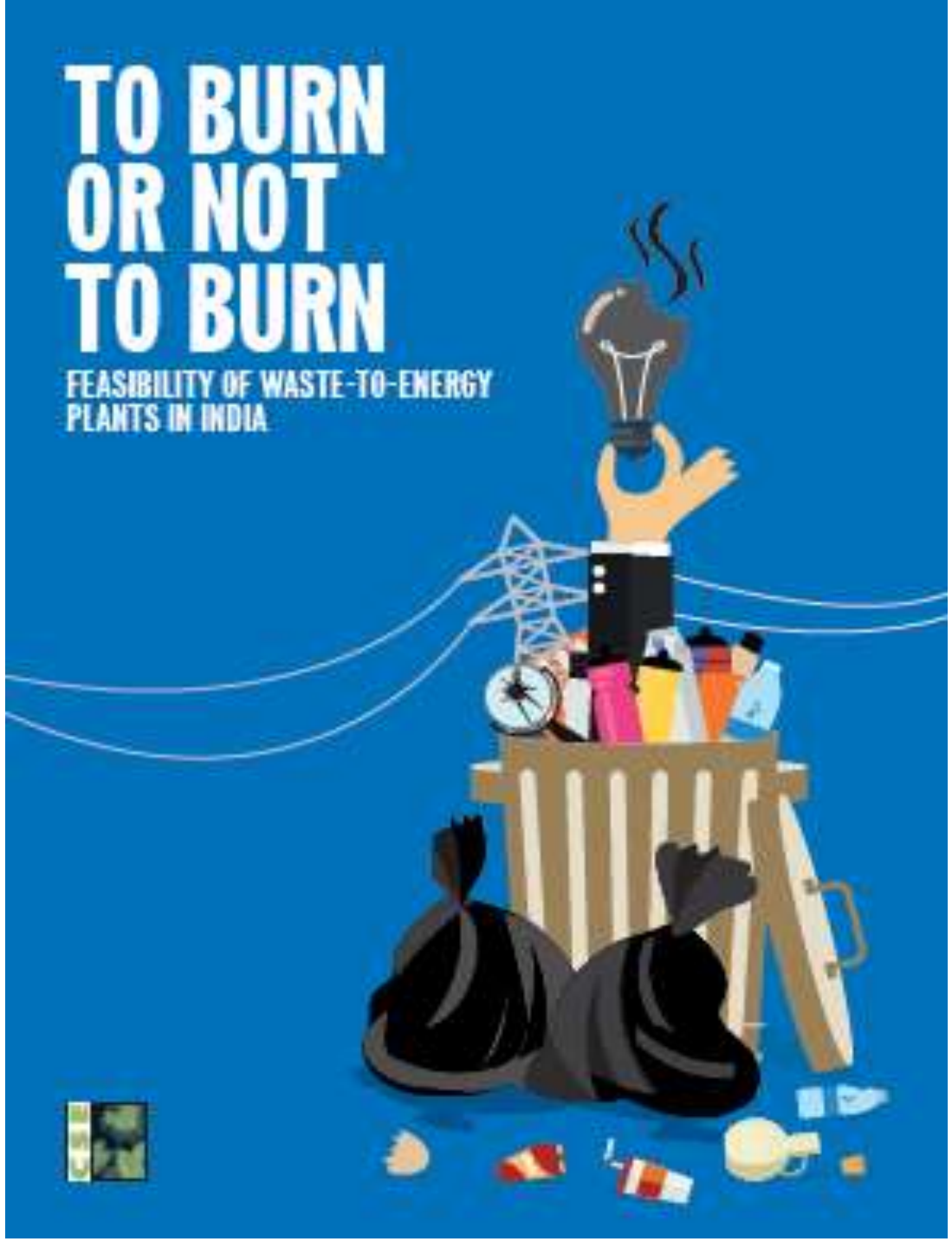

Municipal Solid Waste- Challenges and Feasibility of Waste to Energy (WTE)

