear to be compatible with local requirements
- Efficient, financially affordable and environmentally suitable technological methods should be adopted to recover energy from the waste without compromising on the viability of WTE Plants and ensuring better public health.
- Mass burning of municipal waste should be discouraged and prohibited as it is detrimental to the environment and also a major source of health hazards.
- The Committee noted that most WTEs in the country were failures and the public sector must come forward and set up at least two demonstration WTE plants which would give a message that the government is committed to the cause of scientific management of MSW in general, and adoption of the methods of WTE in particular, and it believes that such a project is viable and can be run efficiently.
- After visiting the Okhla WTE in Delhi, the committee recommended that the model of the Okhla plant may be replicated in other cities for the safe disposal of MSW and generation of power. Perhaps in preparation for their visit to Okhla the committee failed to review the case filed in the Delhi High

Court and then the NGT by residents of the neighbouring Sukhdev Vihar. Despite the claims of the residents being validated by CPCB inspections in 2020-21, the plant was allowed to continue functioning in 2017.

- Since measures undertaken under the Swacch Bharat Mission like grant of project cost, Viability Gap Funding (VGF) to States and Urban Local Bodies (ULB), incentivisation of cities for regular supply of garbage etc were unable to prove adequate in boosting the WTE sector, the committee recommended that 'the grant/funding to States and Urban Local Bodies (ULB) be made more attractive. This just goes on to show the lack of financial viability of WTEs despite repeated grants, increased tariff rates and low-interest rates provided by the government yet the government seems intent on pumping more money into a scheme that even big private investors are shying away from.
- The Committee suggested that adequate ways and means should be allotted to ensure the wholehearted participation of the private sector in MSW management. Tax exemptions/ rebates/holidays for equipment and machinery etc. should be considered to encourage private participation in the sector.
- To make WTEs viable and yet not overcharge consumers for electricity, the committee recommended alternate mechanisms to be adopted rather than adhering to the Rs. 7.90 tariff recommended by the Central Electricity Regulatory Commission.

13. Niti Aayog's Action Agenda, 2017

In its three-year action agenda 2017-18 to 2019-20, Niti Aayog recognised the need to accelerate the action initiated under the Swachh Bharat Mission for the proper management of municipal solid waste.

- To achieve this the agenda said that "options such as biogas and composting are not sustainable solutions in larger cities since they generate by-products or residues in large volumes that these cities will find difficult to dispose of efficiently. Only incineration (also called Waste to Energy), thermal pyrolysis and plasma gasification technologies offer sustainable disposal solutions. However, pyrolysis is not suitable for MSW due to its diverse composition and plasma technology but remains too costly to adopt so far. Hence, incineration or "Waste to Energy" is the best option." This claim again ignores the ash generated by the WTEs and the by-products of toxic emissions and leachate generated by WTEs and the high capital costs required in their installation.
- The Niti Aayog recommended the constitution of a Waste to Energy Corporation of India to "develop world-class waste to energy plants through

PPP across the country. It can play a key role in fast-tracking coverage of waste to energy plants across 100 smart cities by 2019."

- According to the agenda, under the Swachh Bharat Mission, the expected outcome for energy generation from waste was 330 megawatts for the year 2017-18 and 511 megawatts for the year 2018-19.

14. Plastic Waste Management Rules, 2018

The progressive legislation of 2016 was drastically diluted in 2018 when the Plastic Waste Management (Amendment) Rules, proposed substituting the phrase 'non-recyclable multi-layered plastic if any' with 'multi-layered plastic which is non-recyclable or non-energy recoverable or with no alternate use.

15. Swachh Bharat Mission 2.0, 2021

On 1 October, 2021, the Prime Minister launched the Swachh Bharat Mission – Urban 2.0, with a total outlay of Rs. 1,41,600 crores - almost two and a half times more than the first mission. Solid waste management was allotted Rs. 39,837 crores.

- The mission guidelines mention that 10-20% of municipal solid waste in India is non-recyclable and combustible. They also say that "waste to electricity projects are financially and operationally viable only with assured input of minimum 150 – 200 tonnes per day (TPD) of non-recyclable, high-calorific value segregated dry waste (RDF). Ideally, only ULBs with a population of 10 lakhs and above (individually or in a cluster) may opt for waste to electricity projects. While approving Waste to Electricity projects, ULBs are advised to ensure adequate quantity of waste/RDF of specified calorific value."
- The union government's contribution to SWM projects in urban local bodies with a population of more than 10 lakhs needs to be 25% and WTE plants are included in components that can receive this funding.
- The authority to choose the technology for SWM projects has been given to state governments and MoHUA only has the power to bring the various options available to the state/ULB's notice.

16. Plastic Waste Management Rules, 2021

The 2021 amendments made additions to the original rules.

- They prohibit the manufacture, import, stocking, distribution, sale and use of some single-use plastic like earbuds with plastic sticks, plastic sticks for balloons, plastic flags and plastic cutlery.

- The rules also said that "Any notification prohibiting the manufacture, import, stocking, distribution, sale and use of carry bags, plastic sheets or like, or cover made of plastic sheets and multilayered packaging and single-use plastic, including polystyrene and expanded polystyrene, commodities, issued after this notification, shall come into force after the expiry of ten years, from the date of its publication" This effectively stops local bodies and city/state governments from making any immediate rules that prohibit the production or use of plastic and is a central government initiative to stop initiatives to prohibit the overproduction/use of plastic.
- The 2021 amendments also reduced the 2016 prescription of phasing out the manufacture and use of non-recyclable and non-energy recoverable plastic to exclude multi-layered packaging used for imported goods.

17. EPR guidelines, 2022

In October 2021, MoEF released a draft notification on extended producer responsibility (EPR). The rules cast an obligation on producers, importers and brand owners (PIBOs) for the collection and recycling of plastic packaging waste along with the use of recycled material in packaging. The rules are applicable to both pre-consumer and post-consumer plastic packaging waste but do not apply to small and micro-enterprises.

- The rules included three categories of plastic - rigid plastic packaging, flexible plastic packaging and multilayered plastic packaging. They did not include compostable plastic or bioplastics even though in many cases, bio-based plastics can be identical to fossil-fuel-based plastics, and frequently contain a blend of fossil fuels and biological material.
- The rules prescribe targets for the collection, recycling, use of recycled plastic content, and reuse of PIBOs. The EPR guidelines, 2022 reduced several of these targets, meaning that more plastic will be going to incinerators instead of being recycled or reused.
- The 2021 draft and the 2022 guidelines on EPR, also delineate the provision for the generation of surplus EPR certificates, carry forward and offset against the previous year's EPR targets and obligations, and sale and purchase of surplus EPR certificates. It seems like the government is using the logic of net-zero and giving an avenue to bigger, more prosperous PIBOs to shirk away from their responsibility by purchasing EPR certificates.
- The 2022 EPR guidelines also say that only registered plastic waste processors are eligible for processing and recycling plastic waste and issuing EPR certificates to PIBOs. This directly excludes the large informal sector

responsible for waste processing and recycling. Waste will go to bigger, more decentralized processors like corporations that set up WTE plants.

RELATING THE EVOLUTION OF INDIAN POLICIES WITH GLOBAL DEVELOPMENTS IN THE WTE SECTOR

The global experience of increasing industrialization and urbanisation combined with unsustainable consumption patterns was replicated in India as well. The introduction of waste incineration in the global north as a technologically efficient way of waste management soon gave way to a realisation of the perils of such a system that rewards the disposal of resources and increases pollution instead of controlling it. It is dismal to note that during the period when strict legislation and emission standards were being enforced for WTEs in industrialised nations, India was gearing up to welcome this technology without proper safeguards in place. This overlap between the promotion of WTE technology in countries like India and its downfall in the west has been seen by commentators as a strategic shifting of markets by the lucrative industry.

The strict regulation and near rejection of WTE and incineration as a technology in some countries was achieved after years of protest campaigns and lived experiences of illness and discomfort by local populations. Instead of learning from the experience of populations who had suffered at the hands of these plants, the Indian government was keen to ignore the complete mismatch of this technology with the country's specific needs and introduce legislation after legislation supporting it. The five pilot projects introduced by the Supreme Court mandated committee in 2005, failed miserably on one account or the other. The plants in Nalgonda and Bangalore never started functioning even after the government had given monetary concessions to the plant developers. The plant in Pune was only able to process less than half the quantity of waste it was supposed to and instead of using pyrolysis to generate electricity as planned, the plant is compressing waste into RDF and selling it into the market. The plant in Ghazipur, Delhi too suffered from delays due to the withdrawal of investors. The plant in Okhla in Delhi is cited as an example by ULBs and plant concessionaires as proof of the success of WTE technology. The plant however has attracted much infamy by generating grossly excess pollution and being located next to a residential area. The purpose of setting up pilot projects is to test and examine the viability of undertaking the project on a wider scale and prevent unnecessary loss and damage to life and the environment. Why multiple agencies on several levels ignored the failure of hundreds of WTEs around the world and the five plants installed in India, remains a puzzle.

WHAT ARE THE POLICIES IMPLYING: A SUMMARY OF EVERYTHING THAT DOES NOT ADD UP

1. Ignoring the real impacts of WTEs

Policy documents that support the installation of WTEs valorise them as a scientific solution to the problem of urban waste. The 2014 Niti Aayog report on WTE in India, illustrates examples of successful WTE plants in other countries. It does this while ignoring widespread public protests against incinerator facilities and the shutdown of several WTEs across the world and a few even in India. Contrary to what the government would like us to believe, incinerators are worse for the environment and public health as compared to other waste management alternatives. Incineration releases major pollutants into the atmosphere such as dioxins, furans, lead, carbon monoxide, oxides of sulphur and nitrogen, hydrocarbons, and particulates. Toxic ash leftover from burning waste needs to be disposed of in engineered landfills, and if not handled properly can pollute soil and water in the area.

MSW Rules 2000 and SWM Rules 2016, prescribe emission standards for WTEs in India. While the 2016 rules improved upon the earlier rules by covering more contaminants, they are still far more lenient than European standards for incinerator emissions.

Table. Indian versus European standards for WTE emissions[20]

Contaminant	*EU Standards (mg/m^3)*	*MSW Rules 2000 (mg/m^3)*	*SWM Rules 2016 (mg/m^3)*
Organic Substances	10	-	20
CO	50	-	100
HCl	10	50	50
HF	1	-	4
SO_x	50	100	200
NO_x	200	450	400

[20] Reproduced from *To Burn Or Not to Burn: Feasibility of Waste-to-energy Plants in India*, by Swati Singh Sambyal, Richa Agarwal, published by Centre for Science and Environment (New Delhi, India), 2018

SPM	10	150	50
Hg	0.03	-	0.05
Cd, Tl	0.05	-	0.05
Sb, As, Pb, Cr, Co, Cu, Mn, Ni, V, Sn	0.5	-	0.5
Dioxins and furans	0.1	-	0.1
Minimum temperature	850°C	-	950°C
Retention Time	More than 2 seconds	-	More than 2 seconds
Reference value for flue gas oxygen content	11% by volume	-	-
Reference value for flue gas oxygen content for waste pyrolysis/gasification	3% by volume	-	-

Experience with WTE in Delhi has made it clear that these facilities continuously fail in adhering to even the lenient standards for emissions in India. In a 2020 inspection carried out by Delhi Pollution Control Committee and Central Pollution Control Board, it was revealed that all 3 plants exceeded emission standards substantially while their Online Continuous Emission Monitoring Systems recorded false figures that were closer to the stipulated norms.

2. Prioritising Segregation and biological processing of waste only on paper

Most policy documents around waste management prescribe the segregation of waste as an important step towards the efficient handling of solid waste. The SWM rules 2016, Niti Aayog Task Force report on WTE, Manual on MSW Management and The Plastic Waste Management Rules, all mandate that waste generators segregate at source and only high calorific value waste is burnt in WTEs. But segregation means that only a small fraction of waste will be available for incineration. The Swachh Bharat Mission 2.0 guidelines specify that only 10-20% of municipal solid waste in India is non-recyclable and combustible, and while setting up WTEs assure that adequate quantities of high calorific value waste are available in the vicinity. It is puzzling as to why these recommendations and observations are ignored when it comes to the setting up of WTEs. Since 2009, we have only seen a

rise in government support for the incineration of waste, with grants and subsidies provided through various schemes and policies. Instead of creating infrastructure that supports source segregation and minimises non-biodegradable waste, the state is incentivising a technology it cites as one of the least favourable options for MSW management.

3. Is Indian waste suitable for combustion?

The Municipal Solid Waste Rules 2000, prescribed WTEs for waste with a combustion efficiency of at least 99%. The National Action Plan for the management of MSW (2016) by CPCB also prescribed the same. The Solid Waste Management Rules, 2016 prescribed WTE for waste having a calorific value of at least 1,500 Kcal/kg. Calorific value is the measure of heat produced by the complete combustion of a specified quantity of a product. According to a 2004–05 study by the CPCB with assistance of the National Environmental Engineering Research Institute (NEERI) in 59 cities (35 metro cities and 24 state capitals), the average calorific value of waste was in the range of 1,411–2,162 kcal/kg. But a 2021 study published in the International Journal of Engineering, Science and Technology, municipal waste in India has a low calorific value of about 800-1,100 kcal/kg.

4. Public money for public harm

The 2009 position paper on SWM by the finance ministry, listed the large sums of money the government had recently spent on solid waste management. Future plans required even more investment that the government was not capable of providing. The solution was to invite private investments. The government committed to providing several incentives along with tipping fees. It was believed that with PPP, the 'efficiency' and money brought in by the private sector will ensure 100% coverage of waste disposal in urban areas. A Public-Private Partnership (PPP) is a partnership between the public sector and the private sector for the purpose of delivering a project or a service. A study of the working models of the privatisation of public services, and PPPs exposes that both are essentially the same. Working in cohesion with the government and using public finance to create profit making assets has allowed private firms to minimise fiscal and regulatory risks, while enjoying subsidies and grants in the name of progressive policies. Further, private corporations are not held accountable in the same way that governments are when it comes to social and environmental obligations. Examples over the world and in India have proven that when public services or infrastructure are leased out to private corporations, there is an increased chance of corruption, higher costs of

essential services and damage to community resources, workers and public infrastructure.[21]

When it comes to waste management, a private corporation will tend to view the process as divorced from the larger chain of resource extraction, climate change and energy consumption because they have no incentives to contribute positively towards those. They do not sign treaties and pacts like governments of nation states.

Therefore, a company that is given a contract for the setting up of a WTE will not be concerned about the environmental and social impacts of excess waste generation or the importance of implementing a zero waste system as their objective will only be to fulfil obligations of their contract and extract profits.
The trend continued. In the 2014 task force report, 40% viability gap funding for capital investment was recommended from the Union Government and 10% support from the State Government. It was hoped that 215 WTE plants will be installed by 2031. Under the *Programme on Energy from Urban, Industrial, Agricultural Waste/Residues and Municipal Solid Waste launched* by MNRE, the CFA prescribed for power plants based on MSW/RDF is Rs. 5 crore/megawatt, with the condition that the maximum CFA can be Rs. 50 crore/project.

