Waste-to-Energy Projects

Case Studies from Pakistan

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Case Study

Khairpur Waste-to-Power Project

Project Overview

- Khairpur city is the capital of the Khairpur District in Sindh Province, Pakistan with an area of 15,910 square km.
- The economy of Khairpur district is purely based on agriculture, and the city is renowned as “the city of date palms”.
- Biggest dates market in Asia.
- Khairpur city is also the home to Pakistan’s first Special Economic Zone.
- **Project Scope:** In order to supply electric power to all the industries on dedicated, reliable and efficient basis, Government of Sindh has planned to establish a 20 MW power generation facility at Khairpur Special Economic Zone “KSEZ” under public-private partnership mode

Waste Sources and Potential





Agricultural Waste: The economy of the Khairpur District is fully dependent on the production of agricultural products which is evident by the fact that 80% of the population is involved in the agriculture business.

- The potential of using agricultural waste (bio-mass) combined with Municipal Solid Waste presents the best solution for implementing the waste-to-energy project.

- A study conducted at the Khairpur district and its adjoining areas indicates that the available amount of bio-mass is over 9 times the quantity required to operate a 20 MW power plant.

- The agricultural waste available in the district includes Cotton Stalk, Rice Husk, Cane Trash, Bagasse, Dates and Banana Chips. A weighted average of the calorific value of the entire Bio Mass has been worked out in the feasibility study and it comes out to be 3,015.88 kCal/kg

Project Structure





Financial Structure	
Commercial Loan	75%
GoS Equity	12%
Private Party's Equity	13%

Terms for Private Partner
Collection of the agricultural waste/municipal solid waste from the dedicated dumpsite and other areas in the district
Construction, Operation and Maintenance of 20MW Power Plant
Electricity generated by the Power Plant will be sold to the industrial units operating in KSEZ

Project Re-Structuring

Terms for Private Partner For Waste Collection & Management Project

Collection of the agricultural waste/municipal solid waste from the dedicated dumpsite and other areas in the district and deliver the same waste to Waste-to- Power Project on a pre-specified price

Terms for Private Partner For Waste-to-Power Project

Construction, Operation and Maintenance of 20MW Power Plant

Electricity generated by the Power Plant will be sold to the industrial units operating in KSEZ

Case Study
Khairpur Waste-to-Power Project

Lessons Learned

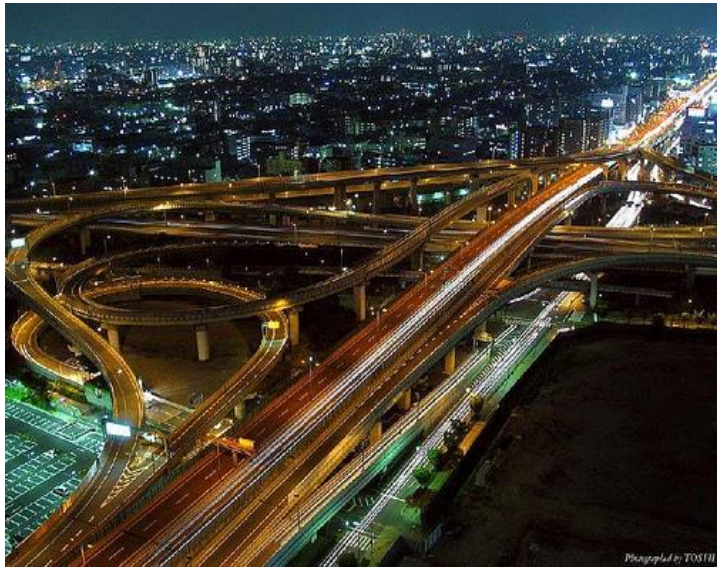
- ✓ Importance of Waste Management System
- ✓ Waste pricing as a feedstock
- ✓ Properly structured project which covers both the demand side and supply side of the Project

Case Study

Karachi Waste-to-Energy Project

Karachi – an international mega-city full of potential

- One of the world's 29 mega-cities along with London, New York, Paris and Tokyo
- Pakistan's gateway to the world
- Pakistan's manufacturing and finance epi- center
- The largest city of the country with a population over 22 million.
- Karachi is the center of immigration with no ethnic group predominate the city; all cultural and social activities essentially revolve around the city
- Karachi is the 3rd-largest city in the world by population within city limits, the 7th largest urban agglomeration in the world, the largest city in the Muslim world.