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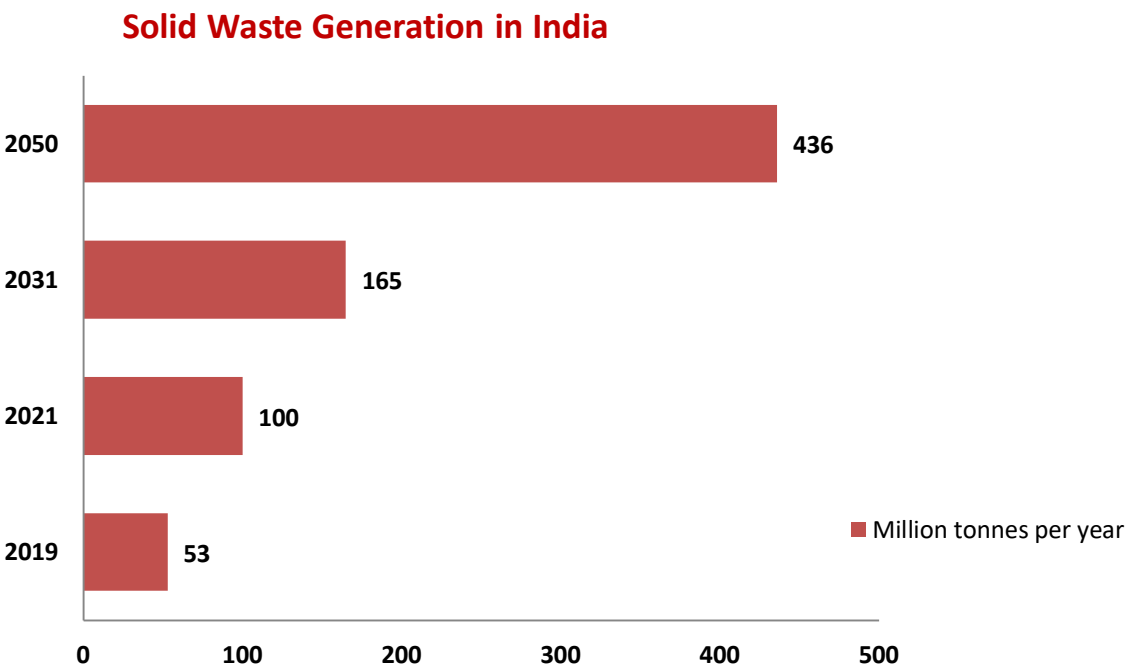
Centre for Science and Environment

Solid Waste in India

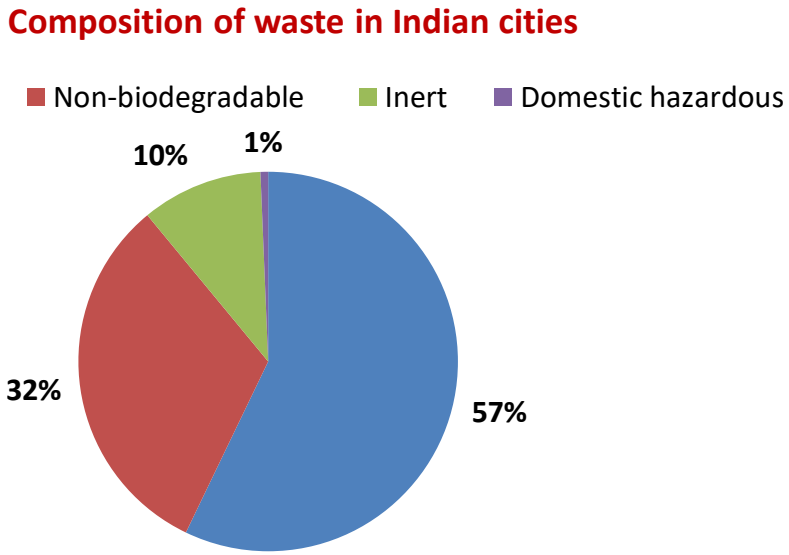
- Urban India produces around 63 million tonnes of MSW every year.
- Of this, only about 50 per cent is processed, i.e. recycled or converted into energy, remaining finds its way into dumpsites or is burned openly.

In such a situation, how should the country manage its waste?

