Proposed Integrated Landfill & Resource Recovery Facility in the Khulna City Corporation, Bangladesh.

January 2022

Outline of the Presentation

- ADB's major involvement in waste management
- Overview of the KCC facility
- Landfill design parameters
- Design considerations
- Capacity of the facility
- Components of the facility

ADB's Major Involvement in Waste Management

- **Integrated Landfill and Resource Recovery Facility in Jashore Pourashava under City Region Development Project**

  - Transformed an uncontrolled dump site to a resource recovery site;
  - Handles 35-42 tons of waste per day from 60,000 household.
  - Produces 2 tons of compost per day;
  - Generates 192 kWh of electricity from biogas;
  - Consists of (i) landfill cells; (ii) compost plant; (iii) pretreatment plant; (iv) fecal sludge management facility; (v) wastewater treatment facility; (vi) biogas plant; etc.

ADB's Major Involvement in Waste Management (contd.)

- **SLF and FSM under Third Urban Governance & Infrastructure Improvement Project**

  - 28 sites are under construction in 28 municipalities;
  - Total waste handling capacity of 300 tons per day;
  - Waste collection from 130,000 households at least twice a week;
  - Reduction of 15,000 tons of CO_2 per year (estimated)

Overview of the Proposed Khulna City Corporation (KCC) facility

- An Integrated Landfill & Resource Recovery Facility to be built in KCC under Second City Region Development Project (CRDP-2);
- 40-50% of 300 tons of waste generated daily by 1 million people remain uncollected;
- Only 10% of households are covered by NGO-led waste collection services;
- 240,000 households 70% of the total households under Khulna City Corporation will directly benefit.

Overview of the Proposed KCC facility (contd.)

- Existing landfill sites in KCC

Characteristics	Rajbandh-I	Rajbandh-2	Solua
Year	1961	2002	2011
Area (acres)	20	5	17
Estimated capacity	Not known	180 m^3/day	-
Types of wastes disposed	All types	FS and medical	MSW
Distance from city center (km)	7	8	15
Dumping practice	Open	Open	Landfill and RR
Segregation facilities	Partially	No	Proposed
Wastes disposed (tons/day)	315 tons/day	2-3 tons/day	Proposed

Overview of the Proposed KCC Facility (contd.)

- Existing landfill sites

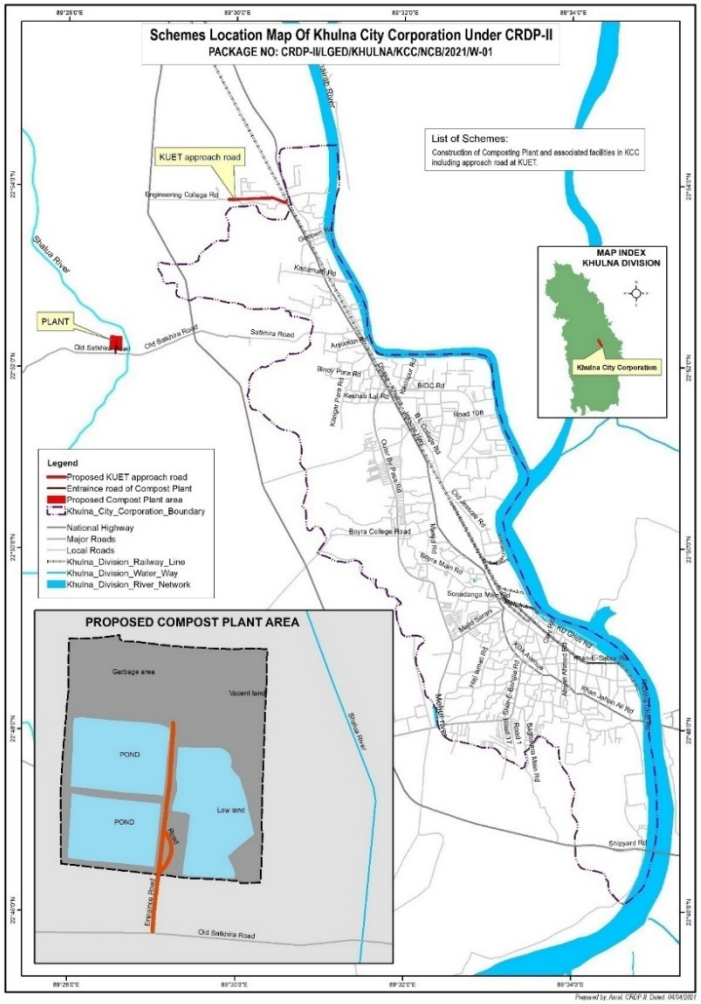
Overview of the Proposed KCC Facility (contd.)