Under the Swachh Bharat Mission too incentives for SWM projects will be in the form of a maximum of 35% Grant / VGF for each project and the state share will be 23.3% of the project cost. The Niti Aayog in its three-year action agenda 2017-18 to 2019-20 said that the expected outcome for energy generation from waste was 330 megawatts for the year 2017-18 and 511 megawatts for the year 2018-19.
The mismatch between the union government's desire to incentivise and fast-track the setting up of WTEs and its acceptance of the fact that source segregation, bioprocessing, reduction and reuse is the preferable form of waste management indicates a clear lack of clarity on the issue. Instead of financing community-based models of waste management, decentralised composting plants and material recovery facilities, the government is directing money to a model of waste management that harms public health and finances along with the environment.

5. Ignoring the massive Waste of Energy—WTEs are unjustifiably being classified as a renewable form of energy.

In its 2012 *Programme on Energy from Urban, Industrial, Agricultural Waste/Residues and Municipal Solid Waste,* the MNRE recognised energy from municipal solid waste as a renewable energy source. How the Ministry came to this conclusion is unclear since waste, especially high calorific value waste like plastic,

[21] https://www.world-psi.org/sites/default/files/rapport_eng_56pages_a4_lr.pdf

wood and paper, is made of fossil fuels and trees - resources that are not renewable. By classifying waste as a renewable resource, we run the risk of incentivising the continued depletion of finite resources because of the over-production of disposable materials.

It has also been established that recycling and reuse save much more energy than WTEs can generate because these practices serve to reduce energy use throughout the production cycle of materials. Reduced use of energy also means that they contribute to the climate crisis less than incineration of waste.[22]
WTEs are also not a viable alternative to fossil fuels as they emit more greenhouse gases per unit of electricity than coal-fired power plants. To make the same amount of energy as a coal power plant, trash incinerators in 2018 released 1.7 times as much carbon dioxide (CO_2), as much carbon monoxide, three times as much nitrogen oxides (NOx), five times as much mercury, nearly six times as much lead and 27 times more hydrochloric acid (HCl).[23]

6. Reuse and Recycle targets: Still a distant dream

The Municipal Solid Waste Management Manual released under the Swachh Bharat Mission in 2016, the 2014 report by the task force on waste-to-energy projects, and the Plastic Waste Management Rules, 2016 delineate a very clear order of preference when it comes to methods of waste management. All of them put reuse and recycling above using waste for generating energy and prescribe the latter only for non-recyclable fractions of waste. According to the CPCB's *Guidelines for the Disposal of Non-recyclable Fraction (Multi-layered) Plastic Waste (2018),* multilayer plastic (MLP) which cannot be recycled through conventional recycling methods is considered non-recyclable plastic.[24] According to the abovementioned guidelines, only 6% i.e. 0.56 million tonnes of the total plastic waste generated annually is non-recyclable.[25] If this number is to be believed then there would be no need to install WTEs across the country since they would need a far greater proportion of non-recyclable waste to function than is being generated. More importantly however, the 6% proportion estimated for MLPs is far too little if data from other sources is to be believed. According to Break Free From Plastic's *Brand Audit 2021*, 35% of plastic waste in India is composed of MLPs.[26] It is virtually impossible that there is a 29% hike in the quantity of MLPs in just three years. Even data from PlastIndia Foundation, an apex body of major associations, organisations, and institutions

[22] https://www.no-burn.org/wp-content/uploads/Burning-Public-Money-GAIA-2011_2.pdf
[23]https://www.energyjustice.net/incineration/worsethancoal#:~:text=Coal%20power%20plants%20are%20widely,incinerators%20are%20for%20air%20quality.&text=Carbon%20dioxide%20(CO2)%20%E2%80%93%20the,that%20of%20coal%20power%20plants.
[24] https://cpcb.nic.in/uploads/plasticwaste/guidelines_nonrecyclable_fraction_24.04.2018.pdf
[25] https://cpcb.nic.in/uploads/plasticwaste/guidelines_nonrecyclable_fraction_24.04.2018.pdf
[26] https://www.breakfreefromplastic.org/brandaudit2021/

connected with plastics, estimated that out of the total 170 lakh tonnes of plastic manufactured in the year 2018-19, 42% was made up of flexible packaging.[27] Most flexible packaging is single use and has very low recycling rates due to its chemical composition.[28]

Eliminating plastic unfit for recycling will require asking fast-moving consumer goods (FMCG) companies to implement reuse systems and stop the use of such packaging. There is no available data on the reuse systems in place in the country. In order to encourage recycling and the use of recycled plastic, the government introduced EPR for plastic manufacturers in 2016 but as the next point illustrates, no real progress has been made even after its introduction.

7. When will the polluter pay

In recent years, governments and societies across the world have recognised the massive financial and environmental burdens of processing plastic waste. Extended producer's responsibility (EPR) is a strategy that aims to make the manufacturer of the product responsible for the entire life cycle of the product and especially for the take-back, recycling and final disposal of the product. India's Plastic Waste Management Rules (PWM) have gotten consistently weaker with every amendment. The 2018 amendment reversed the ban on the production and use of non-recyclable single-use plastic by limiting it to only non-recyclable and non-energy recoverable plastic. There is no non-energy recoverable plastic, all plastic can be burnt. The 2021 amendments further added that multi-layered packaging used for imported goods is exempted from being phased out.

The 2022 guidelines for EPR on plastic packaging described the final targets for producers, importers and brand owners under EPR. The targets were reduced from what the draft notification on EPR had prescribed in 2021. While the guidelines prescribe the 100% collection of plastic waste produced by 2024, they prescribe only 60-80% of recycling obligations and 10-60% for the use of recycled plastic. If the prescribed percentage of the use of recycled plastic is so low, it means that PIBOs will keep sourcing 'fresh' plastic as most recycled plastic is downcycled and rarely fit for its primary use again. When producers, importers and brand owners are not made to take responsibility for non-recyclable waste introduced by them, measures like WTEs come into play. It's clear how much public investment and health and environmental costs are paid for the management of waste that private corporations are earning profits off of.

[27] https://www.plastindia.org/plastic-industry-status-report
[28] https://www.breakfreefromplastic.org/2022/03/31/breakfreefromplastic-movement-responds-to-the-ellen-macarthur-foundations-report-on-addressing-flexible-packaging/

CONCLUSION

The solid waste crisis is a crisis based on our current patterns of production, managing supply-chains and consumption. Incineration does not manage our waste, it simply converts it into harmful residues that we breathe, drink and eat every day. The policy thrust in favour of WTE ignores the unique character of Indian waste, our unique urban dimensions, natural resources and our consumption patterns. The biodegradable nature of the majority of our waste in India is a blessing, not a curse. There is a need for the state to re-examine its approach to waste incineration, and focus instead on waste prevention, segregation and changing production and supply-chains.

IV. CASE STUDIES

Ashi Datta

OKHLA: Shortcomings of India's Model Waste-To-Energy Project Led by Timarpur Okhla Waste Management Company Limited

According to the *2018 Revision of World Urbanization Prospects* produced by the Population Division of the UN Department of Economic and Social Affairs (UN DESA), Delhi was the world's second-largest city with 2.9 crore inhabitants. It was estimated that by 2028 Delhi will become the world's most populous city.[29] With a sharp increase in population, the city has also seen a steep rise in the generation of municipal solid waste (MSW). Total solid waste generation in Delhi for the year 2018-19 was 10,614 TPD[30] in 2019-20 it was 10,466 TPD,[31] in 2020-21 it was 10,990 TDP,[32] and in 2021-22 it was 11,108 TPD.[33]

Policy documents and waste management manuals released by the government acknowledge that waste management requires efforts and investments into the more foundational aspects of waste reduction and the implementation of reuse models along with a decentralised approach. However, despite this, the government's solutions to the problem have been focused on end-of-the-line solutions like dumping in landfills and incineration. Delhi became India's first city to have three operational waste-to-energy (WTE) plants. The Okhla WTE is the oldest of the three and also the most controversial, with consistent violations over the years and no real contribution to solving the waste crisis in the city.

Envisioning the project

The Okhla dumpsite was started in 1994 over 16.20 hectares of land and since then has been operated by the South Delhi Municipal Corporation (SDMC).[34] In 2009, the Delhi Pollution Control Committee (DPCC) prohibited the dumping of waste in the Okhla dumpsite along with Bhalaswa and Ghazipur.[35] Finally in 2018, when the landfill reached a height of 58 metres—thrice the permissible limit - authorities

[29] https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html
[30] https://www.dpcc.delhigovt.nic.in//uploads/pdf/Annual-Report-SWM-Delhi-2018-2019PDF-0a49f9dc183ce283923fa58c47bc22b1.PDF
[31] https://www.dpcc.delhigovt.nic.in//uploads/pdf/Annual-Report-SWM-FY-2019---2020pdf-37a2e45adac2830b854232d8cb8761ac.pdf
[32] https://www.dpcc.delhigovt.nic.in/uploads/pdf/Annual%20Report%20SWM%20(Delhi)%202020-21.pdf
[33] https://www.dpcc.delhigovt.nic.in//uploads/pdf/AnnualReportSWM2021-2022pdf-dac617c79a20231c748458e59c29f441.pdf
[34]https://www.researchgate.net/publication/355700963_The_municipal_solid_waste_disposal_of_Okhla_landfill_in_Delhi_locating_legal_framework_and_institutional_responses
[35] https://www.thehindu.com/news/cities/Delhi/delhi-civic-bodies-to-get-more-landfill-sites/article6114135.ece

officially declared the dumpsite closed.[36] Yet, nothing changed on the ground. Garbage kept being dumped at the Okhla dumpsite. Finally, in 2021, the SDMC set a target to stop dumping of waste at the Okhla dumpsite by June 2022 and scientifically close it by the end of 2023.[37]

As per the information available on the website of Public Private Partnerships in India, Ministry of Finance,[38] around 2005 the Municipal Corporation of Delhi wished to embark on a project to reduce waste being directed into landfills and wished to utilise waste for more productive purposes such as generating electricity. For this, MCD identified two locations, namely Timarpur and Okhla, to develop the following facilities–

1. Plants for converting MSW to Refuse Derived Fuel (RDF), are capable of processing 1,300 tonnes per day (TPD) at Okhla and 650 TPD at Timarpur.
2. A bio-methanation plant capable of handling 100 TPD of green waste at Okhla.
3. A water recovery plant capable of handling up to 6 MLD of treated sewage at the Okhla site for recycling into process water and cooling water.
4. A waste-to-energy power plant with a generation capacity of 16 MW at Okhla.
5. Transportation of RDF from Timarpur to Okhla for combustion in the boiler of the power plant mentioned above.

The government of Delhi decided to undertake this project through a Public Private Partnership (PPP). A PPP is a contract between the government and a private company under which,

- A private company finances, builds and operates some element of a public service
- The private company gets paid over a number of years, either through charges paid by users, or by payments from the public authority, or a combination of both.[39]

After public protests against the privatisation of public services and infrastructure in the 1990s, financial institutions and investors began to rebrand exclusive private investment as public private partnerships. A study of the working models of both arrangements make it clear that the fundamental premise for operationalising of both are the same.[40] Working in cohesion with the government and using public finance to create profit making assets has allowed private firms to minimise fiscal and regulatory risks, while enjoying subsidies and grants in the name of progressive

[36] https://swachhindia.ndtv.com/garbage-hill-eco-park-okhla-landfill-to-change-for-better-36117/
[37] https://indianexpress.com/article/cities/delhi/engineered-landfill-tehkhand-by-next-year-south-delhi-civic-body-7518641/
[38] https://www.pppinindia.gov.in/toolkit/solid-waste-management/module3-rocs-toimswmp1.php?links=toimswmp1
[39] https://www.world-psi.org/sites/default/files/rapport_eng_56pages_a4_lr.pdf
[40] https://www.manthan-india.org/ppp-in-water-sector/

policies. Further, private corporations have no social or environmental obligations towards local populations as they are guided solely by profit making interests. Examples over the world and in India have proven that when public services or infrastructure are leased out to private corporations, there is an increased chance of corruption, higher costs of essential services and damage to community resources, workers and public infrastructure.[41]

In India, the Cabinet Committee on Economic Affairs (CCEA) in its meeting of July 25, 2005 approved the Scheme for support to Public Private Partnerships in Infrastructure. The Scheme for Financial Support to PPPs in Infrastructure (Viability Gap Funding scheme) of the Government of India is administered by the Ministry of Finance and provides financial support in the form of grants, one time or deferred, to infrastructure projects undertaken through PPPs with a view to make them commercially viable. The Government of India provides total Viability Gap Funding of up to twenty per cent of the total project cost; normally in the form of a capital grant at the stage of project construction. The Government or statutory entity that owns the project may, if it so decides, provide additional grants out of its budget up to further twenty percent of the total project cost.[42]

According to a 2016 report on Power Generation from Municipal Solid Waste, by the Standing Committee on Energy 2015-16, under the Swachh Bharat Mission, "in order to promote projects of waste to energy, it is clarified that the central government Grant / VGF may also be used for such projects, either upfront or as generation based incentive for power generated for a given period of time."[43] In the information available in the PPP website of India, there is no mention of government financing through VGF for the WTE at Okhla. The project was financed in equity:debt ratio of 30:70 with all the equity being eventually bought by Jindal Urban Infrastructure Limited.[44]

In March of 2005, the private firm Infrastructure Leasing & Financial Services (IL&FS) signed a Memorandum of Understanding (MOU) with the Municipal Corporation of Delhi to set up a municipal solid waste processing facility at the erstwhile Timarpur incinerator plant site.[45]

The project was undertaken on a Built, Own, Operate and Transfer (BOOT) basis. The entire process of starting a PPP project is complex and opaque, with several processes being non-transparent and controlled by government agencies without any consultation with the people.

[41] https://www.world-psi.org/sites/default/files/rapport_eng_56pages_a4_lr.pdf
[42] https://www.pppinindia.gov.in/schemes-for-financial-support
[43] https://eparlib.nic.in/bitstream/123456789/65224/1/16_Energy_20.pdf
[44] https://www.pppinindia.gov.in/toolkit/solid-waste-management/module3-rocs-toimswmp4.php?links=toimswmp4
[45] https://www.no-burn.org/wp-content/uploads/Timarpur.pdf

The process includes–

- Project identification
- Full feasibility study, preparation for the procurement process and application for in-principle clearance
- Procurement and final approval of the project, awarding of the contract
- Contract management and monitoring

Each of these phases consists of several corporate negotiations and contracting, the documentation of which is unavailable for public access. Further, information can be hidden by contractors on grounds of commercial confidentiality.