Growing quantities and changing composition



Source: SBM, 2019; CPCB 2014 projections



Source: CSE, 2018

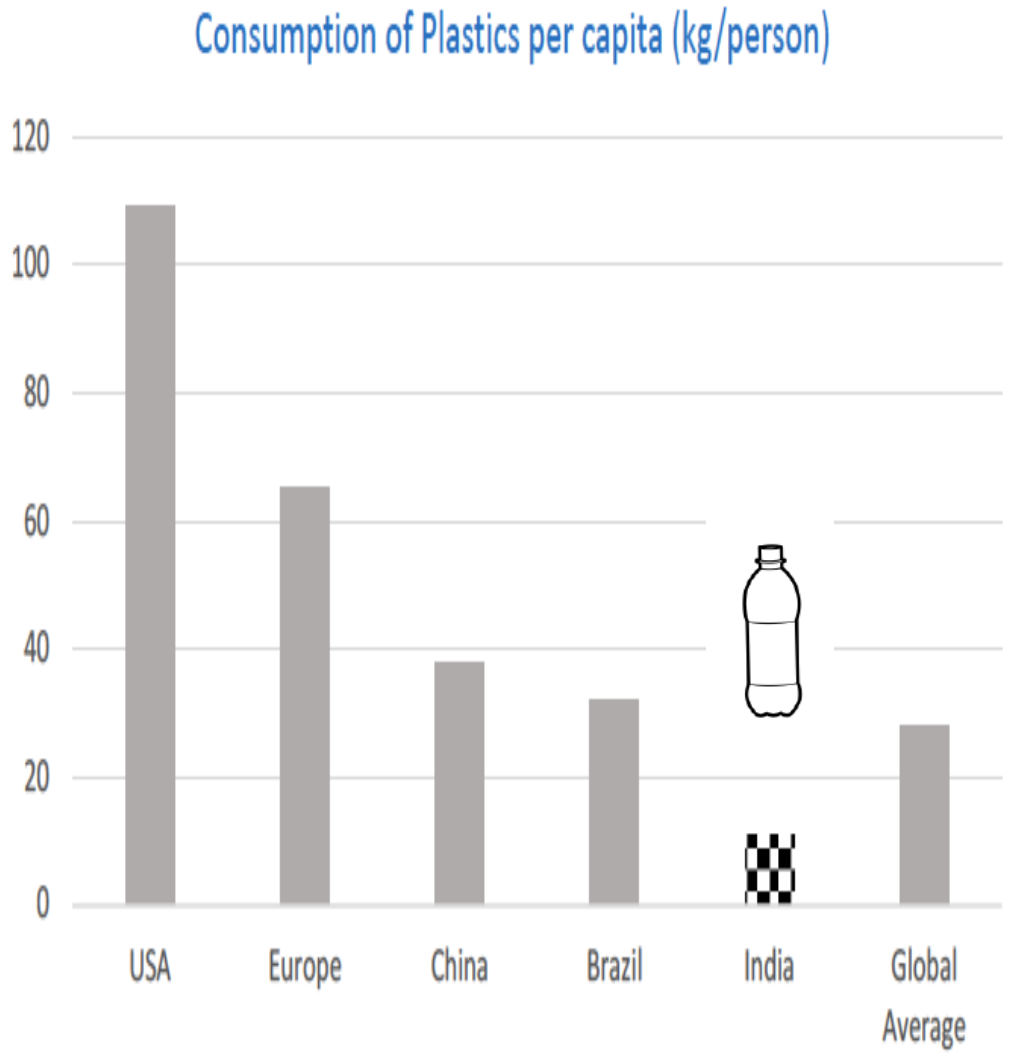
- **Waste generation growth is outpacing population growth by 2-3 times**
- Huge challenge of growing quantities and changing composition patterns (plastics) –**Proportional to wealth**
- Majority of the waste in Indian is biodegradable in nature (40-70 % of the total) –**Myth?**
- Non-biodegradable fraction is **20-40 percent in 2018 - up from 16-20 % in 2011**

Plastic Menace

- India consumes 16.5 million tonnes (MT) of plastic annually - **expected to increase to 20 MT by 2020.** *(FICCI, 2017)*
  - Of this, **43% is plastic manufactured for single-use packaging material**

- **No clear estimate on generation-25,940 TPD of plastic waste of which approximately 15,000 TPD is collected** *(CPCB, 2017)*

