Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

On behalf of:

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

of the Federal Republic of Germany

Rural-Urban Nexus in Sanitation: Waste to Energy Project – Nashik, India

A Project under the International Climate Initiative (IKI) of Govt. of Germany

Jitendra M Yadav, Technical Expert, GIZ

Elisa Rose, Climate Expert, GIZ

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.

Project Metadata

Energieerzeugung aus Abwasser und organischen Abfällen
BMUB-IKI Projekt, PN 2009.9047.3

-Waste to Energy-

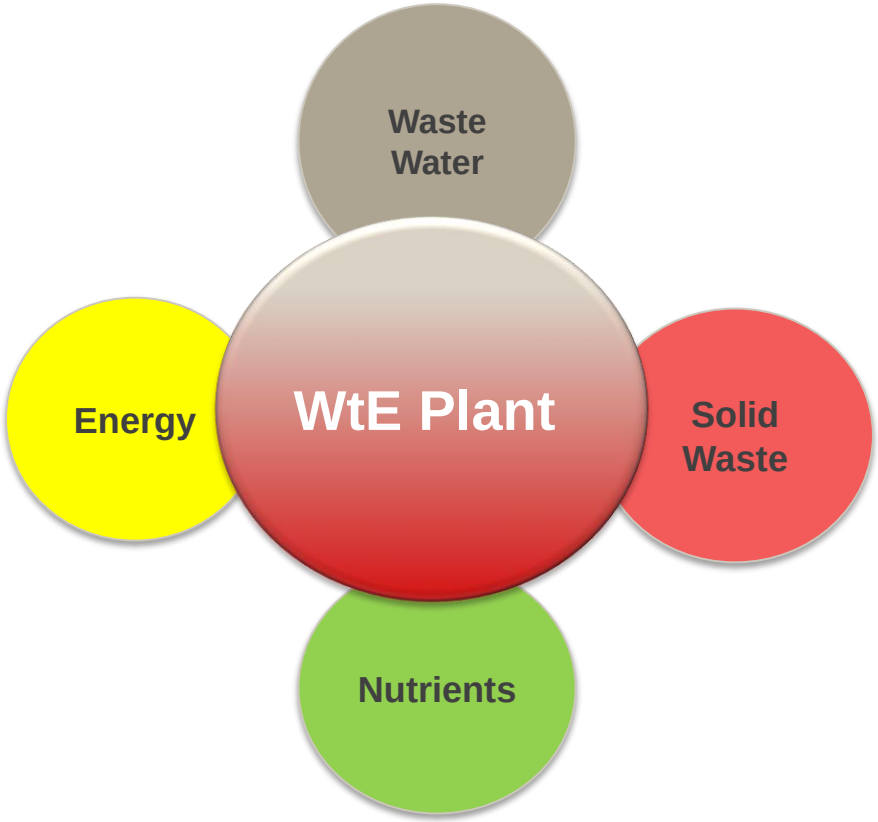
BMUB Signature	**:**	09_I_119_IND_G_Waste to Energy
GIZ Project number	:	2009.9047.3
Project responsible (AV):		Dirk Walther, OE 2100
Project in-charge	**:**	Thomas Kauter-Eby, Jitendra Yadav
Partnerinstitutions:		Ministry of Environment, Forest and Climate Change (MoEFCC), Nashik Municipal Corporation (NMC)
Project volume:		2.03 Mio. EUR

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 of fecal sludge
- Contribution to climate protection goals
- Approach for rapidly growing cities.

Intersectoral approach



Plant Dimensions

Input material

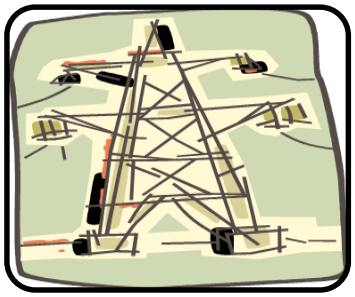
organic waste: 10-15 TPD from restaurants

