Waste To Energy

- Mumbai Region (DATA Collection)

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Facts Regarding Waste Collection

In this project, a case study of Mumbai Waste Management was considered

- Mumbai Produces about 9000+ TPD (tonnes per day)
- Total area of waste collection is about 437 sq. km!
- Supply Chain - Total 1185 Vehicles for collecting waste (250 - MCGM, 935 Private)

Waste collector in Mumbai with conventional green symbol

Waste Allocation (Region Wise)

- There are in total 4 sites in Mumbai where waste is collected
- These are - Gorai (20 ha) , Mulund (20 ha), Deonar (132 ha) and newly opened Kanjurmarg (141.7 ha)
- Out of these sites, currently only two are operational and other two are closed where bioreclamation and waste to energy projects are ongoing.
- The average height of waste is : Gorai (30 m), Mulund (16 m), Deonar (18 m)

This image shows heaps of waste formed at Deonar Dumping Ground

* ha stands for hectare

Existing Plans

Gorai	Operational since 1972. Currently closed with HDPE (high density polyethylene on top of the waste) CH4 formed inside this layer was burned for obtaining carbon credit
Mulund	Operational since 1968. Currently closed for bio-reclamation process
Kanjurmarg	Operational since 2003. Currently fully functional and only fully functional site in Mumbai
Deonar	Operational since 1927. Currently partially closed and will be considered for waste to energy process

Components in Waste

- Municipal waste by definition consists of household waste, street sweeping waste such as plastic, paper, metal, glasses, rags, vegetable waste etc.
- But dumping sites in mumbai also receives waste related to commercial waste, biomedical waste, hazardous waste, debris/construction etc.
- The above waste are treated carefully at Mumbai Dumping Site.
- Waste such as metals, e-waste, paper is generally segregated by rag-pickers, raddiwala, etc.
- But, we will not consider this in modelling of waste to energy since it goes through different process.
- For modelling, only data for Deonar dumping ground is used since this site is considered by government for waste to energy project

Waste Characteristics

Following are the waste characteristics (on an average) at whole **Mumbai**:

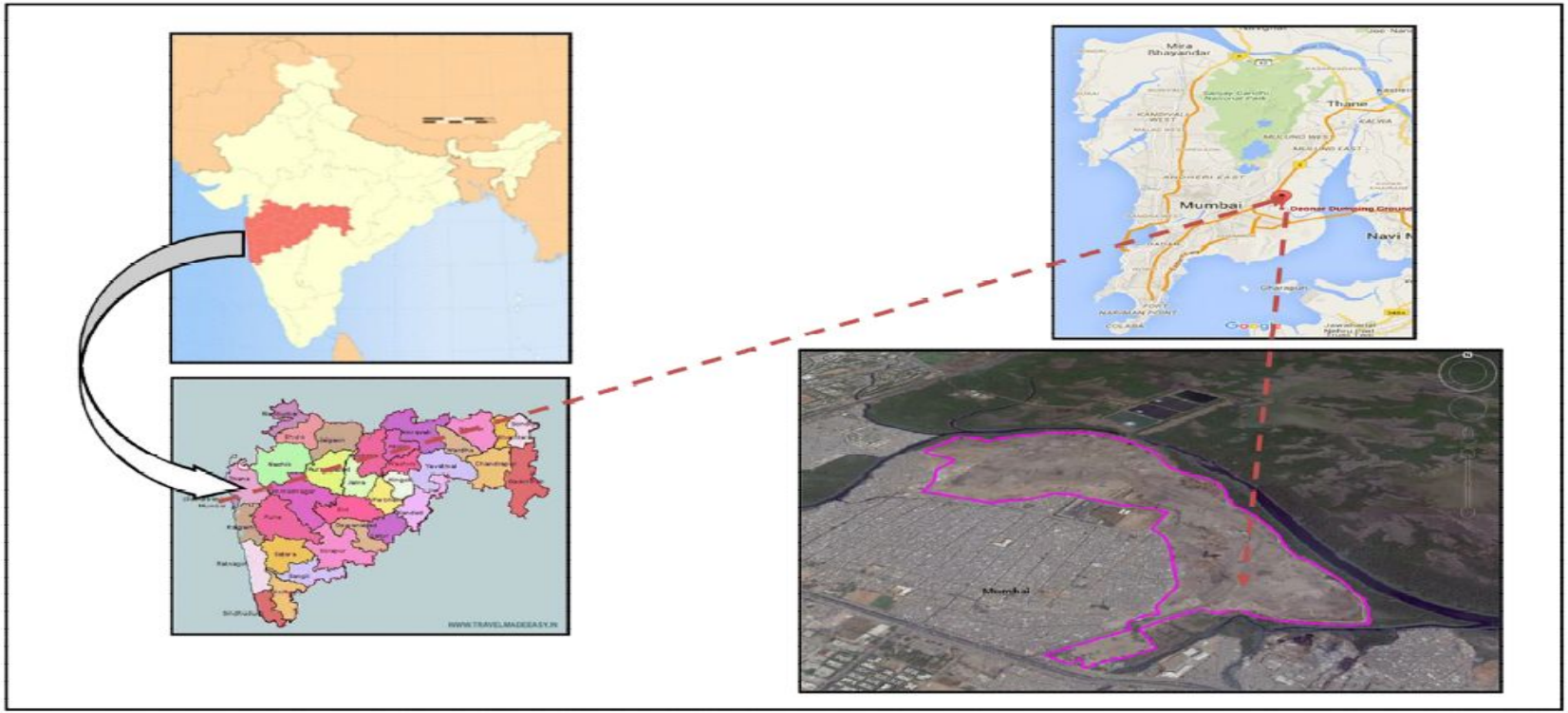
- High amount of biodegradable waste (>50%)
- Recyclable Materials (18.6%)
- Inerts (12.5%)
- High Moisture - 50% in dry period , 65% in monsoon
- Low calorific value (below 1000 KCal/kg)