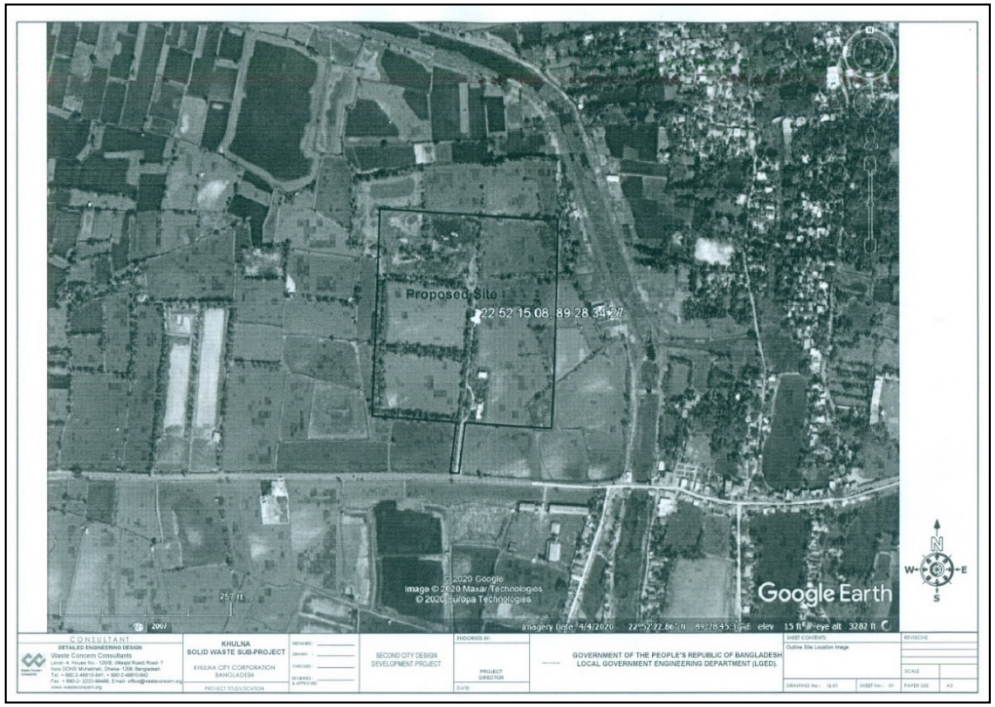
- Complied with relevant laws and policies

  - Environment Conservation Act, 1995
  - National Sanitation Strategy, 2005
  - 8th Five Year Plan;
  - Draft Final Solid Waste Management Rules, 2020;
  - Single Use Plastic Management Work Plan, 2021;
  - Nationally Determined Contribution (NDC), 2015.
  - Others

Overview of the Proposed KCC Facility (contd.)