- **Plastic Waste Management Rules notified in 2016**, further amended in 2018
  - **25 states have banned the use of plastic carry bags**
  - **No implementation of EPR**
  - **Issue of non-compliance from states in submitting data**
- Imports increased four-fold from 12,000 tonnes to 48,000 FYOY 2017 to 2018
- In March, 2019, India banned the import of plastic waste. second largest importer from USA in FEB 2019 *(IndiaSpend, 2019).*



A Paradigm Shift

- Since 2014, considerable progress has been made with **Door to Door collection of MSW (89% in 2019 from 53 % in 2016) .**
- **However, a lot more work is required on source segregation (around 40 %) and processing (around 30 %).**

- ‘Segregation’ was considered desirable but not practical for poor countries like India.

- Main compliance condition for the urban local bodies under the Municipal Solid Wastes (Management & Handling) Rules, 2000 was the construction of a sanitary landfill site.
- The Solid Waste Management (SWM) Rules of 2016**:“every effort shall be made to recycle or reuse the rejects to achieve the desired objective of zero waste going to [a] landfill.”**

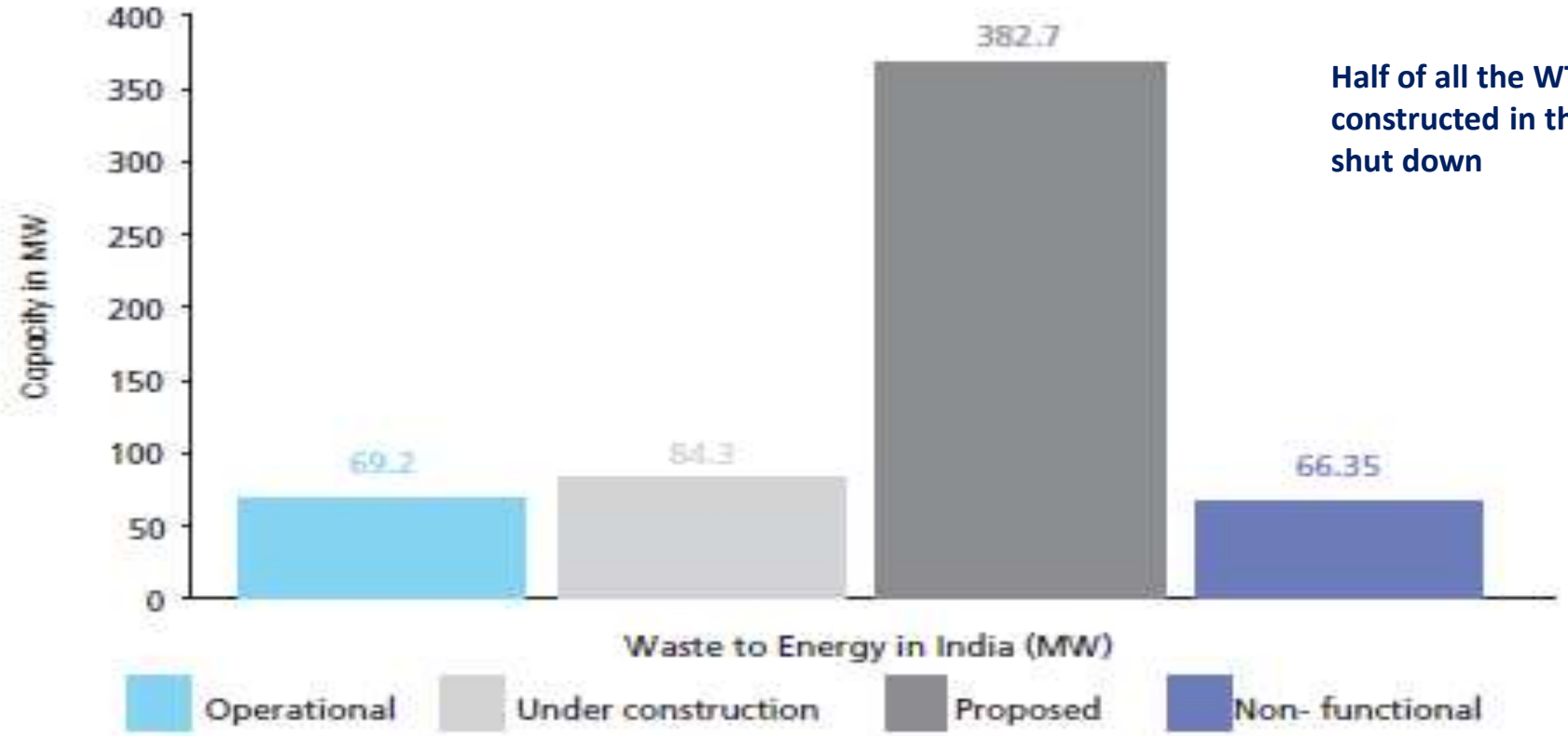
“Solid” Quick fix

- Mis conceptions: Best way to deal with waste is to burn it and produce electricity
- Silver-bullet of burning waste to generate energy will not work unless waste is segregated
- W-T-E plants closing; asking for higher rates for tipping fee or energy; unviable; or people are protesting against pollution by plants
- Reasons: Quality of waste

  Agreements are based on tipping fee
- Segregation at plant is expensive: Ballistic Separator, Density Separator, Magnetic Separator

Status of WTE in India

- First WTE plant —Timarpur in Delhi in 1987 - designed to incinerate 300 TPD of waste and produce 3.75 MW of electricity. It failed and was shut down soon after
- Since then, 14 more WTE plants of 130 MW capacity have been installed. Of these, 7 plants with capacity of 66 MW are closed and the remaining 7 plants are operational

