Office of the Principal Scientific Adviser to the Government of India

WASTE TO WEALTH
Swachh Bharat Unnat Bharat

INVEST INDIA
NATIONAL INVESTMENT PROMOTION & FACILITATION AGENCY

DECENTRALISED WASTE MANAGEMENT

TECHNOLOGY PARK

New Jafrabad, East Delhi

Transforming open dumpsites into Integrated Decentralized Waste Management System

Project Background

Solid waste management (SWM) is one of the most pressing development challenges in urban India today. According to estimates, India generates about 62 million tons of municipal solid waste (MSW) annually which is projected to increase to 165 million tons by 2031. The average per capita waste generation is 0.45 kg per day and has been increasing at a rate of 1.3 percent per annum. A large quantity of this waste is dumped in the open or landfills. Various studies have indicated that the unscientific disposal of mixed waste generates harmful gases and leachates causing health and environment hazards. Most Indian cities and their ULBs lack adequate funding, infrastructure, and space for scientific waste disposal, and are unable to setup and operate large scale waste processing and treatment technologies. Further, to store the projected quantity of untreated solid waste, 1,240 hectares of additional land is estimated to be required every year which is a waste of valuable land resource.

Considering the enormity of the urban waste management challenges, it is imperative to identify, test and validate innovative technologies which can not only cost effectively process the massive quantities of fresh waste but also generate valuable resources out of it. With this focus, the Waste to Wealth Mission, one of the nine scientific missions of the Office of the Principal Scientific Adviser to Government of India, in collaboration with East Delhi Municipal Corporation (EDMC), has set up a model Waste to Wealth Technology Park adjacent to 52-cusec drain in Jafrabad, to pilot and validate several technologies for urban solid waste management and to demonstrate conversion of open dumpsites (dhalaos) to decentralized waste processing sites. The EDMC area supports about 23.5% of Delhi's population and generates on an average about 2000 tons of MSW (approx. 30 TPD from each ward) from its total 469 colonies across 64 wards. The Jaffrabad dhalao was receiving 16 TPD of fresh municipal waste earlier and has now been converted to a decentralized waste processing site where 10.5 tons per day of fresh waste equivalent to waste generated by 22,000 persons (28% of an East Delhi ward) shall be treated and processed.

The technologies deployed at this site spread over an area of 1000 square meters, together constitute a system for cleaning of urban drains, automatic segregation of fresh mixed municipal waste, and onsite processing and treatment of the segregated waste fractions. All technologies shall be operated and monitored by the Mission Project Management Unit hosted at Invest India jointly with the technology providers for a test period of one year. After test-period, O&M would be taken up by EDMC for a minimum period of five years.

Project Highlights

10.5
TONS / DAY WASTE PROCESSED

22,000
PERSONS EQUIVALENT WASTE PROCESSED

4.61
CRORES PROJECT COST

5 TECH
4 SOLID WASTE + 1 WASTEWATER

120 KW
POWER REQUIREMENT

3 KLD
SITE WATER REQUIREMENT

1000
SQUARE METERS AREA

Representative Process Flow of Waste Management at Technology Park

Unsegregated Municipal Solid Waste Brought to Technology Park (10 TPD)

Automatic Waste Segregation Unit (10 TPD)

Compost (1 TPD)

Combustibles (2 TPD)

Recyclables (1.5 TPD)

Floating Waste Separated From 52 Cusec drain (0.5 TPD)

Material Recycling Facility

Gasifier (1 TPD)

Plasma Pyrolysis (1 TPD)

Char, Ash

SynGas

Char, Ash

SynGas

Technologies deployed at Waste to Wealth Technology Park

XAPER

Auto segregation of fresh mixed municipal solid waste

Technology Partner	E3 Waste Solutions, Punjab
Capacity	10 tons/day
Project Capex	INR 155 Lacs
Power required	15 kW
Area required	150 sqm.

A 3-in-1 patented technology based on the principle of size separation and Mechanical Biological Treatment (MBT), capable of handling mixed waste, segregated wet waste and segregated non-biodegradable waste. It segregates the mixed waste into compostable, recyclable, combustible and inert fractions, and simultaneously decomposes organic solid waste to bio-dried compostable material within 24 hours. Both wet waste and dry waste slowly circulate in the drum and get segregated. Recyclable waste is disgorged and collected by waste-pickers.

The biodegradable material is slowly churned into fine dry compost due to the air that flows through the drum. This dry compost is ejected through 12-millimetre slats at the end of the drum. Once enough dry compost has been collected, it is put into pits and over 21 days it becomes compost rich in nutrients and minerals. After recovery of compostable and recyclable fractions, only about 30% combustibles of high calorific value are left for diverting to Waste to Energy facilities.