The incorporation of the Timarpur Okhla Waste Management Company Limited (TOWMCL)

After the MoU was signed by IL&FS, what followed was a very complicated company structure which ultimately resulted in the special purpose vehicle of Timarpur Okhla Waste Management Company Limited (TOWMCL). A complex ownership structure may become an important factor indicating potential abuse. Individuals may hide behind complex legal entities to engage in corruption, money laundering, fiscal mismanagement or tax evasion. Complexity may also result in disguising the true operations and functions of entities to engage in tax abuse or other malpractices.[46]

Unique Waste Processing Company Private Limited (a fully owned subsidiary of IL&FS) and Andhra Pradesh Technology Development Center (APTDC) were each 50% shareholders and technical assistance providers for TOWMCL. APTDC was established under the joint partnership of Confederation of Indian Industries (CII), Government of Andhra Pradesh and Technology, Information, Forecasting & Assessment council (TIFAC). UWPCPL and APTDC then incorporated New Delhi Waste Processing Company Private Limited, a bid implementing agency jointly with a public enterprise called Delhi Power Company Limited, a public enterprise owned by the government of Delhi.[47]

The image[48] below displays the number of actors involved in the formation of TOWMCL.

[46] https://www.world-psi.org/sites/default/files/rapport_eng_56pages_a4_lr.pdf
[47] https://carbonmarketwatch.org/wp-content/uploads/2013/03/CDM-and-waste-Dharmesh.pdf
[48] Reproduced from *CDM and Waste, A Trade or a Fraud? Civil Society Workshop on CDM and Carbon Markets,* by Dharmesh Shah, GAIA, 2012

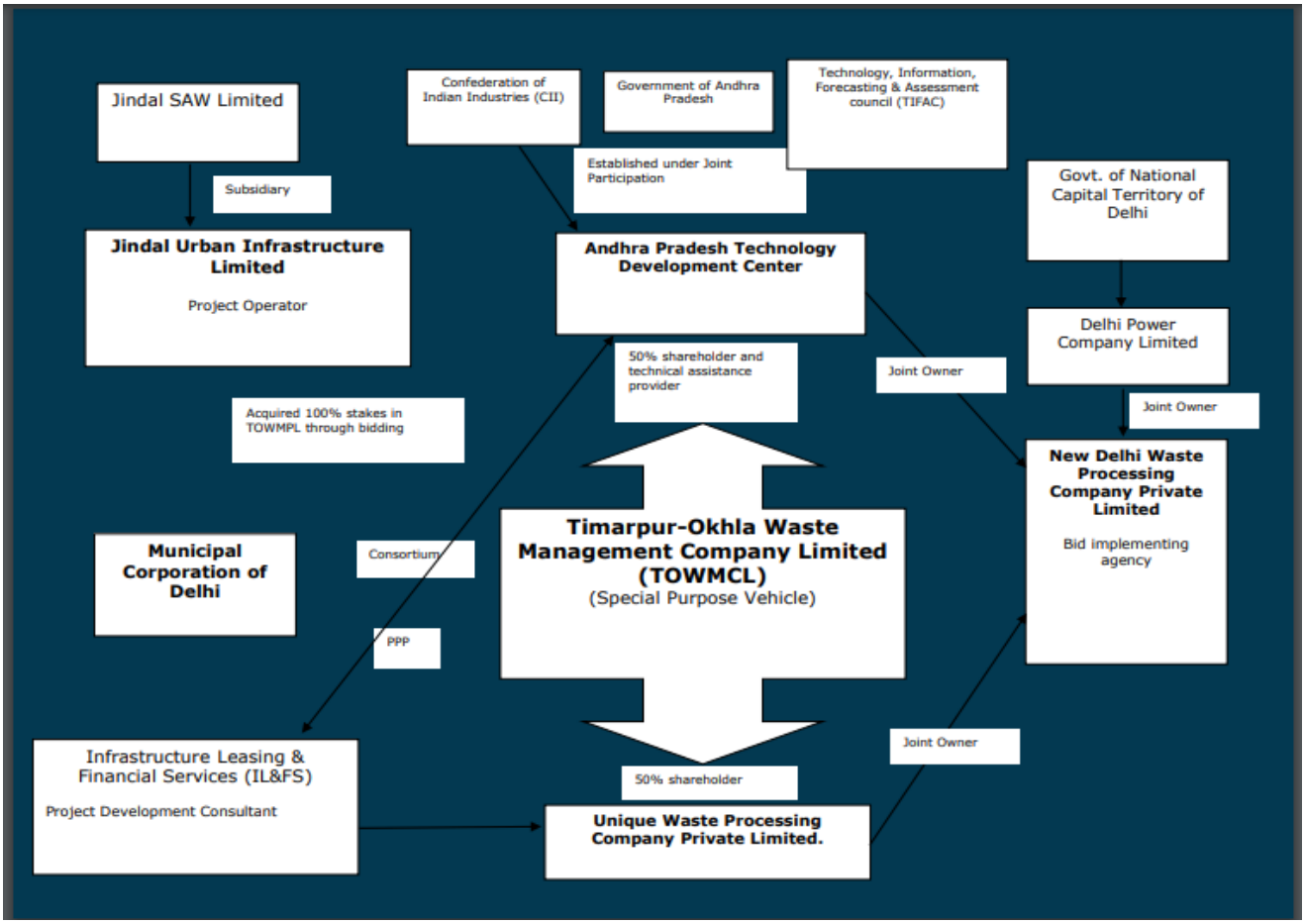


Figure 13. Actors involved in the formation of TOWMCL

The Concession Agreement

On May 10, 2007 TOWMCL, while still being owned by IL&FS and the Andhra Pradesh Technology Development & Promotion Board, signed a concession agreement with the New Delhi Municipal Corporation (NDMC). A concession agreement is an agreement between a Government Authority and a private entity, through which the Government grants certain rights to the private entity for a limited period of time.[49]

As per the concession agreement, TOWMCL was given the following rights.

1. The right to choose technology—TOWMCL was given the right to 'develop the Project Facilities using such technology that it considers suitable and commercially viable for the purposes of implementing the Project'. It was also 'acknowledged that it is the intention of TOWMCL to essentially use Bio-methanation, RDF and material recovery technology associated with the

[49] https://blog.ipleaders.in/concession-agreement/#:~:text=A%20concession%20agreement%20is%20an,Private%20Partnership%20(PPP)%20model

concept of an integrated waste processing plant, though TOWMCL had the right to change the technology at any point'

2. The right to use supplementary fuel for the power plant
3. The right to sell or otherwise dispose of any products derived or produced from the Plant as a consequence of undertaking the processing of the MSW and sewage
4. NDMC shall grant TOWMCL a licence to use the site at a nominal licence fee of Rupee One (Re. 1/-) per annum for the term and NDMC shall execute the License Agreement with TOWMCL together with the execution of this Agreement
5. The right to negotiate directly with each New Bulk Generator and fix a suitable fee (or a mechanism for determination of such fee) for the transportation and disposal of the MSW generated by the relevant New Bulk Generator
6. All costs of any operations for ensuring collection and delivery of MSW at the Receipt Point, including but not limited to collection, manual segregation, storage, transportation and delivery of MSW at the Receipt Point and disposal of the Rejected Waste, were to be borne by NDMC.
7. NDMC agreed that it would deliver, on every day after the Commercial Operations Date (COD), the MSW equivalent to at least the NDMC MSW Quantity at the Receipt Point, in accordance with the Delivery Schedule, and in the event it is not able to deliver the NDMC MSW Quantity for a period of six consecutive days, it would pay TOWMCL for each day of such failure after the six-day period, as a pre-agreed reasonable compensation.
8. TOWMCL would, from the COD of the Power Plant, pay to NDMC, subject to the approval of DERC, Rs. 0.05 (five paise) for every unit of electricity sold from the Power Plant. The Royalty Amount would increase proportionately to any increase in approved tariff after the first year of commercial operations.

These clauses from the concession agreement clearly highlight the extent of allowances and privileges given to TOWMCL by the NDMC. The choice of waste management technology greatly influences the capital required for setting up the system, and the environmental and health impacts it will have. By allowing TOWMCL to choose the technology, NDMC essentially allowed the choice of a technology that would generate maximum profits and be the easiest to maintain, regardless of the impacts. The technology chosen by TOWMCL was RDF production and then electricity generation through a boiler and steam turbo generator. If RDF production is compared to an alternative technology like chemical processing or effective segregation followed by biological processing, the latter fare better on the pollution index but require either heavier investment or more organised collection and processing practices. When burning RDF, or any kind of waste, the two main

by-products are exhaust gases and ash, which both contain poisonous chemicals like dioxins, lead, cadmium, mercury, and fine particles.[50] Given that the company continues to burn waste releasing toxins, it appears that TOWMCL does not have commitments to clean air or public health like the Delhi government has been claiming for decades now. Though there are mechanisms in place to ensure that hazardous technologies are either not used by industries or are subjected to multiple safeguards, the Okhla WTE has managed to jump all these hoops and continue operations despite several violations. Further, the use of supplementary fuel defeats the claims that MSW is a viable source of energy along with adding to emissions.

The concession agreement also gave TOWMCL the right to sell any by-product generated after the processing of waste with NDMC getting only Rs. 0.05 (five paise) for every unit of electricity sold from the Power Plant. Thus, the company would not only get subsidies from the government schemes but also get to keep the entire revenue from the sale of electricity. On top of this, the waste processed from bulk generators would also accrue tipping fee to the company.

The clause of NDMC having to pay a penalty to the plant in case of default on delivery of a minimum of 200-400 tonnes of waste per day indicates how the installation of such large-scale plants takes away from waste reduction and management efforts at the household or ward level. Instead of incentivising practices like source segregation, reduce, reuse and composting, the ULB will just be preoccupied with ensuring that the minimum quantity of waste is supplied to the WTE. Despite this, the collective capacity of the plants was much higher than 200-400 tonnes per day. Put together, the Okhla and Timarpur plants had a capacity of processing 1,950 tonnes of waste per day. The difference between the actual capacity of the plant and the minimum quantity of the waste promised signals that the amount of waste coming into the plant was expected to fluctuate a lot. This in turn means that the outcome and the revenue generation were also unreliable, with a good chance of the project running below capacity.

The project was allotted 15 acres of land by the NDMC at the fee of Re. 1 per annum. This was public land surrounded by residential areas, schools, hospitals, green belts and archaeological sites. The provision of this land to TOWMCL almost free of cost allowed the company to earn profit by operating on public land even after violating pollution norms.

On 27 March 2007, TOWMCL was granted environmental clearance (EC) from MOEF&CC. According to the clearance, TOWMCL was permitted to set up an

[50] https://www.no-burn.org/wp-content/uploads/RDF-Final.pdf

integrated municipal waste processing complex at Okhla. The project at the Okhla site will be designed to process 1,300 TPD (650 X 2) of mixed garbage and 100 TPD of green waste, and the plant at Timarpur will be designed to process 650 TPD (650 X 1) of waste. The plant will have two identical process streams, each handling 650 MT of MSW/day to produce 225 MT of RDF from each of the streams. The RDF produced from both plants will be used at Okhla project to feed the power plant. The power plant would be able to produce 15 MW of Power. This was later amended to 16 MW on 9 May 2007.

Following the grant of the EC, the bidding process was finalised by the bidding agencies. The contract for the building and operation of the solid waste management project was given to Jindal Urban Infrastructure Limited (JUIL), a subsidiary of Jindal SAW Ltd., on 1 January 2008. JUIL's bid was the lowest at Rs. 2.833 per kWh with grants and subsidies, and Rs. 2.844 per kWh without them.[51] The Jindal group was founded in 1952 and today is a large conglomerate with business interests spanning steel, mining, power, industrial gases, cement and seaport facilities, petroleum, diamond, high value metals and mineral exploration. It made a foray into the infrastructure sector in 2007 and incorporated Jindal ITF Limited (JITF) as a subsidiary of Jindal SAW Limited. JITF operates in the sectors such as municipal solid waste processing and power generation, water infrastructure, rail manufacturing, ship building, and coastal and inland water transportation business. TOWMCL was Jindal's first foray into WTE or waste management.

After the appointment of the concessionaire, the project design went through several changes, thus making the EC provided by MoEF null and void. Instead of waste being processed in two units in Timarpur and Okhla, the entire waste of 1,950 TPD was being processed at the Okhla site. The concentration of waste processing in one location means double the emissions and toxic load on that neighbourhood. The project proponent also claimed that they were using a superior technology than had been proposed earlier and were thus producing 20MW of energy instead of the approved 16MW. Auxiliary consumption was envisaged to be 18% of the power produced.[52]

By allowing the project proponent to fundamentally change the project design post the EC being granted, the government was not only in violation of the Environment Protection Act but also actively neglecting the wellbeing of its citizens and the proper utilisation of public funds.

[51] https://www.no-burn.org/wp-content/uploads/Timarpur.pdf
[52]https://cdm.unfccc.int/filestorage/3/1/0/310IHRLWYX2NDAFBZOQ7USK84P6GCJ/1254_PDD_Clean.pdf?t=SEt8cmg0YzNtfDCVrUltonfSKESOMmckFNIN

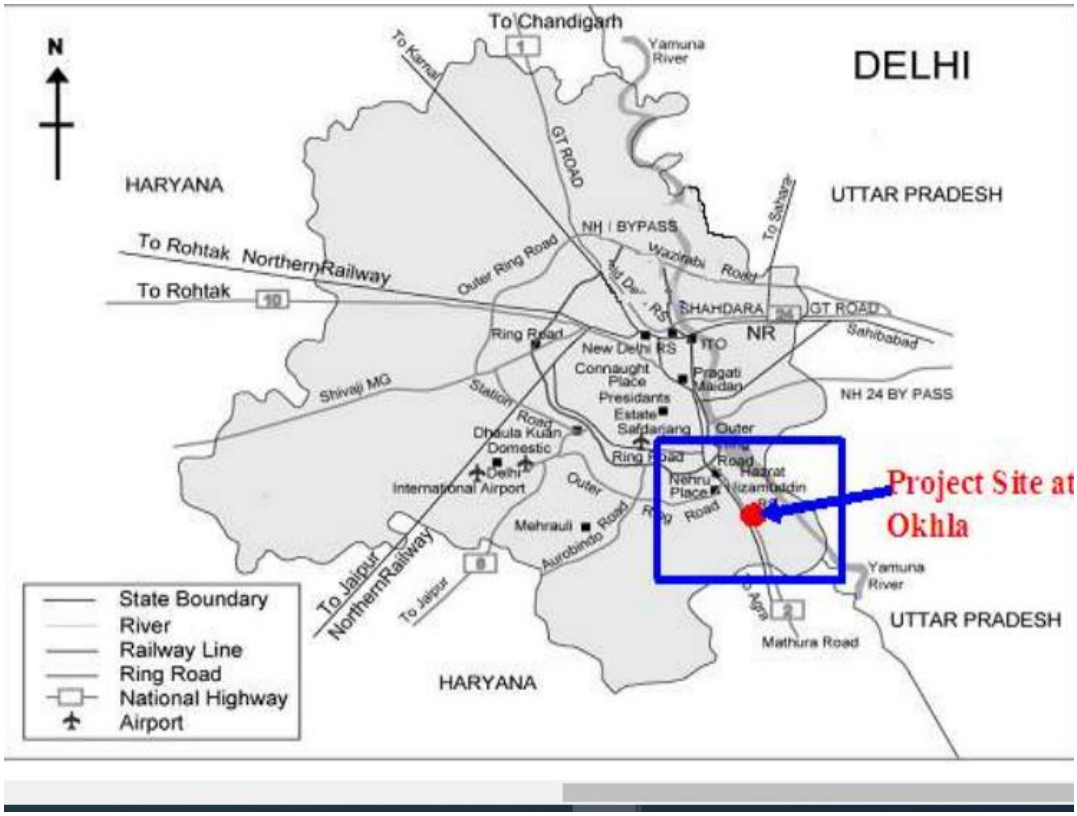


Figure 14. Reproduced map from the Project Design Document of The Timarpur-Okhla Waste Management Company Pvt. Ltd.'s (TOWMCL) integrated waste to energy project at Delhi