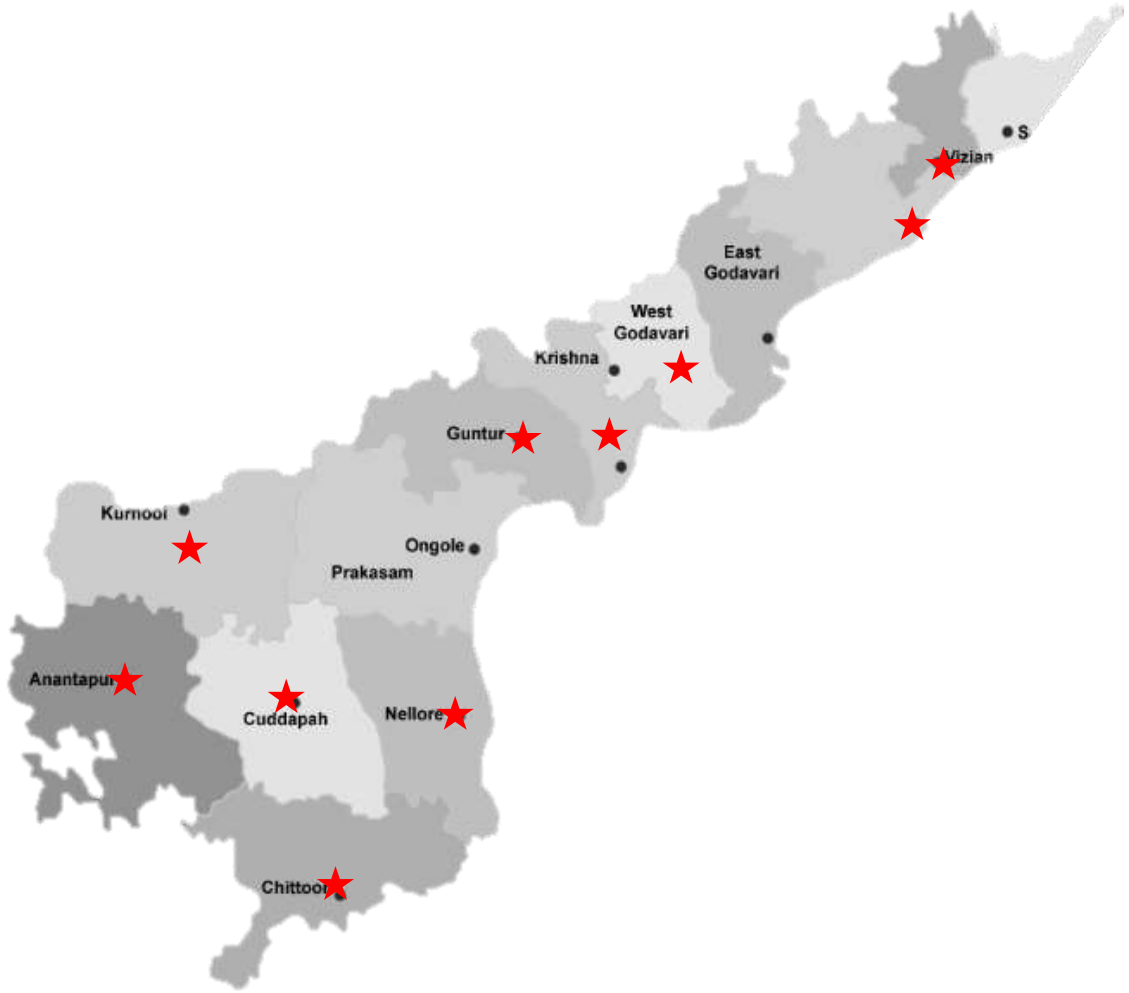


Half of all the WTE plants constructed in the country have shut down

Sources: CSE, 2018.

Status of WTE in Andhra Pradesh

Cluster Name (Lead ULB)	MSW Qnty. (FY 15-16)	Proposed Capacity (MW)
Visakhapatnam	942	15
Vizianagaram	203	4
Tadepalligudem	342	5
Guntur	1,202	15
Machilipatnam	196	4
Tirupati	374	6
Nellore	296	4
Kurnool	316	1
Ananthapur	283	4
Kadapa	317	5



Source: Swachh Andhra corporation

Policy promotes WTE

- Niti Aayog has set a target of constructing 511 MW of WTE plants by 2018–19
- Formation of the Waste to Energy Corporation of India, which would set up incineration plants through PPP models
- In September 2017, National Thermal Power Corporation (NTPC) invited developers and investors to set up 100 WTE plants in the country.

But the big questions for the country is:

How feasible are these plants? Is WTE the first choice to manage MSW in India?

Feasibility of WTE

A. CHARACTERISTICS OF WASTE

B. CALORIFIC VALUE

- As per the NGT order of January 2017, only non-recyclable non-biodegradable high-calorific-value waste should be used as waste feed for WTE.
- Unsegregated waste has high inert content. Not suitable for burning in WTE plants.
- Main reason why WTE plants in Kanpur, Bengaluru, Hyderabad, Lucknow, Karimnagar are closed

(A) COMPOSITION OF WASTE

City	State	Biodegradable (%)	Non-biodegradable (%)	Inert (%)	Domestic hazardous (%)