Septage: 10-20 TPD from community toilets

Volumes

Digester : 1500 m^3

biogas-generation: approx. 2200-2600 m^3/per day

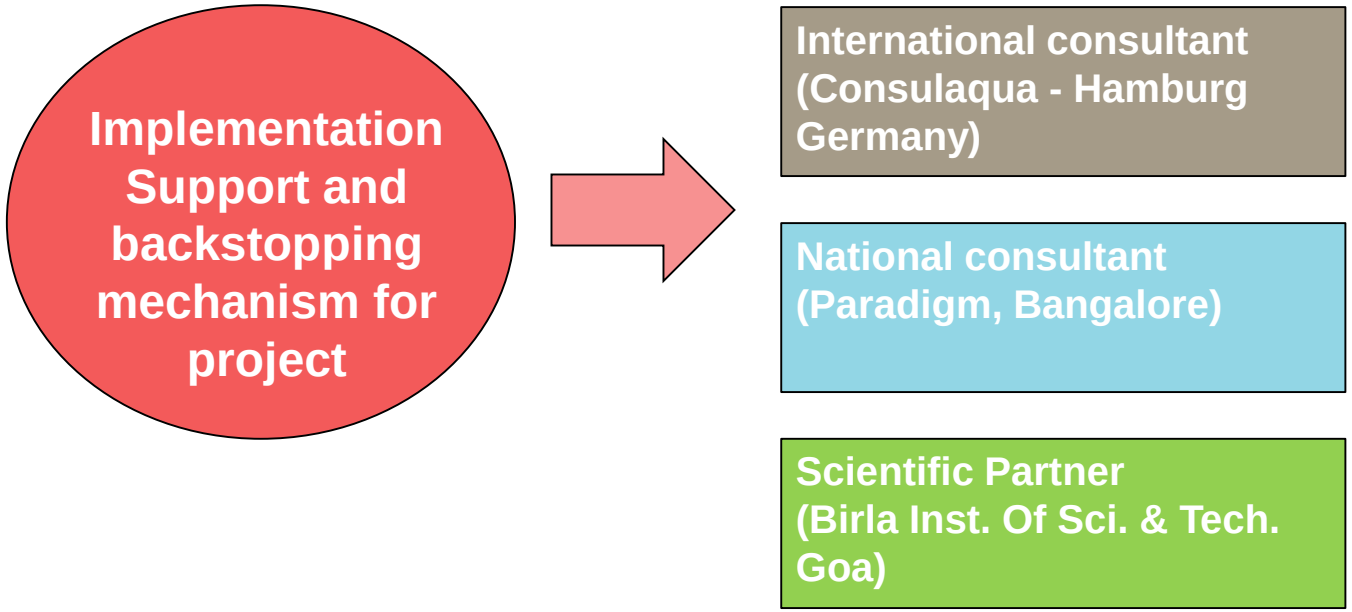


Combined Heat and Power Unit (CHP)

feed into grid 3.300 kWh per day

Excess heat will be used for maintaining temp inside digester

Project Support by GIZ



Steps for Implementation: a time intensive processes

- **Pre-feasibility study**
  Site and Partner selection
- **Feasibility study** - **Project design**
  Baseline creation through focused studies/assessments;
  Setting the stage through identifying boundary conditions
- **Detailed Project Report (DPR) preparation**
  - Operational model
  - Business model
- **Process negotiation with the partner and political clearances**
- **Tendering process** (3 attempts)
- **Construction – 18 month**
- **Commissioning - 2 month**

Feasibility till operation

Supportive studies and baseline assessment (ring-fencing the conceptual approach)

- **Study on biogas generation potential of different mixtures of organic waste and septage**
- **Study for characterization and quantification of organic solid waste generated in commercial establishments**
- **Wastewater study from selected Community Toilet Complexes (CTC) in Nashik**

Tender Process Qualification criteria

Tender Process

DFBOOT mode

Pre-bid: Company provides securities as per NMC norms

Financial Bid: Bidder is selected based on **lowest service fee and 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).**

PPP contract at a glance

Project name	
Technology	**Co-fermentation (Biomethanization process)**
Capacity	**10-15 TPD food waste from restaurants** **10 – 20 TPD septage from community toilets**
Capex Cost	**INR 8.2 Cr./ca. 1.1 Mio EUR (share by contractor 15 %)**
Implementation method	**DFBOOT (Design – Finance - Build – Own – Operate - Transfer)**
Contractor	**M/s VWMSPL, Bangalore**
Expected output	**3.300 KWh of power per day minimum guarantee**
Tipping fees per month	**INR 5 Lakh (30 TPD collection, transportation, operation)**
Concession period	**10 years**

Gross gains for city of Nashik

- **Guaranteed electrical energy supply**
  - approx 100.000 kWh/month equivalent to approx. 7 lakhs Rs. (10 thousand EUR) fixed tariff for power generated 07.04/Rs.unit from city waste

- **Reduced costs for management of waste**
  - saving costs for collection and transport for at least 500 tons of organic waste and 500 tons of septage per month
  - avoiding costs and improved conditions for processing organic waste for alt least 450 tons of MSW

- **Reduced investment costs**
  - Grant is 85% and 15% by contractor

Gross gains for contractor

- **Tipping fee:**
  - Rs. 5 lakhs (7 thousand EUR) per month for collection, transportation and treatment of waste (100% O & M covered in tipping fees)
- **High quality fuel**
  - pre segregated food waste as a efficient and energy rich source for biomethanation process, no long term storage or preprocessing required
- **Excess electricity:**
  - Contractor is free to collect more waste and to generate more energy (feed in to grid)
- **Manure:**
  - Contractor can sell digestate as manure (currently for Compost Rs. 3500/ton subsidy of Rs.1500/ton by central govt.)