Waste Characteristics (Contd)

The waste characteristics element-wise/ component-wise is as follows at **Deonar dumping site**:

Parameters	Max.	Min.	Avg.
Moisture content (%)	79.08	65.48	72.69
Total solids (%)	34.52	20.92	27.31
Loss on Ignition (%)	86.68	55	76.85
Ash content (%)	45.01	13.32	23.15
Carbon (%)	50.8	31.9	44.58
Calorific value (kcal/kg)	4036	3798	3930.77
Nitrogen (%)	2.4	0.94	1.8
C/N Ratio	35.55	20.84	26.63
Sulphur	4.98	1.96	2.8
Phosphorous	2.21	0.75	1.26
Potassium	1.29	0.41	0.77

Location of Deonar Dumping Site



Deonar- Process Description

- 4700 TPD of waste transportation occurs at Deonar dumping site daily.
- Government is planning to treat 600 TPD waste through ‘waste to energy’ at this location.
- The waste considered for ‘waste to energy’ is wet waste containing waste from wastes from fruits and vegetable markets, meat and fish markets, horticulture waste from parks and gardens
- Government is also planning for door-to-door collection of separate biodegradable waste.

Modelling - Basis

- MSW is converted to energy using Anaerobic Digestion method in which biogas is generated which is further combusted to generate energy.
- Energy content of biogas is directly dependent on its CH_4 (methane) content.
- Assumptions -

    - It is assumed that waste does not contain any hospital waste or e-waste

    - It is assumed that it does not contain any heavy metals

    - The waste quality is taken on an average

- Methane yield for individual digester can be approximated from a CSTR system.

Parameters Considered

- Q_B - quantity of biodegradable
- Q_R - quantity of recyclables
- Q_I - quantity of inerts
- m_w - moisture content
- m_a - ash content
- HRT - hydraulic retention time
- k - anaerobic reaction constant

More parameters will be considered and explained in detail 3rd PPT

Conclusion

- Data collected will be used for further analysis
- Modelling optimization will be done through MATLAB
- In presentation 3, modelling and results will be discussed.

References

- MUNICIPAL CORPORATION OF GREATER MUMBAI, Development of 600 TPD Waste to Energy Project at Deonar, Mumbai on Design, Build and Operate (DBO) basis, Volume 2 – Employer's Requirements
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Thank You