Figure 14 depicts the TOWMCL WTE plant as presented in an official project design document.[53]

Legal Recourse

In 2009, residents of Sukhdev Vihar and Okhla filed a lawsuit in the Delhi High Court to stop the plant from getting constructed. Residents' claims included that the public hearing before the EC was not announced properly and the Environmental Impact Assessment (EIA) report was never released to the public. Further, the company claimed in its Detailed Project Report (DPR) to generate RDF with a calorific value of 2,000 kcal but later revised the figure to 800-1,300 kcal in its bid documents. Based on this crucial revelation, the Ministry of New and Renewable Energy (MNRE) noted on 29 May 2008 that "this will necessitate that a fresh DPR is prepared as not only will the actual quantity of MSW required to be processed be

[53] Reproduced from *Project Design Document* of The Timarpur-Okhla Waste Management Company Pvt. Ltd.'s (TOWMCL) integrated waste to energy project at Delhi, as presented on the website of United Nations Framework Convention on Climate, Change Clean Development Mechanism website.
https://cdm.unfccc.int/filestorage/3/1/0/310IHRLWYX2NDAFBZOQ7USK84P6GCJ/1254_PDD_Clean.pdf?t=a1h8cmk1YzZ4fDC_uaxJ5hi90ignY8acc3t_

different but also the basic parameters of all the equipment will change." However, no new DPR had been released.[54]

After 28 hearings at the Delhi High Court between 2009 and 2013, the case was transferred to the National Green Tribunal (NGT). Several hearings over the years revealed the NGT and Delhi government's refusal to acknowledge the harm being caused by the WTE. The following image[55] displays important developments in the case.

[54] https://www.twn.my/title2/climate/info.service/2011/climate20110602.htm
[55] Reproduced from Shah, D., & Sharma, P. (2017, February 16). Why The NGT Okhla Order Sets A Bad Precedent For Indian Environmental Jurisprudence. The Wire. Retrieved August 24, 2022, from https://thewire.in/environment/ngt-okhla-dioxin-fly-ash.

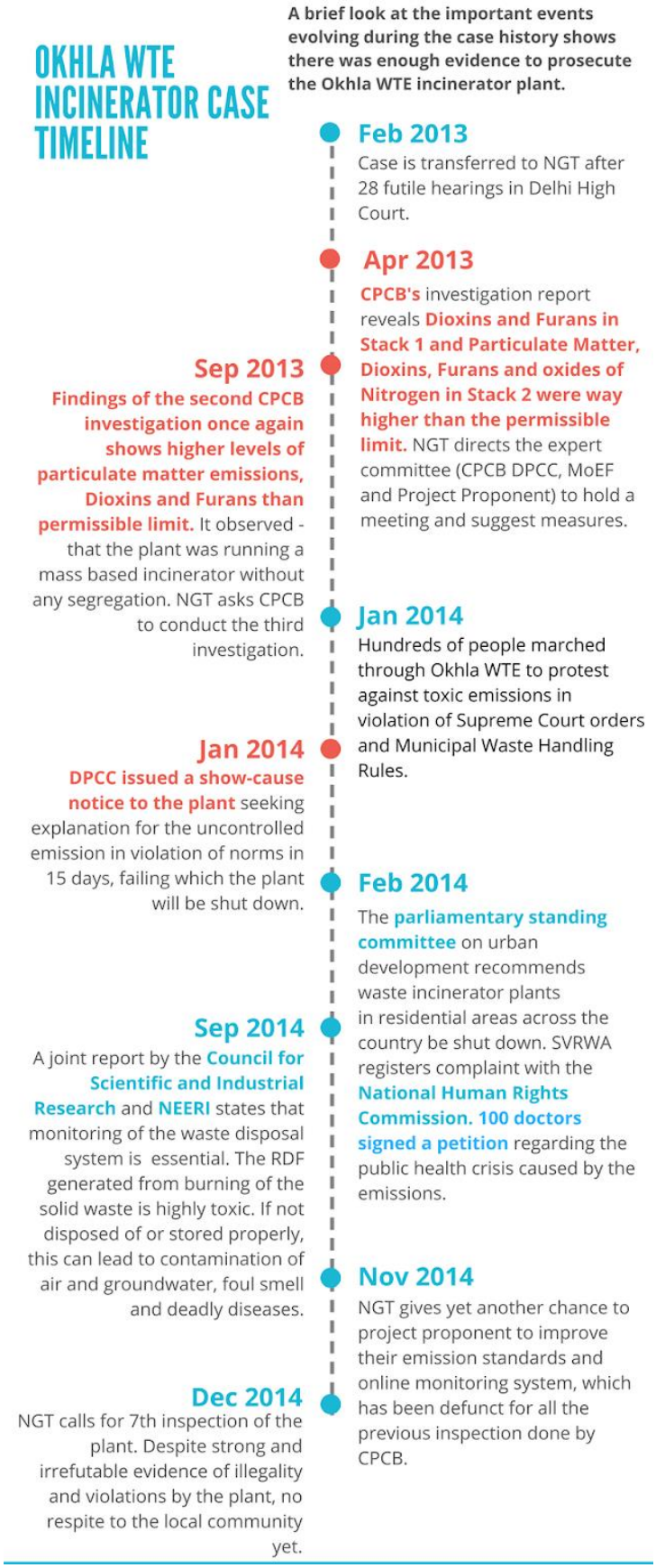


Figure 15. Important developments in the Okhla WTE plant legal case.

The petitioners appealed the NGT judgement in the Supreme Court of India and the matter is currently subjudice.

Post-2017

The NGT judgement of 2017 directed the operators of the plant - Jindal Urban Infrastructure Ltd., to pay a compensation of Rs. 25 lakhs and the Central Pollution Control Board (CPCB) "to collect and analyse the samples of ambient air quality once in four months". In a 2018 order, the NGT mandated that a joint inspection of WTE plants at Delhi be conducted by the CPCB and the DPCC. The most recent report[56] available is of the inspection carried out in September and October 2020. All three functioning WTE plants in Delhi were found violating pollution regulations that included the release of excess Dioxins and Furans, Hydrogen chloride and excess quantities of particulate matter at nearby air quality monitoring stations. According to the WHO, dioxins are highly toxic and can cause reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer.

Following this, the DPCC imposed a fine of Rs. 5 lakhs on each plant as "environmental compensation, without any further direction on future monitoring or reduction of the pollution levels."

According to the results of the stack emission monitoring of the Okhla WTE plant, the dioxins and furans released by the plant are 890% more than the permitted amounts. Similarly, levels of hydrogen chloride exceeded prescribed limits by 296%. Interestingly, the Online Continuous Emission Monitoring System (OCEMS) installed by the plant had recorded readings vastly different from what the CPCB's inspection found, showing figures closer to the stipulated norms. The plant also produces 250 metric tonnes of ash daily from the combustion process that are disposed of at a landfill in Jaitpur.

Thus, despite repeated monitoring and some penalties, not much at the Okhla WTE has changed.

Financials

Lack of availability of high calorific value segregated waste on one side, and high operations and maintenance costs on the other, have been responsible for the failure of several WTE plants in the country. In the case of the Okhla WTE, loans from public financial institutions formed a big chunk of the project's financing. Thus,

[56] https://cpcb.nic.in/uploads/MSW/Reports_swm_6.pdf

along with the social, environmental and health costs of WTE plants, people also have to bear the financial burden in case they fail.

The capital cost of the plant at the time of installation was Rs. 204 crores.[57] The project was financed in an equity to debt ratio of 30:70. Rs. 140 crores (70%) were borrowed from a consortium of banks, with the lead bank being Axis Bank. The remaining amount of Rs. 60 crores (30%) was financed in the form of equity by Jindal.

According to TOWMCL's financial statements, between 2017 to 2021, the company got government grants worth Rs. 40.45 crores. Separately as an operating revenue, the company received Rs. 47 lakhs each year through government grants. The Power Finance Corporation (PFC), an Indian financial institution under the ownership of the Ministry of Power, issued a loan of Rs. 122.66 crores to the company in the year 2018-19. In the year 2020-21, TOWMCL still had to repay Rs. 104.21 crores of the loan to PFC.

Between the financial years 2008 to 2018, other commercial borrowings by TOWMCL included:[58]

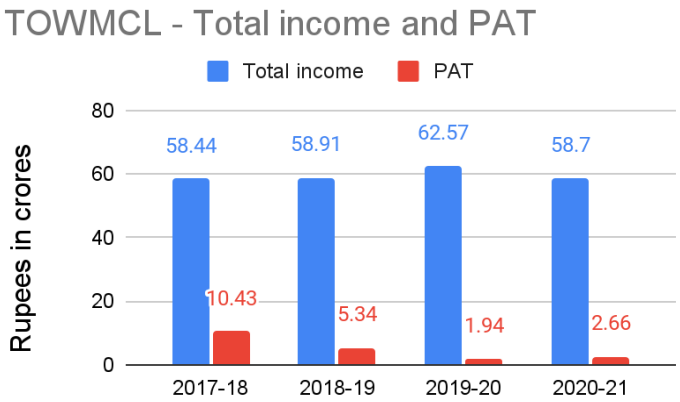
Name of Bank	*Amount (in Rs. crores)*	*Financial Year*
Axis Bank	142	2008–09
IDBI Trusteeship Services Limited	179	2010–11
IFCI Ltd.	60	2013–14
ICICi Bank Limited	49	2014–15
ICICI Bank Limited	8	2014–15
Tata Capital Financial Services Limited	60	2017–18
ICICI Bank Limited	20.18	2018–19
Glebe Trading Private Limited	20.29	2018–19

Additionally, between the years 2017 and 2021, TOWMCL secured a total of Rs. 13.44 crores as working capital loans from banks. In their annual balance sheet filed in March 2021, TOWMCL also declared a government grant of Rs. 10 crores

[57] https://www.no-burn.org/wp-content/uploads/Timarpur.pdf
[58] https://www.quickcompany.in/company/refetch-50939a4e-84a2-45f6-be9b-7501a94a4efd

received from the Ministry of New and Renewable Energy WTE division, awarded against a central scheme for "*programme on energy recovery from municipal solid waste during the year 2007-08*". In the same financial statement, the total outstanding debt of the company was mentioned as more than Rs. 100.13 crores.

Despite having a high tariff rate, free land and government grants and subsidies, TOWMCL's profit rates are not inspiring. As opposed to the total income made by a company in a financial year, profit after tax (PAT) is the net profit available for the shareholders after paying all the expenses and taxes by the business unit. A fall in this value indicates a decrease in the company's profitability and ability to cover its day-to-day expenses.



The annual income of *TOWMCL* has remained stable between approximately Rs. 58 to 62 crores for the last 4 years. However, PAT has been on a decline. It was Rs. 10.43 crores in 2017–18, Rs. 5.34 crores in 2018–19 and Rs. 1.94 crores in 2019–20, which improved slightly to Rs. 2.66 crores in 2020–21. Despite repeated public protests and records of pollution violations, the government is still keen on continuing to finance the Okhla WTE and may also finance the proposed expansion of the unit in the future.[59]

Conclusion

According to the authorities that were responsible for the inception of the Okhla WTE, the plant was meant to handle Delhi's solid waste management crisis and serve as a solution to the public health risks posed by unregulated dumpsites. After ten years of the plant's first day of functioning and the installation of two more WTEs in the city, the problems created by the solid waste generated in the city are more unmanageable than before. According to the data submitted by the Delhi Fire Services, there have been 76 fire calls from the three landfill sites in Delhi in four

[59] https://www.cenfa.org/the-national-capitals-experience-with-waste-to-energy/

years.[60] Open burning of garbage, especially in the poorer neighbourhoods where waste management services are not provided by the city government, continue to be a common site. Other than the three major dumpsites, several smaller, unregulated garbage heaps proliferate in several neighbourhoods, spreading disease and distress,adding to this is the city's air pollution emergency, which has been costing the city's residents years from their lives. What then has been the benefit of this multi-crore WTE plant when it has not reduced the solid waste crisis, increased the city's pollution levels and cost the state a fortune in public money? The answer is clear - the WTE at Okhla serves as an example of what is not a solution to the problem of waste management in the country.

Even before the WTE at Okhla was proposed, the experiences of local communities and governments around the world had made it clear that WTE fails as a technology, both for waste management and electricity generation.[61] Yet, the residents of Okhla are having to fight a long and arduous battle just to be able to live safely in their own homes. The repeated neglect by judicial bodies of hard evidence that the Okhla WTE is violating pollution standards, raises grave concerns about the adequacy of redressal mechanisms available to people when fighting such threats to the natural environment. The judgement in favour of the plant sets a dangerous precedent for those hoping to challenge or hold accountable WTEs being commissioned across the country. The role of the government as an enabler for the toxic technology of WTE is clear throughout the journey of the Okhla plant. The allowances given to the project proponent in the concession agreement along with the expanse of land at no cost, and the environmental clearance by the MoEF&CC seem to indicate that the government favoured attracting private investment over protecting the environment and citizens' health.

Finally, the financial records of the plant clearly illustrate how a WTE plant cannot function without large monetary grants from the government and further financial help in the form of high tariff for sale of power and loans from public institutions. The Rs. 40.45 crores burnt as grants by the government on the plant from 2017-2021, could have been used to develop decentralised waste management systems that have a proven track record of success in terms of efficiency, job creation and pollution control. Just 10 kms from the location of the Okhla WTE lies the locality of Navjivan Vihar that has implemented a zero-waste model successfully.[62] While still being in over Rs. 100 crores of debt, TOWMCL is seeking to expand the capacity of its WTE to double the size. The company submitted EIAs to the MoEF&CC in 2019

[60] https://indianexpress.com/article/cities/delhi/76-fire-calls-from-delhis-three-landfills-in-four-years-dfs-recommends-underground-water-tanks-pumps-at-sites-8064974/
[61] https://www.no-burn.org/wp-content/uploads/2021/03/Rio-de-janeiro.pdf ; https://www.no-burn.org/wp-content/uploads/2021/11/Waste-Incineration-A-Dying-Technology.pdf
[62] https://www.thebetterindia.com/294953/navjivan-vihar-zero-waste-colony-of-delhi-shares-tips-for-composting-waste-segregation/

and 2022, seeking to expand the capacity of the plant from 19MW to 40MW. Both times, the state environment impact assessment authority rejected the EIAs and the expansion was stalled.

