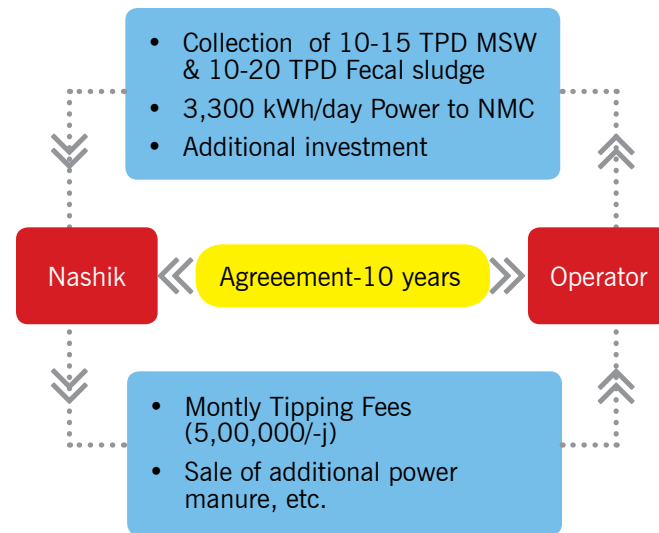


Business Model

The project is implemented in DFBOOT mode. The private player selected in a competitive bidding process is responsible for the design construction and operation and maintenance of the plant for a period of 10 years. The private company is also responsible for assuring the transportation of sufficient waste material to the plant.

Nashik Municipal Corporation provided a capital investment of INR 6.8 crore received through a grant from the German government. The additional capital investment (INR 1.2 crore) cost required is provided by the selected contractor. The monthly investment required from NMC for operation and maintenance and collection and transportation of waste is of INR 5 lakh.

In return the plant operator will guarantee the supply of daily minimum of 3,300 kWh electricity to the Maharashtra Power Grid, which will be accessible for NMC free of cost. Any additional power generated by operator will be a source of additional revenue for the operator. It is a one-stop solution of the Nashik Municipal Corporation since all tasks involved in the process are taken care of by the private operator.



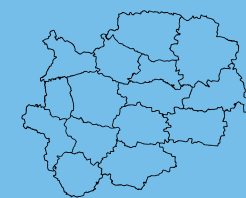
About GIZ

The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is a global service provider in the field of international cooperation for sustainable development with around 16,400 employees. GIZ has over 50 years of experience in a wide variety of areas, including economic development and employment, energy and the environment, and peace and security. Our business volume exceeds two billion euros. As a public-

benefit federal enterprise, GIZ supports the German Government – in particular the Federal Ministry for Economic Cooperation and Development (BMZ) – and public and private sector clients in around 130 countries in achieving their objectives in international cooperation. With this aim, GIZ works together with its partners to develop effective solutions that offer people better prospects and sustainably improve their living conditions.

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This model brings the following advantages for the city of Nashik

- 01 Combined treatment of two major waste sources: Septage & Biodegradable waste
- 02 Electricity bills of the city reduce through generation of energy from renewable source
- 03 Less financial resources required for treatment of waste
- 04 Convincing model for cooperation with the private sector
- 05 City contributes to climate change mitigation

The city of Nashik

With the current economic development and the steep growth of urban population, the quantity of solid waste, wastewater generation and per capita energy consumption is increasing in Indian cities. Like many cities in India, the city of Nashik is also struggling with solid waste management. Therefore, there is an urgent need for an integrated approach to solid waste and wastewater management on the one hand and control of Green House Gas (GHG) emissions on the other hand. The Waste to Energy Project in Nashik is one such solution through co-processing of septage (faecal sludge) with organic solid waste and generating energy to create a sustainable business model.

Even though biomethanation is a well-established process in India, many such plants failed, either because of lack of proper input materials or unviable business models. This project is an attempt to showcase a viable business model for implementation of waste to energy projects through a Public Private Partnership (PPP) and is built on a comprehensive financial and operational model.

The Waste to Energy plant in Nashik

The city of Nashik started construction of the Waste to Energy Plant in 2015 as a Private Public Partnership with Clean and Green Solutions Private Limited. The plant is planned to treat biodegradable waste and blackwater generated in the city and generate energy through biogas for feeding it into the Maharashtra power grid.

The project in Nashik opens possibilities to develop and replicate sustainable Waste to Energy technology with the potential of reducing investment costs for the public sector and to achieve sustainability in operation. The project closes the loops by creating additional benefits like reduction of a carbon footprint and resource efficiency, which for India is of rising economic and environmental importance.

The project was designed and implemented in cooperation with Deutsche Gesellschaft fuer Internationale Zusammenarbeit on behalf of the Federal Ministry of Environment, Nature Conservation, Building and Nuclear Safety (BmUB) of Germany as part of its international climate initiative.

The main objective of this pilot project is to demonstrate the innovative concept of combined treatment of septage and organic solid waste (co-fermentation) of the city of Nashik through a sustainable business model.