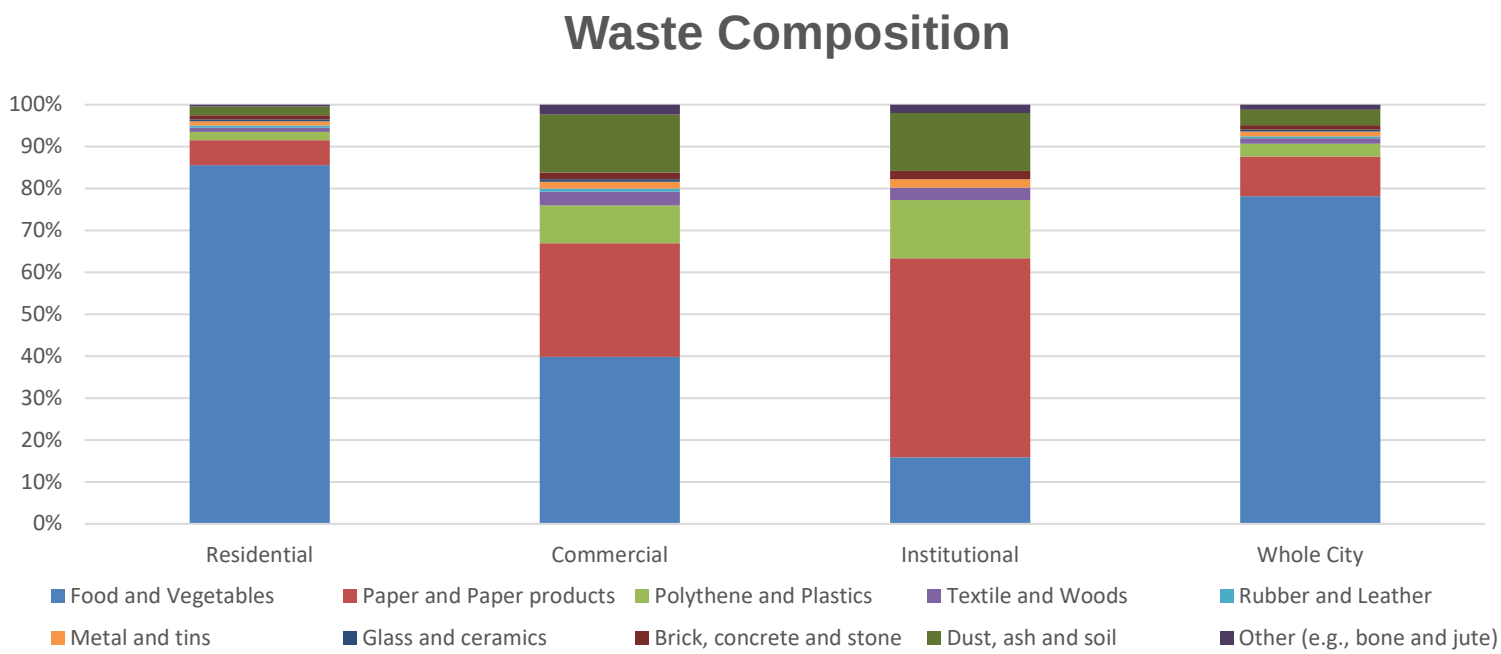
- Location of the site





Design Parameters

- Population: 839,408 (2021) to 1,25,1172 (2041)
- Waste generation rate: 0.33 kg/cap/day (1% increase/year)
- Waste collection rate: 80% from 2026-2041
- Recycling Rate: 32% up-to 2041; 40% from 2041 onwards
- Average disposal: 375 tons/day
- Landfill density: 1,100 kg/m^3



Design Considerations

- Landfill life: 20 years
- Individual cell life: 5 to 8 years
- Geology: the foundation will have sufficient bearing capacity
- Hydrology: adequate drainage facility considering local flooding
- Cover materials: to be sourced from excavation
- Seepage prevention: 2 mm HDPE liner.

Design Considerations (contd.)

- Leachate treatment
  - Aeration pond: retention time 1 day at maximum flow; volume 200 m^3
  - Facultative pond: retention time 2 days at maximum flow; volume 578 m^3
  - Polishing pond: retention time 1 day at maximum flow; volume: 155 m^3