Cities with population of 1 million-plus					
Bengaluru	Karnataka	64	28	5	3
Hyderabad	Telangana	55	40	5	-
Delhi	Delhi	50	35	15	-
Indore	Madhya Pradesh	50	35	15	-
Patna	Bihar	51	27	15	-
Bhopal	Madhya Pradesh	57	30	11	-
Mysuru	Karnataka	50	35	15	-
Cities with population of 0.1–1 million					
Thiruvananthapuram	Kerala	60	35	4	1
Gaya	Bihar	55	34	11	
Muzaffarpur	Bihar	55	25	18	2
Imphal	Manipur	55	35	5	
Alappuzha	Kerala	75	20	5	-
Gangtok	Sikkim	51	28	21	-
Cities with population below 0.1 million					
Balaghat	Madhya Pradesh	70	25	5	-
Bobbili	Andhra Pradesh	50	26	20	4
Vaijapur	Maharashtra	50	45	5	-
Panchgani	Maharashtra	70	25	5	-
Venguria	Maharashtra	54	40	5	1

Source: CSE, 2018.

Fundamental determinant **Biodegradable fraction: 40–70 %**

(B) CALORIFIC VALUE

- Indian waste has low calorific value and high moisture content.
- The calorific value of garbage in Sweden, Norway, Germany and USA ranges between 1,900-3800 kcal/kg—in comparison the calorific value of waste in India is 1,411–2,150 kcal/kg- **too low to burn**

	Net calorific value (kcal/kg)			Moisture (%)		
	Min	Max	Mean	Min	Max	Mean
Capitals with population less than 1 lakh	1,234	3,414	2,149	42	65	52
Capitals with population of 1–5 lakh	591	3,766	2,162	24	63	50
Cities with population of 5–10 lakh	591	2,391	1,481	17	64	48
Cities with population of 10–20 lakh	520	2,762	1,411	25	65	41
Cities with population above 20 lakh	834	2,632	1,772	21	63	47