Key Monitoring Parameters: Mixed waste feed, Segregated fractions – combustibles, recyclables, compost (TPD), Power consumption, Waste diverted from landfill

XAPER Unit by E3 Waste Solutions at Waste to Wealth Technology Park

Plasma Pyrolysis

Treatment of mixed MSW to energy and value-added products

Technology Partner	IIT Delhi & BL Engineering, Gujarat
Capacity	1 ton/day
Project Capex	INR 110.5 Lacs
Power required	40 kW
Area required	100 sqm.
Water required	3000 L/day

Plasma Pyrolysis is the thermal disintegration of carbonaceous material into fragments of compounds in an oxygen-starved environment. It provides the most effective medium to completely dissociate all components (organic and inorganic) into their elemental compounds for recovery and recycling. It renders most waste streams, including medical/hospital waste, chemical waste, hazardous waste, and even low-level radioactive waste, completely safe and inert. Plasma gasification of typical hazardous waste generates almost eight to ten times as much energy per unit of waste than the energy required to destroy the waste. The energy generated can be used for heating/ electricity generation and for brick making.

Pilot Installation of Plasma Pyrolysis Unit at Waste to Wealth Technology Park

Key Monitoring Parameters: Waste feed, End products (Syngas, char, ash), Power Consumption, energy generated, pyrolysis/gasification efficiency.

Enviro-RISE R-A1100

Floating waste removal from drains

Technology Partner	DESMI, Denmark
Capacity	500 – 700 kg/day
Project Capex	INR 46 Lacs
Power required	800 W
Area required	30 sqm.

This technology aims at removal of floating waste from the 52-cusec drain flowing adjacent to the site. It can remove 500-700 kg of waste per day depending on the waste-flow in drain at very low power consumption. The system is designed to draw floating debris to the mouth of the EnviRo-Rise with a chain driven finger feeder unit. The feeder unit brings the debris to the conveyor which then lifts the debris out of the water draining away any free water during the time the debris are on the conveyor belt. It serves to contain much of the floating surface debris in the drain while allowing smaller particles and most naturally occurring materials suspended in the water column to pass through. It has manually replaceable nets which can be changed as per requirement. The system is made modular to ensure its ease of shipping, storage, and assembly.

Enviro-Rise Unit by DESMI at 52-cusec drain

Key Monitoring Parameters: Waste collected from drain, Composition of waste collected, Power consumption

Gasifier

Treatment of mixed MSW to energy and value-added products

Technology Partner	GD Environmental Pvt. Ltd., Maharashtra
Capacity	3 Tons/day
Project Capex	INR 13.5 Lacs
Power required	4 kW
Area required	150 sqm.
Water required	100 L/day

A 150 kg/h plant for gasification of landfill waste and hazardous municipal solid waste (including COVID-19 waste), and producing energy in form of hot air. The residual heat is stored in heat cells which can be used for making electricity, air-conditioning, cold storages or making hot water. The remaining ash is turned to fly ash bricks. Compared to incineration which uses excess air, gasification uses partial oxygen or 1/3 to 1/5 of normal content in ambient air. Hence there are less chances of dioxin and furan formation in gasification as the end products are totally different from incineration flue gases.

A continuous online air pollution monitoring unit is installed to alert in case pollution control norms are breached.

Gasifier Unit by GD Environmental at Waste to Wealth Technology Park

Key Monitoring Parameters: Waste feed, End products (Syngas, char, ash), Power consumption, energy generated, pyrolysis/gasification efficiency

JOHKASOU

Packaged wastewater treatment plant

Technology Partner	Daiki Axis India Pvt. Ltd., Delhi
Capacity	5 KLD
Project Capex	INR 9 Lacs
Power required	3 kW
Area required	20 sqm.

This is a packaged sewage treatment technology to meet the operational and non-potable water requirement at the site through treatment, recycling and reuse of wastewater flowing in the 52-cusec drain.

The JOHKASOU Sewage Treatment Plant (STP) is a decentralized biological wastewater treatment system for treating sewage and grey water from built environment. The system can be installed in all built environment to produce odorless and clear treated wastewater from sewage and grey water. The quality of treated waste water from STP meets the standards for discharging treated wastewater into inland surface water. Except the air lift pump, the operation and maintenance of STP is simple and does not require much human intervention. Only the blower requires electricity.

