On behalf of:

Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety

of the Federal Republic of Germany

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Waste to Energy - Nashik, India

(Co-Fermentation of Kitchen Waste and Fecal Sludge)

A Project under the International Climate Initiative (IKI) of BMUB

Dr. Regina Dube

Senior Advisor and Head

Sustainable Urban Habitat

GIZ - India

INTERNATIONAL CLIMATE INITIATIVE (IKI)

- The International Climate Initiative (IKI) of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) has been financing climate and biodiversity projects in developing and newly industrialising countries since 2008.

- The IKI is a key element of Germany's climate financing and the funding commitments in the framework of the Convention on Biological Diversity.

- The Initiative places clear emphasis on
  - climate change mitigation,
  - adaption to the impacts of climate change and the
  - protection of biological diversity.

- The IKI efforts provide various co-benefits, particularly the improvement of living conditions in partner countries.

Waste to Energy, Nashik : A Pilot Approach
The concept involves co-fermentation of the organic municipal solid waste and fecal sludge

Advantages:

- Treatment of two waste streams (liquid & solid)
- Elaborated business model improves economic feasibility
- Reuse & recover supports the closure of material loops
- Anaerobic digestion ensures scientific treatment fecal sludge
- Contribution to climate protection goals
- Approach for rapidly growing cities.

Waste to energy: Plant Dimensions

Input material

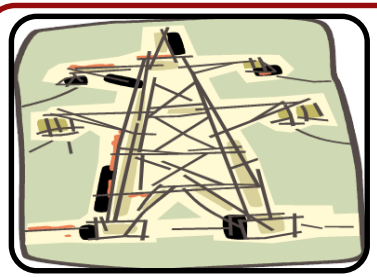
Food waste : 10 to 15 metric tons per day (from 1350 Hotels)

Blackwater : 10 to 20 m³ per day (from 200 community toilets)

Volumes

Digester : 1300 m³ including storage capacity (retention time is 35 days)

Biogas-generation: approx. 2,100 m³/per day



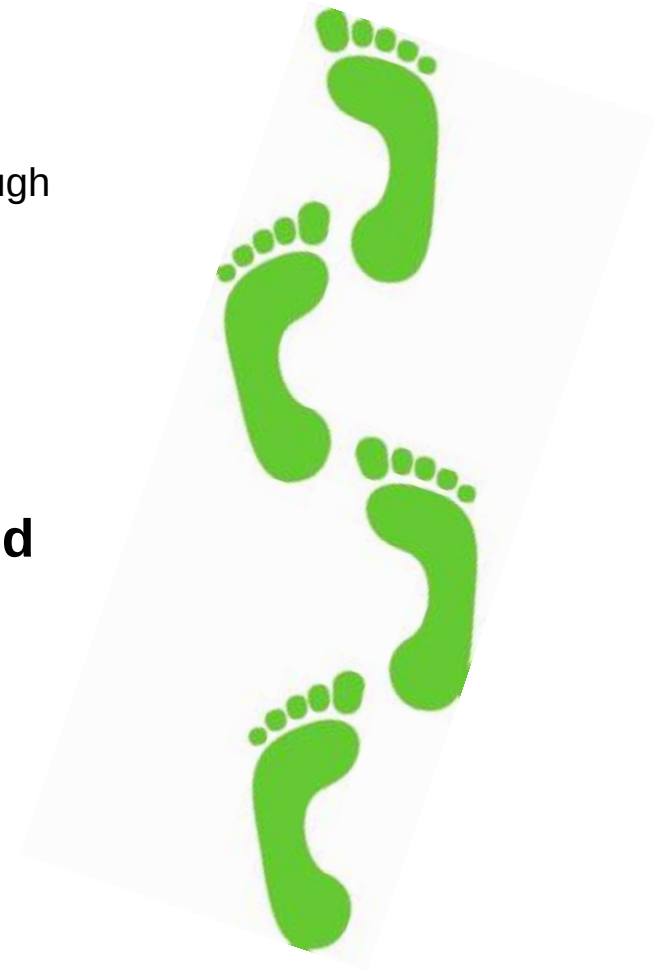
Combined Heat and Power Unit (CHP)

60 kW (24 hours per day) for anaerobic digester-plant

200 kW (15 hours per day) for external use (around 3,000 kWh per day)