While the plant still continues to function, citizens pay the price with their health and well-being.

What is even more abysmal is that the Okhla WTE is often portrayed as a model solution when newer WTEs are proposed in other parts of the country. It is high time that the authorities open their eyes and realise that technocracy, privatisation and throwing good money at bad decisions are not the solution to poor governance and the crisis of waste generation.

DEONAR: MUMBAI'S FIRST WTE PLANT

History of the dumpsite and development of the Deonar WTE

The waste dumpsite at Deonar in the city of Mumbai is India's oldest and biggest large-scale dumpsite. Set up in 1927, it spreads over 326 acres (131.92 hectares).63 The weight of Mumbai's rapid urbanisation and industrialisation was borne by Deonar and in 2019 it was estimated that the site contained close to 1.2 crores (12 millions) tonnes of waste. Frequent fires in the landfill, sliding of the waste, and stench and health ailments due to the release of toxins from the waste piles have been making living conditions exceedingly hazardous for residents of the area and workers working inside and near it.64

In 2013, following several petitions and citizen complaints, the Bombay High Court directed the closure of all dumpsites in the state of Maharashtra that did not comply with the Solid Waste Management (SWM) Rules, 2000.[65] The High Court order took in consideration Public Interest Litigations (PILs) filed in different cities of the state against the inefficient handling of municipal solid waste. Amongst other directions for ensuring proper waste management, the judgement included that "All dumping sites which do not comply with SWM Rules and other governing applicable laws and these directions, and the sites which are not designated as per rules shall be discontinued and closed within a period of three months or an acquisition of a new site whichever is earlier."[66] Schedule III of the SWM rules delineates specifications for landfills and mandates that, "existing landfill sites, which continue to be used for more than five years, shall be improved in accordance with the specifications given in the Schedule."[67] Since then, the Brihanmumbai Municipal Corporation (BMC) has been able to secure upto 18 extensions to continue using the site as a dumping ground as they claim to not have access to any other space for this purpose. In January 2020, the BMC filed an affidavit at the Bombay High Court (HC), and got yet another extension to continue dumping the city's waste at Deonar landfill till June 2023.[68]

In 2013, BMC had invited an Expression of Interest (EOI) for the scientific closure of the Deonar dumpsite. 2014 was the first year in which the WTE located at the

[63]https://www.cseindia.org/content/downloadreports/10487#:~:text=Deonar%20dumpsite%3A,waste%20to%20Deonar%20every%20day.
[64] https://mdl.donau-uni.ac.at/binucom/pluginfile.php/405/mod_page/content/38/KRVIA_6_K.pdf
[65] https://www.dnaindia.com/mumbai/report-court-tells-state-to-shut-illegal-dumps-right-away-1810479
[66] Bombay High Court Judgement, April 2, 2013, Minutes of the Order
https://www.nswai.org/docs/HighcourtOrderMSW_02.04.13.pdf
[67] Solid Waste Management Rules 2000
https://www.mpcb.gov.in/sites/default/files/solid-waste/MSWrules200002032020.pdf
[68] HC allows BMC to continue dumping trash at Deonar, Hindustan Times, Jan 29, 2020
https://www.hindustantimes.com/cities/hc-allows-bmc-to-continue-dumping-trash-at-deonar/story-QzVnZXjeOdtnPVMtlRxlDP.html

dumpsite was proposed by the corporation, but it was unable to attract any contractors since apparently the contract conditions were too stringent. In 2016, based on a Detailed Project Report prepared by TATA Consulting Engineers Limited, a new tender was floated for a plant that would process 3,000 tonnes of waste per day. The Union Government agreed to provide Rs. 571 crores for this plant but there was still no bidder. Finally, in 2018, the plan was amended to a reduced capacity of 600 tonnes per day (TPD) and three bidders applied for the contract. In January 2020, the contract was awarded to the second lowest bidder on technical grounds, an unusual practice that gave rise to several objections that were ultimately ignored.[69]

Contractor

The contract was awarded to Chennai MSW Pvt Ltd., a subsidiary of Ramky Enviro Engineers Ltd (REEL). REEL's business is spread across the waste management sector, they have plants to manage hazardous, municipal, biomedical, construction waste & e-waste, WTE plants and recycling plants for wastewater, paper, plastic and integrated waste. They have over 60 operating locations spread across India, Singapore, UAE, Qatar, Saudi Arabia, Kuwait, Oman and Tanzania.[70]

REEL is collectively owned by Kohlberg Kravis Roberts (KKR),[71] a global investment firm and Ayodhya Rami Reddy, who is also the chairman of the Ramky group of companies. REEL has managed to secure contracts of several WTEs across India, namely Hyderabad, Delhi, Raipur, Rewa, Dehradun and most recently Mumbai. In 2017, through the special purpose vehicle Delhi MSW Solutions Ltd., REEL installed India's largest WTE with a capacity of processing 2,000 tonnes of waste per day, in the northern part of Delhi.[72] According to an inspection conducted by the Central Pollution Control Board and Delhi Pollution Control Committee in September 2020, dioxins and furans were 390% higher than the prescribed limit and the plant was burning a higher quantity of waste than permitted while generating less than 24 MW electricity, its stated capacity. The ambient air quality in and around the plant was also worse than the prescribed limit. Fly ash generated by the incineration process is deposited within the plant premises in a landfill.[73] Therefore, despite heavy investment and large claims, the plant violated pollution standards. The financials of the company were in an even worse condition. In 2019, the debt-to-equity ratio of the company was -168, which means that for every one rupee worth of assets the

[69] Mumbai: BMC panel greenlights Rs 1,100 crore Deonar waste-to-energy plant, Times of India, November 2020 https://timesofindia.indiatimes.com/city/mumbai/mumbai-bmc-panel-greenlights-rs-1100-crore-deonar-waste-to-energy-plant-plan/articleshow/79053083.cms
[70] https://ramkyenviroengineers.com/about-us/
[71] https://www.crunchbase.com/organization/kkr
[72] https://www.hindustantimes.com/delhi/municipal-corporation-inaugurates-india-s-largest-solid-waste-to-energy-plant-at-narela/story-dZuZaGLV3UFQPzU8vmSbyM.html
[73] https://cpcb.nic.in/uploads/MSW/Reports_swm_6.pdf

company owned, it had 168 rupees worth of debt. In 2020, the ratio increased to -33 still implying very high spending on interest repayment.[74]

Financials

The total cost for this project is cited as Rs. 504 crores from which the Environment Monitoring Programme was allotted Rs. 12.40 lakhs with a recurring cost of Rs. 98 lakhs per annum. In its 2021-22 budget for the project, the BMC had allocated Rs. 65 crores for it, which was later put on hold.[75] Then in its budget for the Financial Year 2022-23, BMC allocated Rs. 75 crores for the Deonar WTE plant.[76] Once the plant starts functioning it will also be eligible for obtaining grants from the Ministry of New and Renewable Energy under the Programme on Energy from Urban, Industrial and Agricultural Wastes/ Residues.[77]

Will the people of Deonar be able to survive this plant?

The Deonar dumpsite is located in the M east ward on the north-eastern edge of Mumbai. The M east ward is one of the twenty-four administrative divisions of Mumbai and covers the areas of Chembur (E), Deonar, Anushakti Nagar, Govandi, Trombay and Mankhurd.[78] According to the 2011 census 8,07,720 people lived in the ward out of which over 72.5% lived in slums. Its human development index is the lowest in the city representing an infant mortality rate of around 66.47 per thousand live births, out-of-school children between the ages of 6 to 14 years is 1,490, more or less equally divided between boys and girls, and more than 50 percent children are malnourished.[79] Population living in middle and low income areas around the dumpsite is dominantly made up of by two social groups, Muslims and the Maang/Matang (an untouchable caste). Several of them are migrants from different regions of Maharashtra, Tamil Nadu, Karnataka, and Uttar Pradesh.[80]

WTE plants are a problem wherever they may be located, but those who live closest to the burner are usually the ones who suffer the most. Identified emissions include heavy metals such as lead, cadmium, arsenic, chromium and mercury, halogenated hydrocarbons, acid gases, particulate matter, and volatile organic compounds such

[74] https://www.cenfa.org/the-national-capitals-experience-with-waste-to-energy/
[75] https://indianexpress.com/article/cities/mumbai/mumbai-committee-to-decide-on-capacity-of-second-waste-to-energy-plant-at-deonar-dumping-ground-7895440/
[76] https://www.freepressjournal.in/mumbai/bmc-budget-2022-mumbai-civic-chief-iqbal-singh-chahal-presents-budget-of-rs-4594921-crore-for-fy-2022-23-1770-higher-than-previous-year
[77] https://mnre.gov.in/waste-to-energy/schemes
[78]http://timesofindia.indiatimes.com/articleshow/56694349.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst
[79] https://tiss.edu/view/11/projects/transforming-m-ward/
[80] https://sci-hub.se/https://www.jstor.org/stable/23527308

as dioxin and furans. Even small amounts of these toxins can be detrimental to human health and the environment.[81]

A 2021 study published in the journal of Clinical Epidemiology and Global Health[82] captured that the prevalence of morbidities was significantly higher among the group exposed to the Deonar dumping site compared to a group that was not. For instance, prevalence of respiratory illness was 23% to 10% higher, risk of developing an eye infection was 20% to 10% higher, stomach problems were 27% to 20% higher and headache/fever were 30% to 25% higher respectively.

According to a report[83] submitted by the Waste to Energy Research & Technology Council (WTERT-INDIA) to the Mumbai Metropolitan Region – Environment Improvement Society in November 2019, the general hospitals and clinics near the Deonar dumping site reported that nearly 30 to 40 patients approached them every month and complained about fever, skin problems, itching, cough & cold, stomach-ache and bronchitis. The report also mentioned that around the Deonar area, the gases Hydrogen Sulphide (H_2S), Methane (CH_4), Ammonia (NH_3), Dimethyl Sulphate (DMS), Volatile organic compounds (VOC) and Particulate Matter were exceeding acceptable concentrations and hence posed serious risks to the surrounding populations.

A case study[84] published in 2017 provided a detailed description of how the current situation of slum dwellers in Deonar interacts with the environmental hazards caused by the dumpsite to place the inhabitants in a very precarious position. The study mentioned that the concentration of suspended pollutants was nearly eight times the permissible limits during the mornings in residential areas close to the Deonar dumping ground. Hourly data revealed that levels of PM10 were as high as 788 ug/ m^3 as against a safety limit of 100 ug/m^3 on one reading and 718 ug/m^3 on another two days after thick smog was released from the fire at the dumping ground. Similarly, PM2.5 – pollutants measuring 2.5 microns or less, were 583 ug/m^3 as against permissible standards of 60 ug/m^3.

In the Adarsh Nagar, Deonar settlements,

i. Only 2% follow safe sanitation and hygienic practices.
ii. Only 5% drink safe water.
iii. Over 80% live below the poverty line.[85]

[81] https://www.no-burn.org/wp-content/uploads/Pollution-Health_final-Nov-14-2019.pdf
[82] https://cegh.net/article/S2213-3984(20)30165-2/pdf
[83] https://cegh.net/article/S2213-3984(20)30165-2/pdf
[84] https://mdl.donau-uni.ac.at/binucom/pluginfile.php/405/mod_page/content/38/KRVIA_6_K.pdf
[85] https://mdl.donau-uni.ac.at/binucom/pluginfile.php/405/mod_page/content/38/KRVIA_6_K.pdf

With these numbers displayed, it becomes clear that the communities living near Deonar are in no position to suffer any more risks to their health or employment. Yet, instead of focusing attention on stopping more waste from coming into the dumpyard, the BMC is investing public money into a WTE plant that will only make matters worse.

The Environmental Impact Assessment (EIA) and approval of the WTE plant

In August 2021, the BMC submitted an EIA[86] to the Ministry of Environment Forests and Climate Change (MoEF&CC) for environment clearance for the WTE. The EIA states that vide MoEF&CC notification dated 2 January 2014, as amendment to the EIA notification, thermal power plants utilising non hazardous solid waste upto 15 MW capacity are exempt from the purview of prior environmental clearance. Therefore the proposed plant was exempt for an EC from the MoEF&CC. However, the project required an EC because of the Sanitary landfill to be constructed in the adjoining 2 hectares of land for inerts and ashes from the project. Incinerator ash is filled with heavy metals such as Arsenic, Barium, Mercury, Chromium and Lead all of which are considered hazardous as per the "Manufacture, Storage, and Import of. Hazardous Chemicals (MSIHC) Rules, 1989" under the Environment. (Protection) Act, 1986.[87] These are also considered as High Level of Concern by fulfilling one or more of hazard criteria under EU regulations (namely: very bioaccumulative; carcinogenicity; mutagenicity; reproductive toxicity; endocrine disruption; specific target organ toxicity upon repeated exposure; and chronic aquatic toxicity).[88] The presence of a sanitary landfill filled with inerts and ash from the WTE will directly expose surrounding neighbourhoods to all these effects.

According to the ambient air quality recorded in the EIA, the average value of NO_x was 102 µg/m^3 at the Project Site which exceeded the NAAQS limit of 80 µg/m^3, and the maximum value of PM10 was 178 µg/m^3 which exceeded the NAAQS limit of 100 µg/m^3 and the value of PM2.5 was 155 µg/m^3 at the project site which exceeded the NAAQS limit of 60 µg/m^3. Therefore, the EIA records that even without the WTE, the dumpsite has hazardous levels of Nitrogen Oxide, PM10 and PM2.5.

The surface water analysis from the part of the Thane Creek near the project site revealed that the water is polluted and values of parameters like TDS, Sulphate, Chlorides, Magnesium, Calcium and F. Coli. are exceeding permissible limits. The groundwater analysis from borewells near the project site revealed that the

[86]http://environmentclearance.nic.in/DownloadPfdFile.aspx?FileName=HG6VPTQ9qdN6GVzufGlrCZQFLu0Df+gurYdMw5ftnEtGlT/xuUect8ev75IXogxnZKJBldf/nD0oi6rLLxakMtla+Y5vIe3s4mkTRsESAJnBOB4+3mY6CkblqQegPrCDpUTbiYz/dPV/FEhvDuIuYA==&FilePath=93ZZBm8LWEXfg+HAlQix2fE2t8z/pgnoBhDlYdZCxzVPEh4a7F53Cae7tleKGoXIDiA7chYePNgRJpehWx3dLsaLaee8RS5VxBvVdCAnIMg=

[87] https://www.cpcb.nic.in/openpdffile.php?id=UmVwb3J0RmlsZXMvTmV3SXRlbV8xNThfTVNJSEMtUkVQT1JULnBkZg==

[88] https://zerowasteeurope.eu/wp-content/uploads/2022/01/zwe_Jan2022_toxic_fallout_research_report.pdf

pollutants in the groundwater exceeded the limits defined in Indian Drinking Water Standards BIS-IS 10500:1991. The reported values of Total Dissolved Solids (TDS) in the groundwater were in the range of 520 mg/l and 1,356 mg/l. The total hardness varied between 50 mg/l and 392 mg/l. The reported Chloride ranged between 35 mg/l and 380 mg/l. The reported values of Sulphate varied between 31.8 mg/l and 182 mg/l. The conductivity ranged between 755 µmhos/cm and 780 µmhos/cm, indicating contamination from surface pollutants.