Waste Sources and Potential

Municipal Solid Waste
Household / Industrial

Total generation 13,500 TPD

Recycled
2,275 TPD

Landfill
4,000 TPD

7,225 TPD
Left on street corners
Left in open drains, rivers
and suspended to Arabian Sea

Animal Feces

Total generation 6,000 TPD

Landhi Biogas Plant
500 TPD

6,500 TPD
Left in open drains, rivers
and suspended to Arabian Sea

Sewerage / Sludge Waste Water

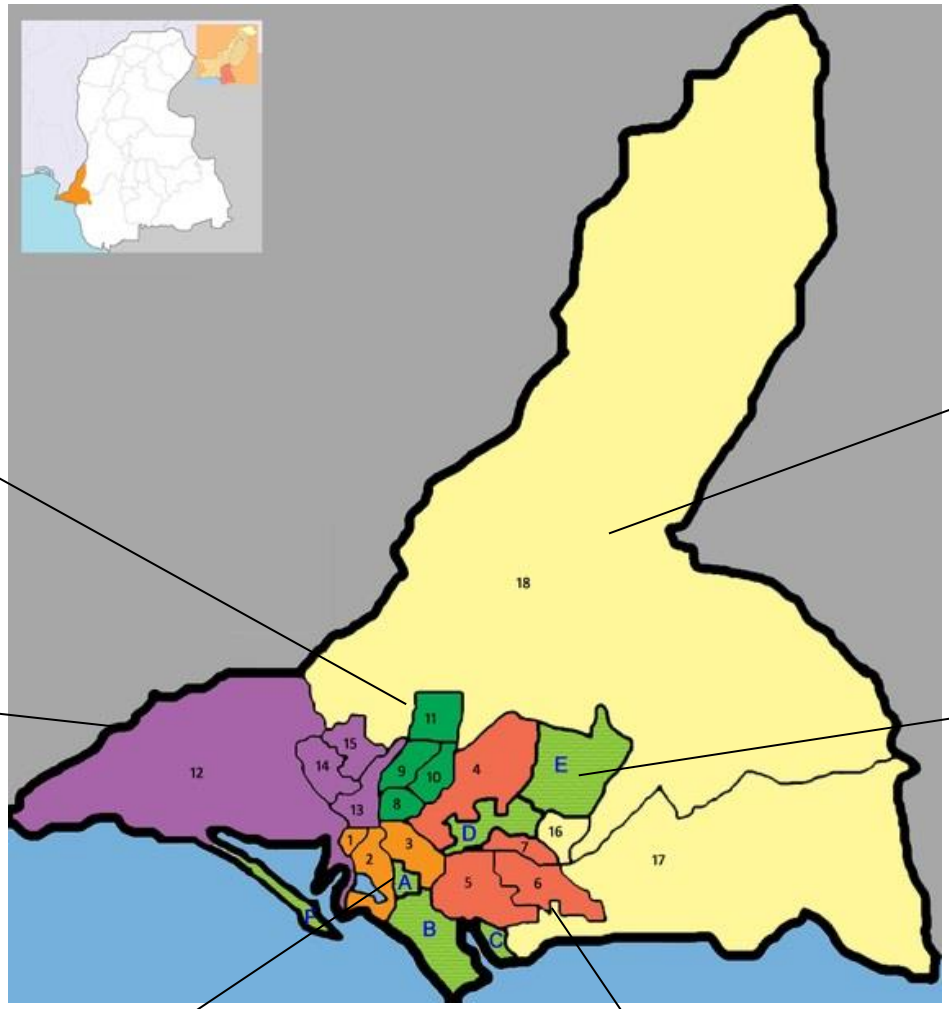
Four Wastewater Treatment Plants
But none are operational

Nearly 400 million gallons per day of untreated waste goes into the Arabian Sea

Karachi – Civic Administration

Sindh Solid Waste Management Board

Karachi Water and Sewerage Board



DMC - Malir

DMC - Central

DMC - West

Cantonments

DMC - South

DMC - East

Neighbourhood Street corner

Drainage canal now comletely filled with waste

Challenges faced

- **Governance Issue:**
  Karachi is the home to every ethnic group in Pakistan and all the political parties present in the country are stakeholders of Karachi. Due to this diverse mix of opinions, the government is unable to bring together all the stakeholders for a single cause.

- **Weak legal, institutional and planning framework:**
  The aforementioned problem of governance is amplified by the lack of clarity of responsibilities among institutions at various levels of government (e.g. Local Government Act and SW Board Act) and lack of systematic planning for entire spectrum of MSW sector

- **Very limited technical and financial resources to modernize and upgrade system:**

Case Study
Karachi Waste-to-Energy Project

Lessons Learned

- ✓ Good Governance and strong institutional framework
- ✓ Strong Waste Management System
- ✓ Properly structured project which covers both the demand side and supply side of the Project