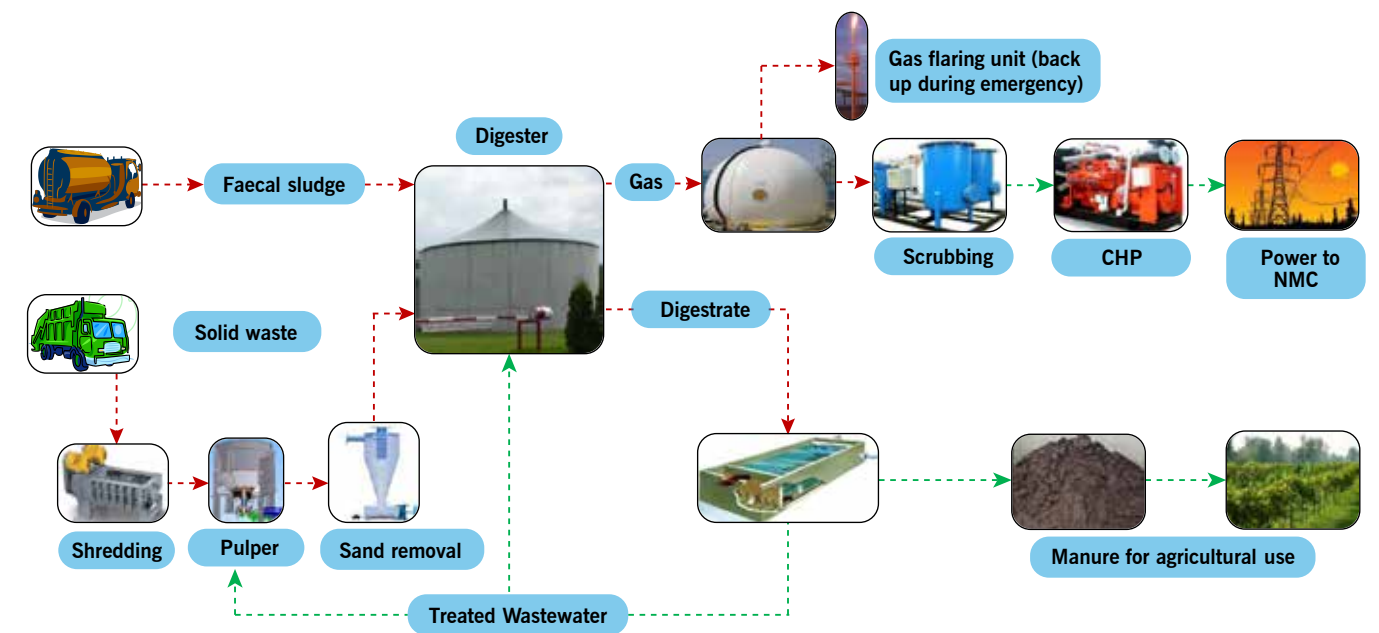
How the plant works: Technical approach

The participatory process ensures involvement of all stakeholders - Nashik Municipal Corporation (NMC), public representatives, the hotel industry, technical experts and engineers.

- Daily 10 to 15 tons of food and vegetable waste from 1,300 restaurants and 10 to 20 tons of septage from 400 community toilets are collected by trucks and delivered to the plant. The organic waste from hotels is segregated at the collection points.
- In a first step, kitchen waste and septage will be treated separately. The kitchen waste will once more be cleared from any foreign matter, fed to a crusher and then mixed with septage to form a slurry. The slurry is continuously agitated and forwarded to the digester. Option of pasteurization of septage using excess heat is kept open considering reuse of treated wastewater from the digester.
- The co-fermentation process takes place in the bio-digester producing approx. 2,500m³ biogas per day.
- After purification and reduction of moisture the gas is sent to a Combined Heat and Power (CHP) unit, where power of minimum 3,300 kWh/day is generated.
- The generated power will be feed into the power grid and treated septage will be used for production of organic fertilizer.
- The hygienically safe and nutrient-rich effluent from the earlier treated septage can be used as a moisturizing agent in the composting process in the existing compost plant, thus closing the loop of recycling and reusing waste.

FACTS & FIGURES

- Treatment of up to **30 tons** of waste daily
- Generation of **3,300 kWh per day** to be fed into Maharashtra power grid
- Capital investment of **INR 8.2 Crore**
- PPP Model with monthly costs for Nashik Municipal Corporation of **5 lakh INR**



Steps towards successful implementation

A systematic approach is followed for the implementation to ensure robust plant design and economic viability in long run. The following studies and scientific assessments were carried out to collect baseline information and define characteristics of feed material. Information and results of the assessments were used for the technical design and developing a sustainable business model.

- 1 Prefeasibility study conducted for selection of city for the implementation of a project based on various parameters e.g. quantities of waste generation, existing system of waste management, city experience in handling similar nature of projects, market for products (power, compost etc.) and provision for feed in tariff in the Maharashtra State Power Grid, etc.
- 2 Feasibility study: The feasibility study projects the operational and economic viability of the project and based on this business model is proposed for implementation considering the local resources and favorable environment in NMC.
- 3 Supportive studies and baseline assessment: Survey of hotels and community toilets for assessing quantity and quality of organic waste, scientific study for deciding right mixture of organic waste and faecal sludge, hydraulic profiling of selected septic tanks, etc. were conducted to ensure continuous supply of input material flows with consistent quality.
- 4 Detailed Project Report (DPR): Information and data collected during surveys and studies were used for preparation of the DPR. Based on outcomes of feasibility it has been decided to implement the project through Design, Finance, Built, Operate and Transfer (DFBOOT) mode to ensure additional investment required and sustained operation in long run.
- 5 Tendering process: A competitive tendering process was followed for selection of the bidder based on lowest service fee and highest guaranteed electricity generation (subject to minimum 1,150 kwh/day); whatever is the best deal for Nashik. The other criterion for selection includes technical know-how, understanding of the concept, experience in implementation and O&M, experienced staff, financial capabilities of the bidder.
- 6 Construction: Construction started in September 2015 and is expected to be completed by August 2016 followed by handholding support to contractor for commissioning of the plant.