On April 27, 2021, a public hearing was held for the project. Citing covid restrictions as their reason, the BMC conducted the public hearing via an online meeting. As a result, only one resident from the neighbourhood surrounding the project site attended the hearing.[89] The above information taken from the EIA indicates that the site of the proposed WTE is already highly polluted due to the dumpsite with contaminated air and water from the region. Yet the State Environment Impact Assessment Authority (SEIAA) of Maharashtra granted approval for the construction of the plant on 7 December 2021. Despite failures of WTEs in different parts of the country, gross violations by the functional WTEs in Delhi and the availability of data on the health hazards of the plants, the stage is set for the WTE plant at Deonar to come up.

Interactions with organisations and individuals working in the area

From April 18-20, two researchers from CFA and two from GAIA India went to Mumbai to visit the site of the upcoming WTE and meet with organisations working in the area surrounding the Deonar dumpsite. There are several civil society organisations, researchers and activist groups working in the areas surrounding Deonar who have organised with the local community on several issues including housing rights, environmental issues, worker rights and women's rights.

Our conversations with the organisations and individuals gave us further insight into how deeply the communities living around Deonar rely on the dumpsite for their livelihood. The Deonar dumpsite is a double-edged sword for the surrounding communities. While it has been the reason behind recurrent illnesses and deaths, it is also a source of livelihood for several people who work either full-time or partially as waste pickers. The nature of employment for most people is shifting - they work as street vendors, drivers, construction or factory workers, and several daily wage workers use waste picking as temporary employment for days they don't get other forms of work. After the loss of employment during COVID, waste picking has served as a safety net for several people in the area. This has also meant increased

[89] https://www.hindustantimes.com/cities/mumbai-news/300-citizens-write-to-bmc-seek-second-public-hearing-for-deonar-wte-plant-101619981337916.html

competition for recyclable materials especially since the BMC is making access to the dumpsite difficult for waste pickers. The Deonar area also has a high proportion of single women migrants who work as domestic workers in the city.

A member of an organisation working in the area reported that in Mankhurd, 90% of people are living in informal settlements with no access to a public hospital. The local dispensaries are not equipped to deal with patients. Since the areas around Deonar have been highly polluted for several decades now, local populations have been made habituated to their persistent poor health status. On top of this, continual uncertainties regarding employment, residence and access to basic services have made the very existence of these communities consistently difficult. While there have been complaints and protests against the already functioning bio-medical waste incinerator in the area, very few residents were aware of the BMC's plans to set up a WTE plant in the area.

Waste picking for the last year had been further restricted by the BMC by raising the barricade height of the dump yard and restricting entry. Only waste-pickers with an official pass were allowed to enter the dump yard and all recyclables were purchased by BMC officials inside the dump yard and no recyclable material was allowed to be taken outside.

There are also two fishing communities near the Thane creek area—Kolis and Bhandaris.

Conclusion

The Deonar dumpsite has long been the cause of illness and distress for the citizens living around the dumpyard. But repeatedly, the BMC has shirked responsibility for the health hazards caused by the dumpsite by seeking extensions on bans imposed on the dumping of waste and ignoring the dismal living conditions of the residents of the area.

The case of the Deonar WTE illustrates that government agencies in India are viewing WTEs as a solution to the problem of India's overburdened and unregulated landfills. Similar to the case of the WTEs in Delhi, the Deonar WTE was also preceded by court orders that stopped the municipal corporation from dumping waste at the landfill. What is shocking is that the experience of the Delhi WTEs in terms of their violation of emission standards and inability to solve the city's solid waste crisis has not dissuaded government agencies from choosing WTEs as an alternative solution. The disappointing track record of the project proponent was

also not enough for the government to surmise that repeating the same mistake as Delhi would be an error on their part and disastrous for the residents of the city.

The existing air and water quality standards near the site of the upcoming WTE are enough to prove that the already dire environmental and health situation in the area will be further exacerbated by the installation and commissioning of the WTE. The case of the Okhla WTE in particular and different government schemes and policies that support WTEs, make it clear that once a WTE comes up it requires heavy government investment as well that they are only too eager to provide. The spending of public money on a toxic technology becomes even more cruelly unfounded when the project site is in a location that is in a dire need of access to basic services and employment. What the BMC will be spending on financing this WTE can be directed towards setting up decentralised, zero waste solutions across the city, which will reduce the amount of waste coming to the dumpyard and reduce the pollution and health impacts it has on residents of neighboring communities.

Mumbai as a city has struggled with managing its waste for several decades now and the people from the weakest socio-economic background living next to its dumpyard have borne the brunt of it. Once the WTE comes up, they will yet again be the worst affected population, though the entire city will also be affected to different extents. In a city as large as Mumbai, it becomes even more imperative that decentralised and better though out waste management solutions like zero-waste models[90] are implemented, instead of the waste of public resources and health on a WTE.

[90] https://www.no-burn.org/going-zero-waste/#

DELHI: The National Capital's Experience With Waste-To-Energy

Suitability of Delhi's Waste for WTE

According to the annual report[91] filed by the Delhi Pollution Control Committee (DPCC) for the year 2020-21, out of the 10,990 tonnes of solid waste generated in the city every day, 5,457 tonnes is processed/treated and 5,533 is landfilled. This means that the city's 19 composting plants, 13 bio methanation plants and 3 WTE plants are only able to process 49.65% of the total waste generated. Why so, when only the three WTE plants put together have a capacity of treating 56% of the total waste? Why are they functioning below their capacity and are not able to reduce waste going to landfills? A major reason behind this is the nature of municipal waste generated in India. WTE plants need high calorific value combustible waste to operate, the kind of waste that is mostly made up of plastic. According to a 2020 report[92] commissioned by the Delhi government, plastic waste only forms 10.10 per cent of the city's waste. Out of this percentage, a major portion is made up of recyclable plastic that can be reclaimed and need not be burnt. Moreover, the Solid Waste Management Rules, 2016 clearly articulate that only segregated non-recyclable high-calorific fractions like used rubber tyres, multi-layer plastics, discarded textile and paper etc. are to be used in WTE plants. The waste processing quantity projected for WTE plants takes into consideration total waste generated in a city and not the non-recyclable high calorific fraction. Therefore, WTEs end up burning organic waste as well either in its original form or after composting and drying it.

Ultimately, the question that arises is – where is the waste that we are installing these WTE plants for. Why has the government commissioned plants with a capacity to treat 56% of the city's waste when only 10.10% is suitable for going into them.

[91] https://www.dpcc.delhigovt.nic.in/uploads/pdf/Annual%20Report%20SWM%20(Delhi)%202020-21.pdf

[92] http://environment.delhigovt.nic.in/wps/wcm/connect/17386b804204239d95839728c2355f02/SRI++Plastic+STUDY.pdf?MOD=AJPERES&lmod=-331427138

Table 4. Operational waste-to-energy plants in Delhi

Location	*Name of SPV*	*Developer*	*Waste-handling capacity*	*Electricity-generation capacity*
Ghazipur	East Delhi Waste Processing Company Ltd.	IL&FS	1300 tonnes per day	10 megawatts
Narela-Bawana	Delhi MSW Solutions Ltd.	Ramky Enviro Engineers Limited	3000 tonnes per day	36 megawatts
Okhla	Timarpur-Okhla Waste Management Company Limited	JITF Ecopolis	1950 tonnes per day	23 megawatts

WTEs adding to Delhi's toxic levels of pollution

Delhi's existing WTE plants are located at Okhla, Narela-Bawana and Ghazipur. All three plants were built next to pre-existing dumpsites to mitigate the hazardous environmental and health effects of rising garbage mountains in the city. In 2017, following a long legal battle, the National Green Tribunal cleared the functioning of the WTE plant in Okhla. The judge ignored the sustained resistance of Okhla residents as well as the massive deviations the plant design had undergone from the original proposal cleared by the Ministry of Environment, Forests and Climate Change (MOEF&CC). The judgement also directed the operators of the plant – Jindal Urban Infrastructure Ltd., to pay a compensation of Rs. 25 lakhs and the Central Pollution Control Board (CPCB) "to collect and analyse the samples of ambient air quality once in four months". In a 2018 order, the NGT mandated that a joint inspection of WTE plants at Delhi be conducted by the CPCB and the DPCC. The most recent report available is of the inspection carried out in September and October 2020. All three functioning WTE plants in Delhi were found violating pollution regulations that included the release of excess Dioxins and Furans, Hydrogen chloride and excess quantities of particulate matter at nearby air quality monitoring stations. According to the WHO, dioxins are highly toxic and can cause

reproductive and developmental problems, damage the immune system, interfere with hormones and also cause cancer.

Following this, the DPCC imposed a fine of Rs. 5 lakhs on each plant as "environmental compensation, without any further direction on future monitoring or reduction of the pollution levels."

According to the results of the stack emission monitoring of the Okhla WTE plant, the dioxins and furans released by the plant are 890% more than the permitted amounts. Similarly, levels of hydrogen chloride exceeded prescribed limits by 296%. Interestingly, the Online Continuous Emission Monitoring System (OCEMS) installed by the plant had recorded readings vastly different from what the CPCB's inspection found, showing figures closer to the stipulated norms.

The plant also produces 250 metric tonnes of ash daily from the combustion process that are disposed of at a landfill in Jaitpur.

The WTE plant in Bawana followed a similar route. Dioxins and furans were 390% higher than the prescribed limit and the plant was burning a higher quantity of waste than permitted while generating less than 24 MW electricity, its stated capacity. The ambient air quality in and around the plant was also worse than the prescribed limit. Fly ash generated by the incineration process is deposited within the plant premises in a landfill.

According to the CPCB report, the level of dioxins and furans recorded at the Ghazipur WTE were exceeding prescribed limits by 170% and the OCEMS data did not match the CPCB's readings. Contrary to the detailed project report of the plant approved by the MOEF&CC, no wet waste composting was operational in the plant. Further, the plant is operating without valid consent for operation CFO. Its consent to operate was valid till 8 December 2018 and at the time of the CPCB inspection, an extension had not been granted. During the inspection dates, the actual power generation of the plant was in the 3.45-8.75 MW range which is much lower than the plant's 12 MW capacity.

Plans for more of the same: Tehkhand waste-to-energy plant

In 2017, the South Delhi Municipal Corporation (SDMC) issued a notice inviting tenders and Request for Proposal (RfP), for a Solid Waste Processing Facility adopting Waste to Energy (WTE) technology as per Solid Waste Management Rules, 2016 for 2,000 tonnes per day (TPD) of municipal solid waste. The project was approved by an SDMC standing committee that cited the overflowing of the

pre-existing Okhla dumpsite as the reason behind the new plant located at Tehkhand. As of 2017, 1,800 tonnes of solid waste was going untreated at the existing dumpsite every day. According to the draft EIA submitted by the SDMC, the Rs. 375 crore project has a capacity of 25 megawatts and covers an area of 60.10 hectares. The SDMC commissioner at that time, Puneet Kumar Goel, had said that the Union Government will provide Rs 122.38 crore under the Swachh Bharat Mission and the Power Ministry will give Rs 52.66 crores for the development of the project. The remaining amount will be raised by the corporation itself, in collaboration with the appointed bidder. In its RfP, the SDMC assured financial assistance of Rs. 125 crores to the bidder. If this assistance is over and above the other grants, then the project proponent will get a plant worth Rs. 375 crores with an investment of Rs. 75 crores, having to pay only 20% of the project cost while the public funds all in all will be used to pay Rs. 300 crores. The Tehkhand plant will come up less than a kilometre from the Okhla WtE, greatly exacerbating the levels of toxicity being ingested by the residents of the region.

Financials

Companies that undertake the construction and operation of WTEs do so through the creation of special purpose vehicles (SPVs). An SPV is a subsidiary created by a parent company to isolate financial risk. It may be used to undertake a risky venture while reducing any negative financial impact upon the parent company and its investors.

Lack of availability of high calorific value segregated waste on one side, and high operations and maintenance costs on the other, have been responsible for the failure of several WTE plants in the country. Several municipal corporations have cancelled WTE contracts because of a massive delay in the commencement of construction and/or operations by the concessionaire. The costs of appointing new concessionaires, maintaining the plant and managing municipal solid waste in the intervening period are borne through public funds. In the case of Delhi's WTE plants, loans from public financial institutions formed a big chunk of the projects' financing. Thus, along with the social, environmental and health costs of WTE plants, people also have to bear the financial burden in case they fail.

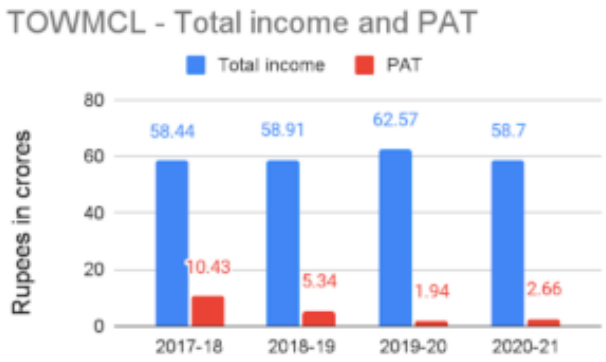
The Okhla and Ghazipur WTEs do not have any provision for the payment of tipping fees, therefore their only revenue comes from the sale of electricity or financial assistance from the government. In their annual balance sheet filed in March 2021, the company controlling the Okhla plant declared a government grant of Rs. 10 crores received from the Ministry of New and Renewable Energy WTE division, awarded against a central scheme for "*programme on energy recovery from municipal solid waste during the year 2007-08*".

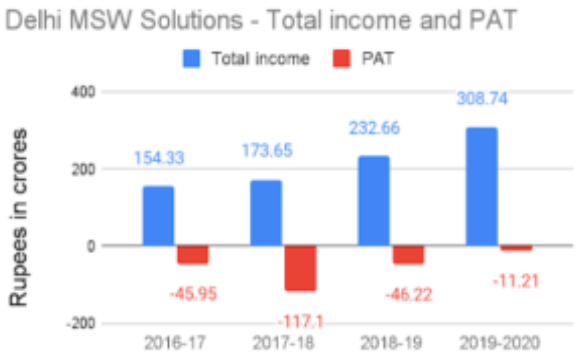
Since the government seems keen on continuing to invest in WTEs, we analysed the financials of Delhi's WTE plants, to assess their economic feasibility.