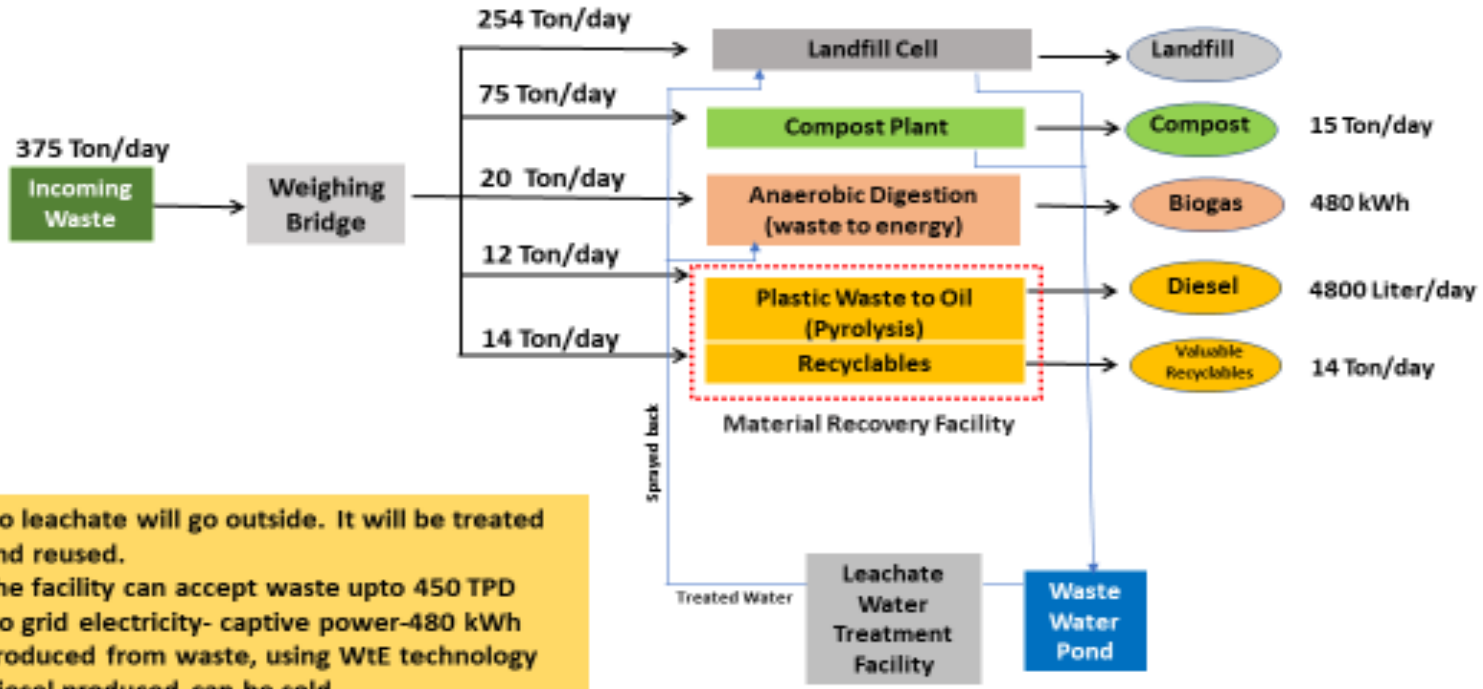
Design Considerations (contd.)

- **Consideration for climate resilience**

  - Ground level of all construction above the flood level;
  - Embankments to be built around the landfill;
  - Structures are to withstand storms up to 260 km/hr;
  - Concrete roads to avoid waste penetration in the ground;
  - Leachate collection and treatment ponds can take additional wastewater in case of extreme events;
  - The highest rainfall amount in the last 10 years has been considered;
  - The landfill site shall have HDPE lining and clay layer to avoid percolation of leachate water into the groundwater;
  - To save the landfill area, between 10-15% of the inorganic waste shall be recycled.

Capacity of the Facility

- Balance of waste



- No leachate will go outside. It will be treated and reused.
- The facility can accept waste upto 450 TPD
- No grid electricity- captive power-480 kWh produced from waste, using WtE technology
- Diesel produced can be sold
- Compost produced can be sold
- Design life of the landfill cells upto 2041