Source: CPCB-NEERI, 2006,

Affordability of WTE

- Capital cost (Major affordability factor)
- MNRE offers financial incentives by way of interest subsidy in order to reduce the rate of interest to 7.5 per cent
- Tiping fee to the Concessionaire
- Land at nominal fee and long term lease
- Incentives for preparing Techno-economic Feasibility Reports and for promotion, coordination and monitoring of projects
- Concessional custom duty on imported parts
- **These subsidies/incentives take care of about 35 per cent of the project cost. Yet, the cost of electricity produced from these plants is the most expensive**
- Compared to Rs 3–4 per kWh from coal and solar plants, WTE plants sell electricity at about Rs 7/kWh. Reluctance of Discoms in buying such expensive electricity

Environmental, Health and Social Costs

- Not able to meet environmental norms due to highly variable and poor quality of waste
- Housekeeping is extremely challenging, leading to odour and visual pollution
- WTE plants reject about 30–40 per cent of the waste, which is dumped because it is either inert or too poor in quality to be combustible
- High bottom ash due to mass burning (MB)

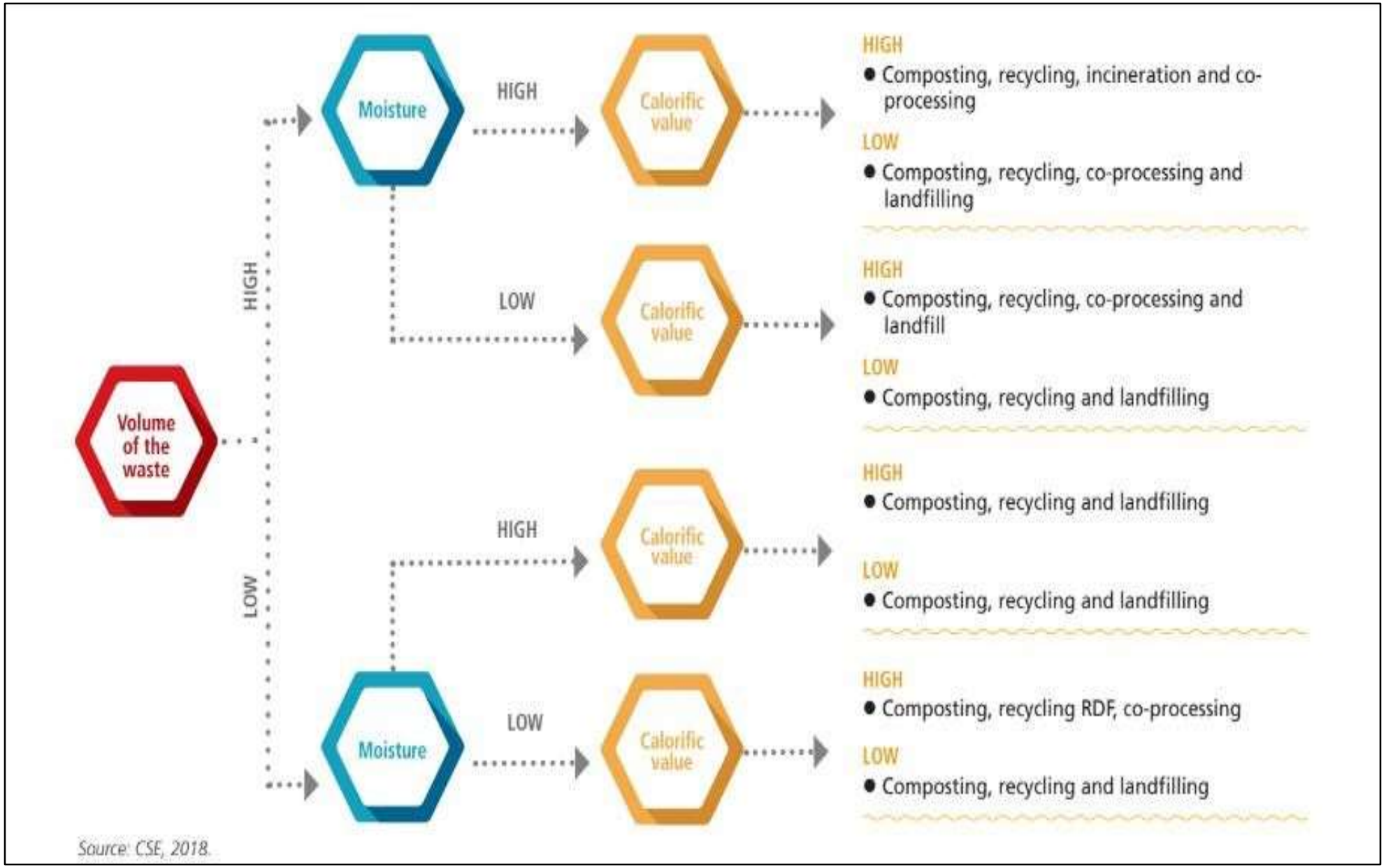
Global Experience

- **W-T-E works** if waste is segregated so that fuel generated is of high quality and plants can get paid for energy
- **W-T-E works** if emission standards are stringent; monitoring systems are credible so that plants do not pollute (***more the unmixed waste, more stringent the standards need to be and higher the cost of plant***)

What to Burn

- Only segregated non-recyclable high calorific waste be sent to WTE plants
- Of the 55 Million T of MSW generated every year, only about 15 per cent can be classified as non-biodegradable, non-recyclable, high-calorific-value waste. About **30,000 TPD** of waste which can be fed to the WTE plant