Total income and profit after tax

As opposed to the total income made by a company in a financial year, profit after tax (PAT) is the net profit available for the shareholders after paying all the expenses and taxes by the business unit. A fall in this value indicates a decrease in the company's profitability and ability to cover its day-to-day expenses.

The annual income of the SPV in charge of the Okhla WtE – Timarpur Okhla Waste Management Company Limited (TOWMCL) has remained stable between approximately Rs.58–62 crores for the last 4 years. However, PAT has been on a decline. It was Rs. 10.43 crores in 2017-18, Rs. 5.34 crores in 2018–19 and Rs. 1.94 crores in 2019–20, which improved slightly to Rs. 2.66 crores in 2020–21.





From March 2017 to March 2020, Delhi MSW Solutions (Narela-Bawana) recorded a constantly increasing total income, with amounts totalling almost 4 to 5 times the income of the Okhla WTE. However, the company's PAT was still in the negative range which indicates that costs and interest payments were still higher than the earnings.

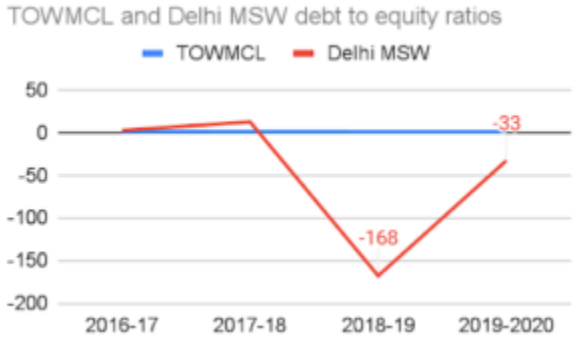
The total income for East Delhi Waste Processing Company Limited (Ghazipur) during 2011–16 was Rs. 14 lakhs– and profit after tax was consistently in the negative. The consent for operation (CFO) was received by the plant in 2016, financial records after that year are unavailable. In 2020, after the leading shareholder of the plant, IL&FS declared bankruptcy, ownership went to Ever Enviro Resource Management Pvt Ltd. Ever Enviro is a wholly owned subsidiary of Green Growth Equity Fund (GGEF), a UK-India fund aimed to leverage private sector investments in 'green infrastructure' projects in India.

Debt-to-Equity

The debt-to-equity ratio of a company indicates its dependence on loans, it is a measure of the degree to which a company is financing its operations through debt versus shareholder funds. 1 to 1.5 is considered a good debt to equity ratio as a high debt to equity ratio means an excess reliance on debt for financing daily operations and growth, whereas a negative ratio implies that the business has fewer assets than it has liabilities.

Timarpur Okhla Waste Management Company (Okhla) had the most stable debt to equity ratio out of the three as it remained stable between 0.5 to 1.5, in the last 4 years.

Delhi MSW Solutions (Narela-Bawana) had the most steeply fluctuating debt to equity ratio from the lot. In 2019, it dipped to -168, which means that for every asset the company-owned, it had 168 liabilities. In 2020, the ratio increased to -33 still implying very high spending on interest repayment.

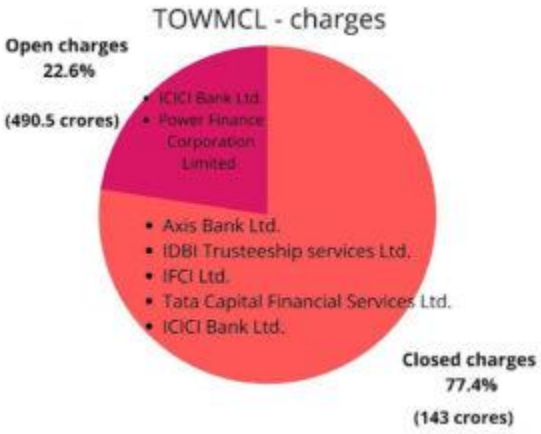


East Delhi Waste Processing Company Ltd. (Ghazipur) showed a debt-to-equity ratio higher than 5 in the period 2013-2016. This implies that during this period, the company relied on its borrowings rather than existing equity for its functioning.

Out of the total charges issued by it, TOWMCL only has 22.6% of open charges. Power Finance Corporation of India, an Indian financial institution under the ownership of the Government of India, lent Rs. 135 crores to the SPV in 2019.Under the Companies Act 2013, the charge is defined as *"any kind of interest or any kind of security on the property or any assets of a company or any of its happenings or both as security and includes a mortgage."* A company's charges indicate the fixed and floating assets mortgaged by it to secure debt from financial institutions.

Sustained debt means increasing spending on interest payments and a reduction in financial viability.

Existing and closed charges



Delhi MSW Solutions has 42.5% open charges. In 2011 and 2013, Andhra Bank (a public sector bank merged into Union bank in 2020) lent the company Rs. 42.79 crores and Rs. 14.86 crores respectively.

Of the three plants, EDWPCL has the maximum amount of assets mortgaged for debt. Bank of India, a nationalised bank under the ownership of the Union Government, extended a loan of Rs. 99.38 crores to the company in 2009.

Conclusion

Despite being given concessions by the government, Delhi's WTE plants are functioning with the help of debt financing. Only the Okhla WTE has had any financial profits over the last few years but they too have been decreasing from 2017 to 2021. The high income of the Narela-Bawana plant is offset by its drastic debt to equity ratio, indicating a very heavy reliance on debt for facilitating plant operations.

The Ghazipur plant generated Rs. 14 lakhs in revenue until 2016 following which the bankruptcy of IL&FS and the consequent sale of its assets caused a change in ownership and it is unclear whether the plant has restarted its operations as its consent to operate has not been renewed. This situation exists despite government subsidies and compulsory power purchase. Even after heavy investments, debts and expenditures, the waste crisis still remains in Delhi. The landfills and smaller dumpsites on the outskirts of the city continue to grow even as public money is pumped into WTE plants.

Those who present WTE systems as the only solution to handle India's growing waste problem ignore community-based recycling and composting initiatives[93] and decentralized resource recovery programmes that have time and again proven to be more environmentally and financially sustainable. The costs to public health, money and resources make it clear that investment in WTE projects is an investment in public harm and is actually a waste of energy.

[93] https://zerowasteworld.org/wp-content/uploads/India.pdf

V. MANAGEMENT OF PLASTIC WASTE

Swathi Seshadri, Ashi Datta

BAN OF SINGLE-USE-PLASTICS

Effective July 1, 2022, the Union government has banned identified single use plastics (SUPs) as mandated by the Plastic Waste Management Rules, 2021. The stated aim of this ban is to arrest plastic pollution by targeting low-utility high-littering SUPs.

Going by industry estimates this ban would target only 2 – 3% of total plastic produced. In fact, the bulk of the problem can be traced to plastic packaging of fast-moving consumer goods (FMCGs) which include sachets and packaging of products like chips, biscuits, soaps etc., which the ban conspicuously excludes.

The ban and the fossil fuel industry

Break Free From Plastic, in its Brand Audit in India in 2021, found that 70% of the 1,49,985 pieces of plastic audited were marked with a clear consumer brand. Some of the top plastic polluting international and Indian brands identified during the audit were Hindustan Unilever, Pepsico, Coca-Cola, Parle, ITC Limited, Britannia, Haldiram's, Tata Consumer Products etc. Analysts at Kotak Institutional Equities, which has released a report on the ban, claims that the current ban will not affect FMCGs, but one on sachets/pouches/wrappers/laminated tubes could impact their profitability. In 2015, FICCI and strategy consultants Strategy& in their report, 'Plastic Packaging – the sustainable and smarter choice: Why banning plastic packaging in Indian FMCG is not a viable option', argued that banning FMCG packaging would affect the processed food industry to the tune of approximately Rs. 90,000 crores per annum, amounting to 72% of the industry.

The 2021 Rules treat SUPs generated by FMCG and non-FMCGs differentially (except for the straws attached to packaged branded beverages). While there is a ban on non-FMCG SUPs, companies in the FMCG category have been allowed to go scot-free since accountability measures like Extended Producer Responsibility (EPR) are only introduced in diluted forms allowing for use of these toxic materials by paying a small fee and staggering transition over 3 years.

Plastic is a petrochemical and in India is produced from crude oil that is imported and then refined domestically. Therefore, the human, environment and climate costs are not limited to the disposal of plastics but extend to its entire life cycle. The FICCI report rightly points out the backward linkage in plastic production which includes petroleum intermediate producers, resin and naphtha producers (both raw materials to plastic polymer), pre-packaging manufacturers, and plant & machinery, mould and additive producers etc, and a ban on FMCG packaging would have a significant impact on this entire chain. Perhaps this is where the untold story lies.

Who wins, who loses?

According to a PlastIndia (2019) report, Reliance Industries Limited is the sole producer of LDPE (a variety of plastic raw materials used in SUPs) and owns 42% of the total production capacity of commodity plastics, used to manufacture SUPs with OPaL in a distant second place.

A February 2022 CPCB notification identifies 18 polymer producers who supply raw materials for SUPs, which is a niche industry. Since the ban is limited to only some SUPs, this will not have a significant damaging effect on these producers since they will continue producing polymers for other SUPs which have not been banned.

Those who have been significantly impacted instead are some of the 30,000 MSME units that manufactured the plastic products on the banned list. While this is no reason to not ban SUPs, it is pertinent to note that there has been no hand-holding by the government to these MSMEs to transition into another industry. For example, 12 days into the ban and the Delhi Pollution Control Committee has already issued closure notices to 14 units manufacturing the banned SUPs and within the first 9 days total penalties of Rs. 1.37 crores have been levied. The absence of alternative forms of livelihood and employment will undoubtedly contribute to the existing unemployment crisis which looms large over this country. Further, many of the identified SUPs which are banned are used by small eateries, other small enterprises and street vendors. This ban will therefore largely impact the MSME and informal sector both on the production and use side, leading business to be taken away from the informal to the formal sector, a trend set in motion by demonetisation and GST, and boosted by lockdowns during the pandemic. All this while making an insignificant and irrelevant dent in plastic use and pollution in the country.

Banning SUPs used by big corporations would mean upsetting billion-dollar industries, a move that the Indian government has not even remotely considered yet. If the government indeed wants to put money where its mouth is, it would focus

on envisioning a retail system which will take us away from the use-and-throw economy to one which is designed for reusable and sustainable packaging and which considers the interests of not big corporations but smaller players, the end user and fundamentally, the environment and climate.

CRITIQUE OF RECENT PLASTIC WASTE MANAGEMENT LAWS

According to the *Annual Report on Implementation of Plastic Waste Management Rules*,[94] India produced 34,69,780 tonnes of plastic waste in 2019-20. This amounted to 6.3% of total municipal solid waste generated, after 25.8% of the waste remained unaccounted for. Owing to its unique and diverse chemical composition, recycling plastic is never a simple process. Add to this the limitations of segregation, collection and infrastructure for processing, and most of the plastic around us ends up downcycled at best and floating in water bodies, buried in landfills or burnt in open fires or incinerators at worst. In the past, the responsibility for managing waste has been with public authorities like municipal corporations and pollution control boards. With the rising municipal solid waste crisis across the globe, populations and governments are pushing (PIBOs) to take financial and institutional responsibility for the plastic waste they produce.

In 2022, the union government has released two key subordinate legislations to try to curb the plastic waste problem: Plastic Waste Management (Amendment) Rules, 2022,[95] and a ban on identified single-use plastics (SUPs) items.[96]

The Plastic Waste Management (Amendment) Rules, 2022, delineating Extended Producer Responsibility (EPR) obligations for producers, importers, brand owners (PIBOs) were released on 16 February 2022 by the Central Pollution Control Board (CPCB). The rules were preceded by the 2022 draft rules released nearly a month before and the draft EPR guidelines released in 2021. EPR is a practice and a policy approach based on producer pays principle and in which producers take responsibility for the management of the disposal of products they produce once those products are designated as no longer useful by consumers. In India, EPR guidelines only apply to plastic packaging. The CPCB has been trying to enforce EPR since 2011. The desire to implement the mechanism found articulation in the 2016, 2018 and 2021 amendments to the rules too. No explanation was given as to why the final guidelines were only released in 2022, while plastic pollution and production kept increasing in the country.

Around the same time, on 4 February 2022, the CPCB also released a notification[97] announcing a ban on 19 items that the union government considers SUPs from July 1, 2022. The ban completely ignores plastic packaging, the main component of plastic waste. Even by industry estimates, the banned articles only constitute 2-3%

[94] https://cpcb.nic.in/uploads/plasticwaste/Annual_Report_2019-20_PWM.pdf
[95] https://cpcb.nic.in/uploads/plasticwaste/PWM-Amendment-Rules-2022.pdf
[96] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1837518#:~:text=For%20effective%20enforcement%20of%20ban,banned%20single%20use%20plastic%20items.
[97] https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS8zNDNfMTY0Mzk3NzUwNF9tZWRpYXBob3RvNjI3My5wZGY=

of total plastic waste produced in the country and conspicuously exclude any type of plastic packaging. The only other mechanism in place for holding PIBOs responsible for plastic packaging waste is EPR but the chances of anything substantial happening there also seem bleak.

Majority of plastic packaging is not recyclable

The 2022 EPR guidelines prescribe recycle targets for 4 categories of plastics:

Category 1: Rigid plastic packaging, usually made up of HDPE and PET
Category 2: Flexible plastic packaging of single layer or multilayer; Mostly made of LDPE and PP.
Category 3: Multilayered plastic packaging (at least one layer of plastic and at least one layer of material other than plastic).
Category 4: Plastic sheet or like used for packaging as well as carry bags made of compostable plastics.

For several years, the industry narrative has justified the overproduction and consumption of plastic packaging by saying that the recyclability of plastic makes it a wonder material and not environmentally damaging. But experience with plastic pollution has exposed a different reality. Large-scale and sustainable recycling of plastic does not happen because of various reasons.[98] Several commonly found plastic packaging material is made of multi-layered plastic (MLP) which has a heterogeneous chemical composition and hence is technologically difficult to recycle. Other smaller pieces of plastic do not generate enough revenue to make their recycling profitable.

In the guidelines, the highest reuse and recycle targets are set for rigid plastic packaging, followed by flexible plastic packaging, multilayered plastics and then compostable bags. According to a report[99] released by Break Free From Plastic (BFFP) India that documented plastic waste to identify the companies responsible for plastic pollution, multilayered plastics made up the highest proportion of plastic waste - 35%. Next was LDPE with 31% followed by PP at 14%. Thus in the EPR, the most common type of plastic packaging has the least recycling target that extends to only 60% by 2027. Because of their low value and complex composition, MLPs usually escape informal recycling mechanisms as well and end up in waste incinerators or landfills.

In the EPR guidelines, the target for the reuse of recycled MLPs is also only 10% till 2027. It is unclear what the PIBOs are expected to do with the rest of the recycled

[98] https://education.nationalgeographic.org/resource/whopping-91-percent-plastic-isnt-recycled
[99] https://swachcoop.com/brand-audit-report-2021/

waste but there are chances of their use in other post management false solutions like pyrolysis, gasification and co-processing.