Pilot Installation of Johkahsou Sewage Treatment Plant at Waste to Wealth Technology Park

Key Monitoring Parameters: BOD, COD, Total Suspended Solids, Total Nitrogen, Total coliform

Technology	Technology Partner	Contact Details
Auto Mixed Waste Segregation & In-Situ Vessel Composting	E3 Waste Solutions, Punjab	Ms. Jasmeet Kaur Tel: +91-95011 40057 Email: info@e3wastesolutions.com
Gasifier	GD Environmental Pvt. Ltd., Maharashtra	Mr. Ajit Gadgil Tel: +91-9922752760 Email: contact@gdepl.org
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Johkasou Packaged Sewage Treatment Plant	Daiki Axis India Pvt. Ltd., Delhi	Mr. Kamal Tiwari/ Mr. Sunil Saigal Tel: +91-9810367527 / 9810434380 Email: kamal@daiki-axis.com /sunil-s@daiki-axis.com

For more information on the Technology Park or Waste to Wealth Mission, contact: wastetowealth.team@investindia.org.in or visit our website www.wastetowealth.gov.in

Jafrabad Dhalao before Development of Technology Park

Jafrabad Dhalao after Development of Technology Park

About Waste to Wealth Mission

The Waste to Wealth Mission is one of the nine scientific missions of the Prime Minister's Science, Technology, and Innovation Advisory Council (PMSTIAC), and is spearheaded by the Office of the Principal Scientific Adviser (PSA), Government of India. The Mission aims to identify, test, and validate technologies that recover value from waste. These technologies will be piloted at sites identified across the country in collaboration with urban local bodies, industry, and other partners, to demonstrate solutions for India's critical waste challenges and contribute to conserving, restoring, and enhancing India's land, air, and water resources.

Following are some of the other projects being undertaken by the Mission

1. Cleaning of Barapullah Drain

Barapullah drain, Sun Dial Park, South Delhi

The Mission in collaboration with South Delhi Municipal Corporation (SDMC), has deployed an indigenous amphibious excavator developed by M/s Cleantec Infra Pvt. Ltd. to clean, desilt and remove waste from Barapullah drain (1.2 km stretch in first phase). This technology named Drain Master (DM-80), has been customized considering the limitation of cleaning urban drains (with width more than 7 m) and using external excavator which cannot reach extreme ends of such drains. SDMC has made arrangements to remove the collected waste to avoid waste accumulation at site.

DM-80 installation in Barapullah drain, South Delhi

2. Agri-residue to High Energy Bio-coal

National Agri-Food Biotechnology Institute (NABI), Mohali

A pilot torrefaction plant of 1,000 tons per year capacity based on Swedish technology has been setup for the conversion of agri-waste into high energy bio-coal at National Agri-Food Biotechnology Institute (NABI), Mohali. The project was aimed to resolve the challenges faced by the farmers in handling the enormous quantities of agri-waste (residues), particularly rice straw, through the development of a torrefaction plant for producing a high-energy density material (bio-coal). The produced bio-coal has 30% higher energy density than conventional coal and 90% less emissions. The bio-coal can also be co-fired with conventional coal up to 50% ratio in existing thermal power plants without further modifications in the plant design.

Pilot Torrefaction plant at NABI, Mohali

3. Portable Biomedical Waste Incinerator

Buxar, Bihar/ Faridabad, Haryana

A small-scale forced draft incinerator for biomedical waste made of cotton, plastic, or similar materials, with provision of waste heat recovery has been developed by Ganesh Engineering Works, Buxar. The unit, with a capacity to treat 50 kg/hour of biomedical waste, requires 1 square meter area and only 0.6 kWh electricity for initial ignition of the waste. The unit can be deployed in portable as well as fixed configuration with only one local worker needed for weekly general maintenance.

4. Floating Waste Removal from Water Bodies

AlphaMERS Limited, Bangalore, has developed a floating trash barrier technology that utilizes the natural flow of water to trap plastic along with other forms of solid waste. The technology was selected through the 'Cleaning and Restoring India's Water Bodies Challenge' conducted by the Mission, and potential sites are being identified for its deployment.

5. Greywater Management in Rural Areas

Rajasthan, Karnataka, Uttar Pradesh

The Mission has identified nature-based solutions for greywater management in three villages where currently the untreated greywater is flowing into and polluting nearby water bodies.

6. Swachhta Saarthi Fellowship

The Fellowship is an initiative to recognize students, community workers/self-help groups, and municipal/sanitary workers who are engaged in tackling the enormous challenge of waste management, scientifically and sustainably. The first call of the fellowship received an overwhelming response, with 379 fellows being selected from across 27 states, 6 UTs in India for a period of one year. The next call for applications for the Fellowship Cohort 2022 will be released in January for Category A (High School Students), Category B (College Students and Researchers) and Category C (Community Workers and SHGs).

Decentralised Processing of waste is one of effective solution to manage the rising issue of both Fresh and Legacy waste challenge. Urban Local Bodies need to have such processing sites closer to source of waste generation.

Dr. Parvinder Maini
Scientific Secretary
Office of Principal Scientific Adviser to the Government of India

Sensitizing the community to segregate the waste at source is more important than segregating the waste by a machine.

Dr. Monoranjan Mohanty, FNAAS
Adviser/Scientist 'G'
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Team

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