Components of the Facility

Embankment 16

Landfill Cell 15

Compost Plant 5

4

Weighing Bridge 2

3

Entrance Gate and Security Guard Room 1

16 Embankment

7 Plastic to Oil

6 Material Recovery Facility

8 Leachate Treatment Facility

9 Substation and Generator Room

10 Biogas Plant

11 Storage Balloon and Generator room

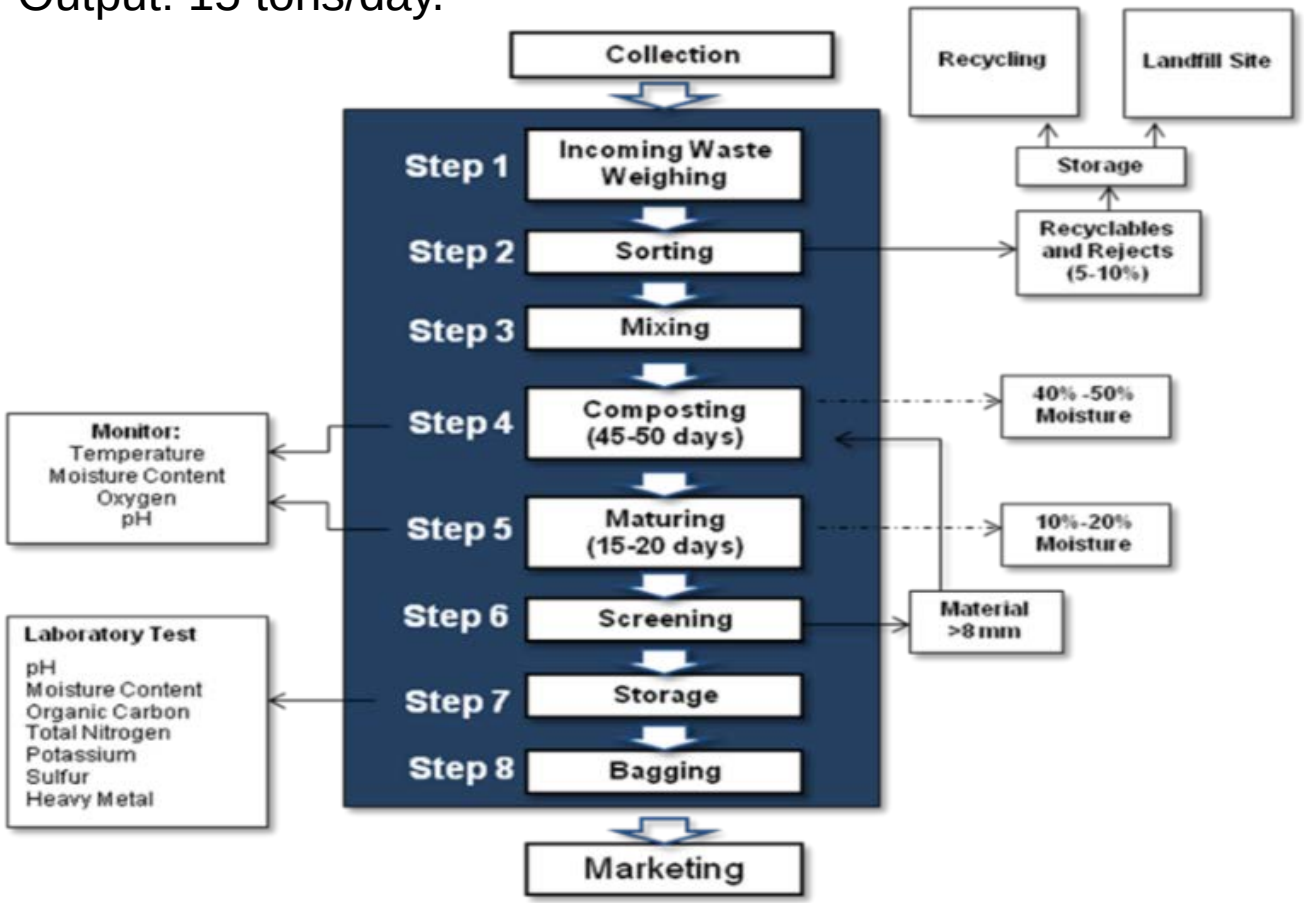
12 Pond

13 Workshop, Electrical, Mechanical Room

14 Vehicle Washing Ramp

Components of the Facility (contd.)

- Compost plants
  - Capacity: 75 tons/day
  - Output: 15 tons/day.



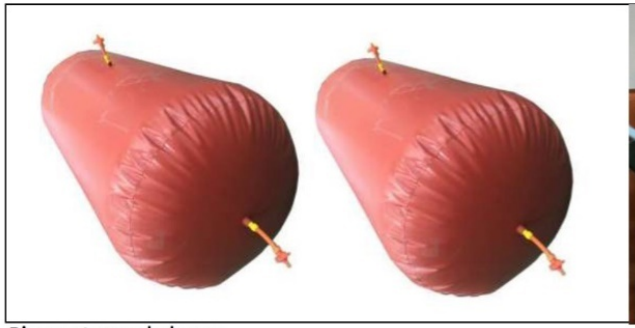
Components of the Facility (contd.)