The 2016 PWM rules identified the problem of MLPs in plastic packaging and prescribed a phasing out of non-recyclable multi-layered packaging. But in 2018, the rules were amended to include 'multi-layered plastic which is non-recyclable or non-energy recoverable or with no alternate use'.

Safety of recycled plastic used for food packaging

The EPR guidelines also specify the minimum quantities of recycled material to be used by PIBOs in their plastic packaging. The highest obligations are for rigid packaging followed by flexible packaging and MLPs, just like recycling targets. The food and beverage industry is one of the largest consumers of plastic packaging and if EPR obligations are fulfilled then they will have to use recycled plastic in their packaging.

The use of recycled plastic in food packaging is a contentious issue with even the MoEF&CC mentioning in the PWM Rules 2016[100] that carry-bags made of recycled plastic or products made of recycled plastic shall not be used for storing, carrying, dispensing or packaging ready to eat or drink foodstuff.

This decision was reversed in the 2021 amendment and in 2022 the Food Safety and Standards Authority of India (FSSAI) also permitted the use of recycled plastics as food contact material, reversing its earlier regulations.[101] Research has pointed out that the use of recycled plastic as food contact material can be potentially harmful to human health if done without proper regulations. Using recycled packaging waste to create new food packaging increases the number and level of chemicals that can then leach from the packaging into foods due to accumulation of contaminants when materials are repeatedly recycled and the entry of non-food grade materials into the recycling system.[102]

To complete their collection and use of recycled materials target PIBOs need to be able to use recycled materials in their packaging. This has been made possible by recent amendments in the law. But these amendments also open a doorway for a big public health problem through the exposure of food materials to toxic chemicals present in recycled plastic.

[100] http://www.mppcb.nic.in/proc/Plastic%20Waste%20Management%20Rules,%202016%20English.pdf
[101] https://www.downtoearth.org.in/blog/waste/why-new-rule-allowing-recycled-plastic-in-food-packaging-raises-concerns-79454
[102] https://unwrappedproject.org/recycled-content-in-food-packaging-toxic-chemical-exposure

EPR Trading and checking mechanisms

The guidelines allow that the surplus in one category can be used for off-setting carry forward and sale in the same category, and PIBOs can meet their EPR obligations by purchasing surplus certificates from others. Experience with carbon and emissions trading has shown that such market mechanisms exacerbate existing inequalities and hinder efforts to promote climate equity. With the current provisions, big PIBOs can dodge recycling targets by purchasing EPR certificates and have no incentive for creating packaging that is more suitable for recycling or reuse. Further, EPR certificates are issued by waste processors registered under the CPCB. The current recycling system in India is largely an informal network that employs lakhs of workers who struggle everyday for a fair wage. While formalising this industry, the government must make sure that the informal sector is incorporated into this planning, and big players have transparent and non-corrupt processes in place.

What will happen to the plastic waste that EPR and bans do not cover?

Historically, waste management has been an area that Urban Local Bodies have spent a high proportion of their revenue budget on. In recent years as well, governments at the union and state level have launched expensive schemes and programs to 'clean' the nation. In 2014 the Modi government launched the Swachh Bharat Abhiyan (SBM), a campaign divided into the two facets of urban and rural with the goals of solid waste management and eradicating open defecation. The cost of implementing SBM- Urban in the first phase (2014-2019) of the program was estimated at over Rs. 62,000 crores.[103] The second phase was announced in 2021 with a financial allocation of Rs. 1.41 lakh crores.[104] Municipal Corporations (MCs) are not far behind either. In its civic budget for the year 2022-23, the MC of Mumbai allotted INR 4,531 crores for Solid Waste Management (SWM), which is nearly 10% of its overall ₹45,949 crore budget. For the same time period, the Municipal Corporation of Bangalore, allocated INR 1,619 crores for SWM.[105] In Chennai, the MC hired a private company called Urbaser Sumeet in October 2020 to only collect and transport the waste of 7 of its 15 zones at a cost of INR 447 crores per year.[106]

According to a report[107] by the Niti Aayog on Waste to Energy, organic waste makes up 51% of the total MSW generated in the country. If processed in decentralised

[103] https://zeenews.india.com/node/1479062
[104] https://www.financialexpress.com/budget/budget-2021-fm-introduces-swachh-bharat-2-0-focus-to-bring-swachhta-to-urban-india/2183901/
[105] https://www.thehindu.com/news/national/tamil-nadu/cm-launches-solid-waste-management-project-in-7-zones/article32736896.ece
[106] https://www.thehindu.com/news/national/tamil-nadu/cm-launches-solid-waste-management-project-in-7-zones/article32736896.ece
[107] http://swachhbharaturban.gov.in/writereaddata/Task_force_report_on_WTE.pdf

units, composting biodegradable waste would require a miniscule fraction of the cost currently being spent on SWM. Most of what will be left will be plastic waste and the fiscal, social and environmental costs of managing this waste is borne by the people. In popular narratives, consumers are blamed for plastic pollution while also being assured that plastic pollution can be eradicated through proper disposal techniques. But such a thing does not exist for a material like plastic. Despite lakhs of crores of public money being spent on SWM, dumpyards keep rising and rivers keep getting choked with waste. The new solution being adopted by the government of installing waste incinerators is like jumping out of the frying pan into the fire.

Conclusion

The nature of the plastic waste management crisis compels us to not be able to easily ignore it, which also means that government agencies are under pressure to find quick solutions to it. The rules notified in 2022 are a testimony to this. However, what these rules fail to understand is that the problem with plastic waste is its overproduction. Laws like EPR and ban on SUPs tackle the problem in a manner so limited that they end up acting as little more than distractions. While rules like EPR were designed to shift the burden of plastic waste on private corporations, they completely ignore the environmental, health and social costs of the plastic production process. While measures like a ban also target production, if they are enacted only on 2-3% of the total plastic waste, then any real impact is impossible. The costs, both financial and health, are borne by the people who are being duped with false solutions and laws that are only good on paper.

ANNEXURE

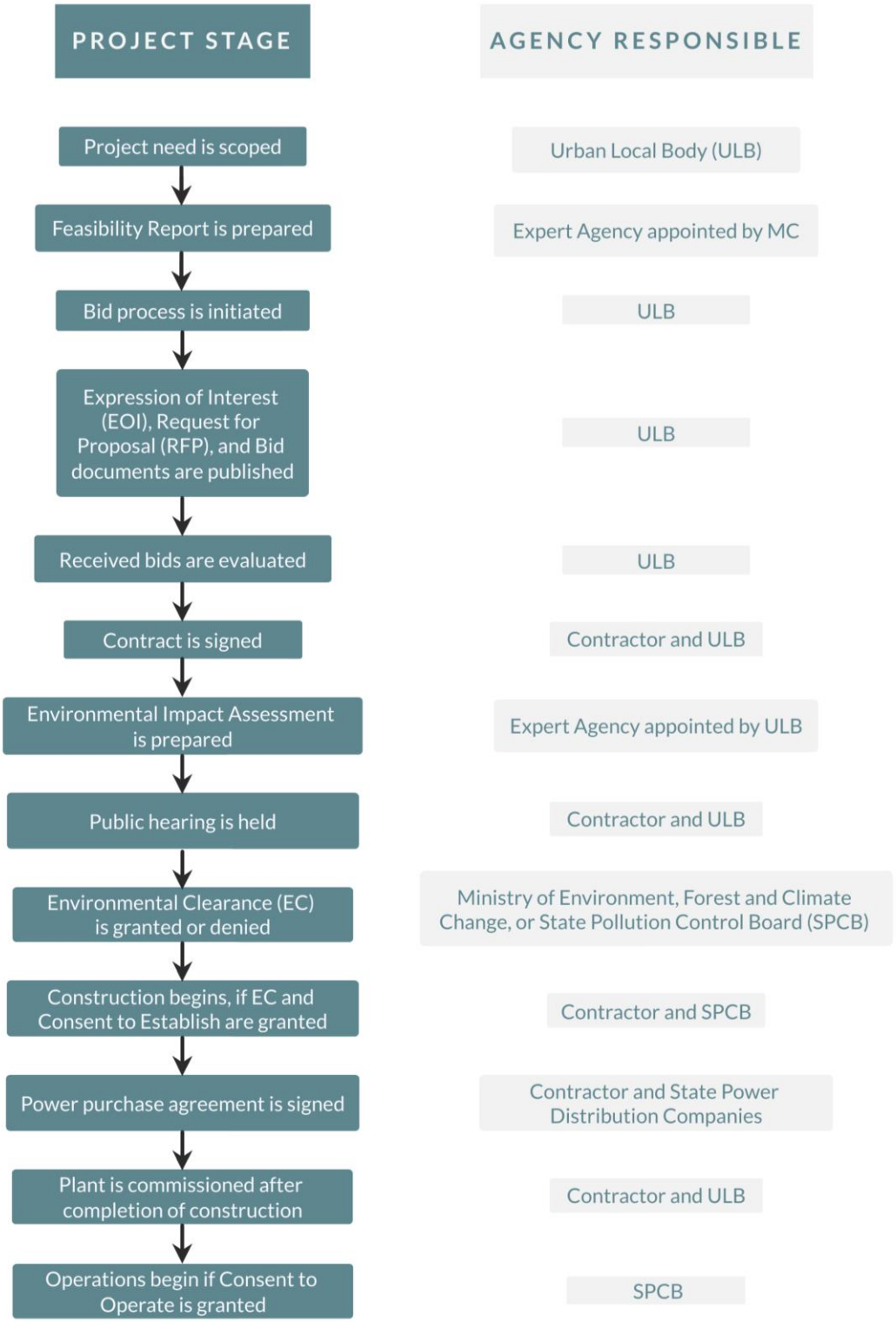


Figure 1. Process of installing a WTE plant.

Table 1. WTE plants selected for analysis.

S. No.	Location	State	Developer	Special Purpose Vehicle	Concession Authority	Power Purchases
1	Visakhapatnam	Andhra Pradesh	Under construction	Jindal Urban Infrastructure Limited	Jindal Urban Waste Management (Visakhapatnam) Limited,	Visakhapatnam Municipal Corporation
2	Guntur	Andhra Pradesh	Under construction	Jindal Urban Infrastructure Limited	Jindal Urban Waste Management (Guntur) Limited,	Guntur Municipal Corporation
3	Patna	Bihar	Proposed	A.G. Dauters Waste	AGD Bairiya Energy private limited	Patna Municipal Corporation
4	Raipur	Chhattisgarh	Operational	Ramky Enviro Engineers Limited	Information unavailable	Raipur Municipal Corporation
5	Narela-Bawana	Delhi	Operational	Ramky Enviro Engineers Limited	Delhi MSW Solutions Ltd.	North Delhi Municipal Corporation
6	Sukhdev Vihar, Okhla	Delhi	Operational	JITF Ecopolis	Timarpur-Okhla Waste Management Company Limited	South Delhi Municipal Corporation
7	Tehkhand	Delhi	Proposed	JITF Urban Infrastructure Limited	Tehkhand Waste To Electricity Project Limited	South Delhi Municipal Corporation
8	Ghazipur	Delhi	Operational	IL&FS	East Delhi Waste Processing Company Ltd.	East Delhi Municipal Corporation
9	Ahmedabad	Gujarat	Under construction	Abellon Clean Energy	Goodwatts WTE Ahmedabad Pvt ltd.	Ahmedabad Municipal Corporation
10	Murthal	Haryana	Operational	Neel Metal Products Limited and Poland-based EKOLOG Ltd	JBM Environment Management Pvt Ltd.	Sonipat Municipal Corporation
11	Bandhwari	Haryana	Under construction	Ecogreen Energy Private Limited	Ecogreen Energy Gurgaon Faridabad Pvt. Ltd.	Faridabad Municipal Corporation
12	Patvi, Ambala	Haryana	Proposed	Zonta Infratech Private Limited	Information Unavailable	Ambala Municipal Corporation
13	Kozhikode	Kerala	Under construction	Zonta Infratech Private Limited	Malabar Waste Management Pvt Ltd	Kozhikode Municipal Corporation

14	Rewa	Madhya Pradesh	Proposed	Chennai MSW Private Limited & Consortium	Rewa MSW holding limited	Rewa Municipal Corporation
15	Jabalpur	Madhya Pradesh	Operational	Essel Infra	Essel Msw Jabalpur Pvt Ltd	Jabalpur Municipal Corporation
16	Mumbai	Maharashtra	Proposed	Chennai MSW Pvt Ltd	Information Unavailable	Brihanmumbai Municipal Corporation
17	Pune	Maharashtra	Proposed	Vku-urban	Pune Bioenergy Systems Pvt. Ltd.	Pune Municipal Corporation
18	Jawahar Nagar, Hyderabad	Telangana	Operational	Ramky Enviro Engineers Limited	Hyderabad Integrated Municipal Solid Waste Limited	Greater Hyderabad Municipal Corporation
19	Dehradun	Uttarakhand	Proposed	Ramky Enviro Engineers Limited	Dehradun Waste Management Private Limited	Dehradun Municipal Corporation
20	Varanasi	Uttar Pradesh	Proposed	NTPC Vidyut Vyapar Nigam (NVVN) Limited	Information Unavailable	Varanasi Nagar Nigam

Table 2. Type of technology used by WTE plants.

WTE Plant Location	Technology Used
Visakhapatnam	Mass Incineration
Guntur	Refuse Derived Fuel (RDF) based power plant
Patna	Gasification
Narela-Bawana	Refuse Derived Fuel (RDF) based power plant
Okhla	Refuse Derived Fuel (RDF) based power plant
Tehkhand	Mass Incineration
Ghazipur	Refuse Derived Fuel (RDF) based power plant
Murthal	Refuse Derived Fuel (RDF) based power plant
Bandhwari	Refuse Derived Fuel (RDF) based power plant
Ambala	Refuse Derived Fuel (RDF) based power plant
Kozhikode	Mass Incineration
Jabalpur	Mass Incineration
Rewa	Mass Incineration
Pune	Mass Incineration
Dehradun	Refuse Derived Fuel (RDF) based power plant

Table 3. Capital investment listed by concessionaires in DPRs for WTE plants

Location of WTE plant	Estimated investment (in crores)	Waste handling capacity (in tonnes per day)
Ghazipur, Delhi	₹100.00	1300
Mohali	₹123.79	600
Dehradun	₹123.96	300
Murthal	₹154.44	500
Jabalpur	₹177.95	600
Varanasi	₹180.00	700
Raipur	₹197.00	500
Kozhikode	₹214.38	300
Guntur	₹218.84	1200
Visakhapatnam	₹219.96	1200
Ahmedabad	₹240.00	1000
Gwalior	₹254.00	1200
Okhla, Delhi	₹273.00	1950
Agra	₹280.00	1000
Pune	₹325.00	750
Bandhwari	₹330.48	1500
Patvi, Ambala	₹338.98	490
Tehkhand, Delhi	₹375.00	2000
Narela-Bawana, Delhi	₹378.00	3000
Mumbai	₹877.76	3000
Patna	₹3,400.00	1200

CFA
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