- But the total waste treatment capacity for 48 existing, under-construction and proposed WTE plants is over 37,000 TPD
- Choice of technology—whether waste will be burned or recycled or composted—depends on the quality of waste
- WTE can only be the option for fraction of waste that cannot be managed by other technologies

Rationale for WTE



Way Ahead

- SUSTAINABLE WASTE MANAGEMENT
- IMPLEMENT EPR AND CIRCULAR ECONOMY
- CO-PROCESSING BEFORE WTE
- WTE TO BE the LAST OPTION, NOT THE FIRST SOLUTION

Research and Publications

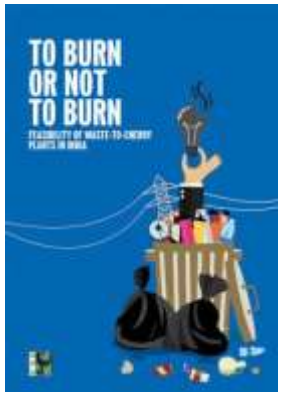
- **To burn or not to burn (2018):** Feasibility of waste-to-energy plants in India and recommendations on viability of this technology and roadmap to sustainable waste management.

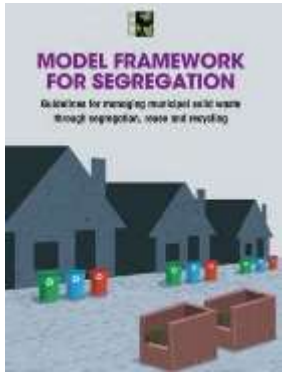
- **Charting the future of city compost (2018):** Analyses the gaps in the existing composting policy of India and suggests changes to strengthen the current marketing mechanisms and policy.

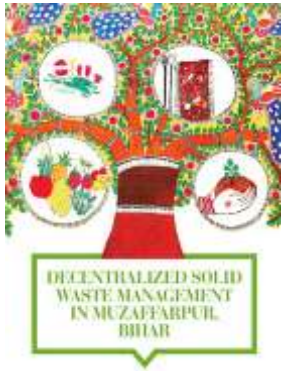
- **Model framework for segregation (2017):** Guidelines help cities develop their waste management frameworks with focus on segregation and resource recovery.

- **Action plan for solid waste management, Delhi (2017):** CSE was invited to be a member of a committee to prepare an action plan for SWM for Delhi. The Delhi High Court has asked all MCDs to adopt this. CSE also worked in drafting the byelaws on SWM for Delhi.

- **Advocacy, information dissemination:** Research/policy papers, extensive writing and documentation in Down to Earth magazine, as well as creating multimedia videos that have proved popular.







Thank You

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