- Biogas plant
  - Capacity (input organic waste): 20 tons/day
  - Output: 480 kWh.


Aerial View of the biogas plant


Cross sectional view of the biogas digester


Aerial View of the biogas plant

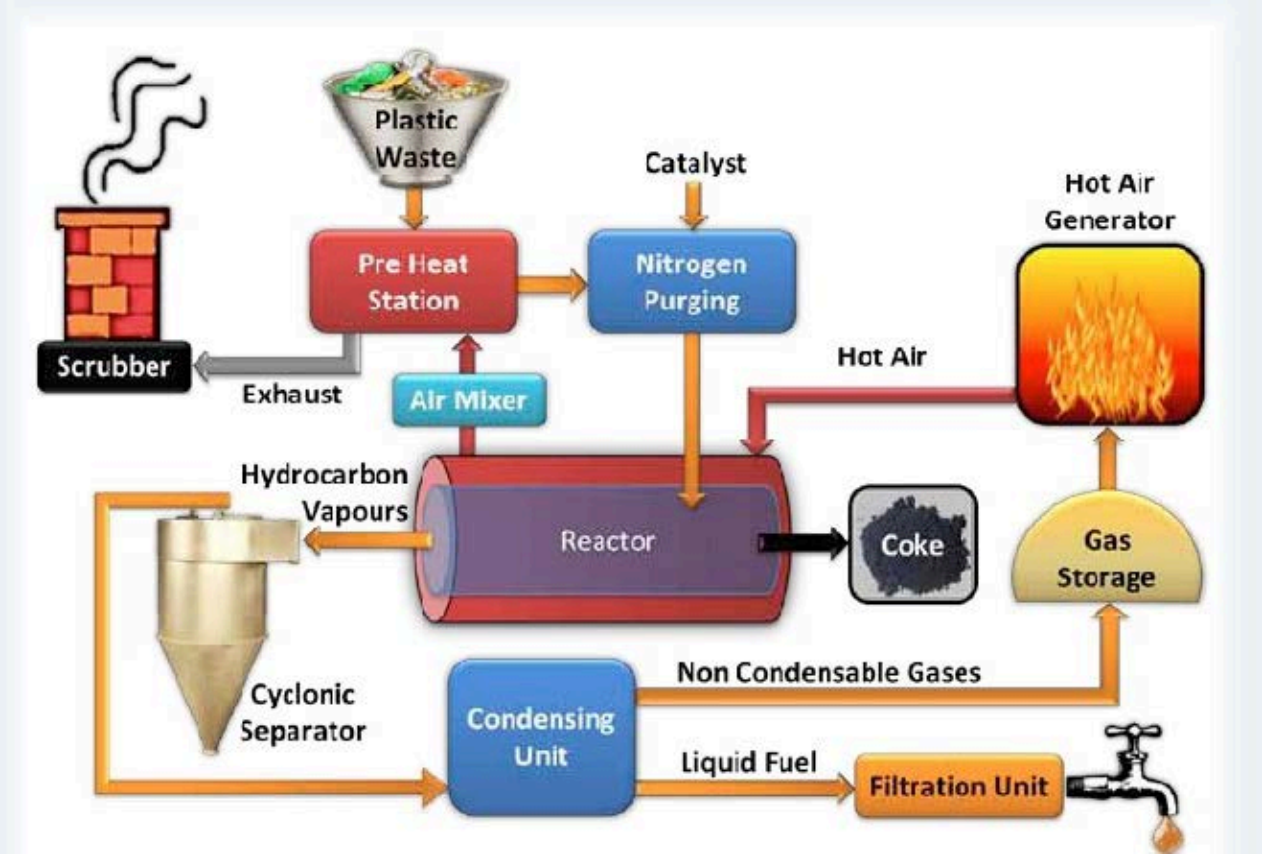

Biogas storage baloons


Control room of biogas generator


Biogas Generator

Components of the Facility (contd.)

- Waste to oil
  - Capacity: 12 tons/day
  - Output (diesel): 4,800 liter/day



Thank you