Waste to Energy: Steps for Implementation

- **Pre-feasibility study ***
  - Site selection
- Feasibility study
  - **Project design** incl. baseline creation through focused studies/assessments
- DPR preparation
  - Operational model
  - Business model
- **Process negotiation with the partner and political clearances**
- **Tendering process**
- **Construction (current status)**
- Commissioning
- **Monitoring**



*Bold letters refer to time intensive processes

Pre-feasibility study (2010)

Identification of partner city :Three cities selected for study (Delhi, Raipur, Nashik)

Nashik – Key-criteria for selection:

- Secured waste sources
- Well regulated collection system for organic waste from hotels
- Provisions for utilization of the produced energy into the state power grid
- HR capacities of Nashik good
- Market for products – manure
- Availability of compost plant
- Land availability

Nashik
Area: 259 Sq. Km,
Population: 1.48 million (2011)
1.65 million (current)

Feasibility Study (2011)

Operational viability:

- Possibilities for combining liquid and solid waste flows, nutrient, heat and energy recovery
- Secured input of substrate is available throughout the year

Economic viability:

- Readiness of ULB for paying tipping fees to the operator
- Electricity charges in Maharashtra: Rs. 5 per unit (feed in tariff)
- Byelaw to regulate collection of kitchen waste from hotels
- Already existing market for manure

Supportive studies and baseline assessment

- **Study on balance of input and output at different admixtures**
  - Admixture of organic waste to fecal sludge at **1:1.5 and 1:2** ratios gives better biogas production as compared to other ratios.
- **Study for characterization and quantification of organic solid waste generated in commercial establishments**
- **Wastewater study from selected Community Toilet Complexes (CTC) in Nashik:**
  - To assess the hydraulic load of the septic tanks inflow to ensure that sufficient quantity of fecal sludge is available throughout the year.

DPR Preparation (2011)

DPR prepared by an Indian consultant with detailed design, technical specification, operation and maintenance plan, business model, capacity building strategy , environment, health and safety plan.

Project Financials:

Capital Costs

Investment : approx. 1 Million Euro

- Grant will be provided by BMUB through GIZ
- Additional investment (if any) from contractor (as per tender)

Operation and maintenace cost factors

- Collection and transportation
- Maintenance of the plant, staff

Expected Revenue from

- Manure – Rs. 3000 per ton
- Monthly O & M service fee for collection and treatment
- Feed in tariff for excess electricity (INR 5 per unit (6,2 Euro cent))

Tender Process: Qualification criteria

Tender Process

Implementation through Design, Finance, Built, Operate and Transfer (**DFBOOT**) mode

Pre-bid: Company provides securities as per NMC norms

Financial Bid: Bidder is selected based on lowest service fee and highest guaranteed electricity generation (subject to minimum 1150 kwh/d); whatever is the best deal for Nashik

Technical Bid: Technical know-how, understanding of the concept, experience in implementation and O&M, experienced staff, financial capabilities

Sustainable operation of the plant ensured through a provision, stating that services should be **"one – stop – solution" (collection, transportation, processing, marketing and disposal in one hand).**

The Tender results (as proposed by the most competitive bidder)

- **500.000 INR/ month (6250 Euro) service fee for collection, transportation and treatment of organic solid waste and fecal sludge as per tender requirements**

- **Garanteed electrical energy supply of 3300 kWh/day to Nashik (as against minimum requirement of 1150 kWh/ day) worse 5 INR/ kWh (appr. 500.000 INR/ month (6250 Euro))**

- **The gross gain from this contract for Nashik is savings in transport of at least 450 t per month of MSW and 300-600 tons of fecal sludge / month ending on actual quantities and avoided costs for processing of MSW**

- **Bidder gets service fee as well as feed in tariff for excess electricity and can sell manure**

Learnings, opportunities and challenges ahead
The way forward…

- Nashik as location for the pilot was the right decision (tipping fees already known, SWM facility, byelaws etc)
- Handholding of operator and Nashik during construction, commissioning and first operation as well as time and cost management
- Capacity building concept (for both operator and NMC)
- Monitoring (GHG emissions, technical and cost performance)
- Business model seems to be robust but absolute revenue small due to the pilot character of the plant; bidder interested in technology approach
- Integration of learnings into urban sanitation strategies for India

Safe costs by

Thank You……