Current Status

- Construction and commissioning is Certified by expert consultant
- Streamlining of all plant processes
- Implementation of systems for segregation and collection of waste streams

(2-3 Tons per day)

+

(8-10 Tons per day)

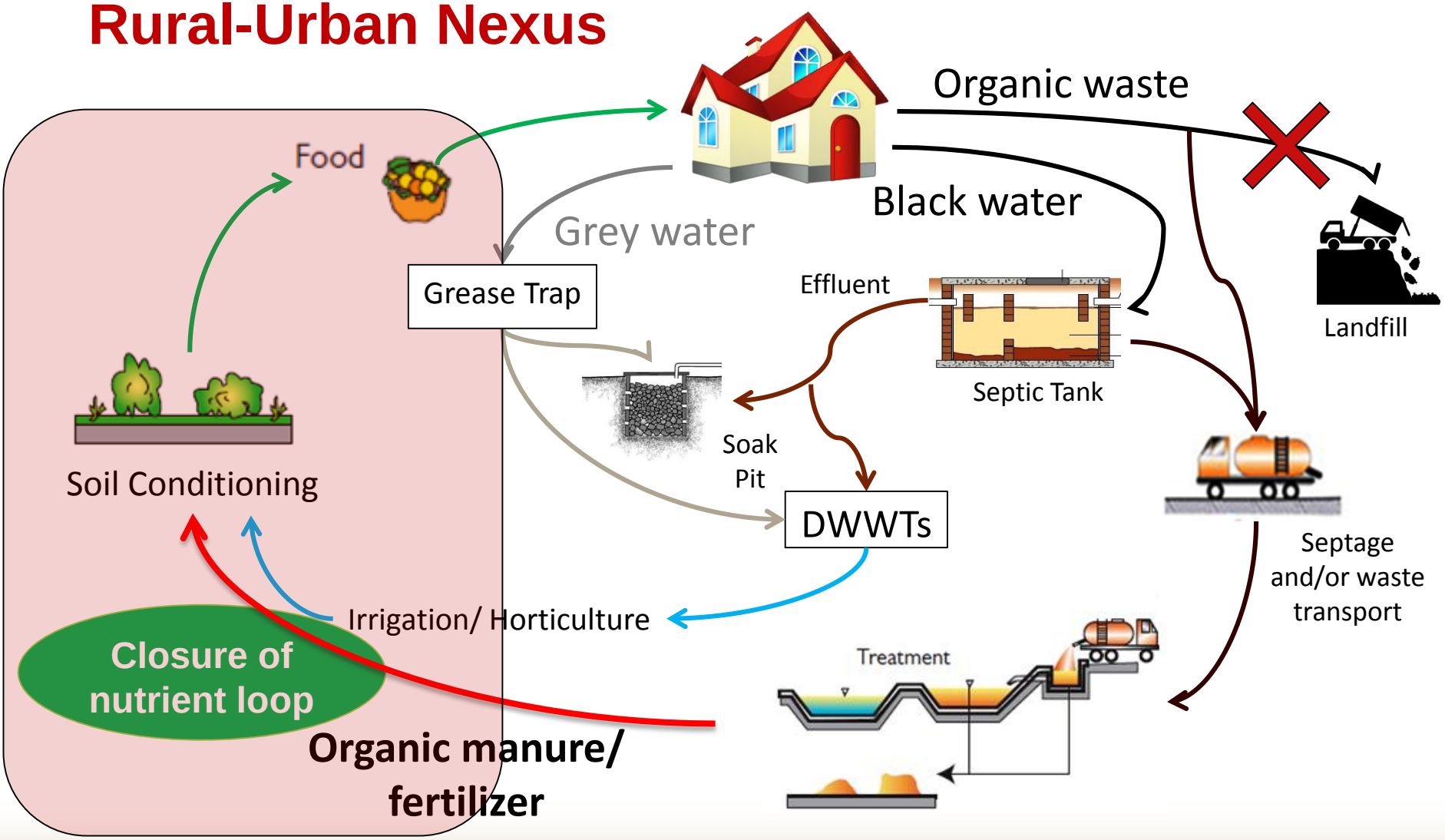
=

(500-700 kWh)

Way forward

- Research ongoing on developing products from effluent and sludge – PROM, Terra Preta, Compost etc. – **Birla Institute, Goa;**
- Reuse sludge from the Biogas reactor in the agriculture (pilot in Dhule district) as soil fertilizer and enhancer **– IWMI develop business model;**
- Both research studies are undertaken under the ProSoil project on soil improvement in agriculture, which is contributing to SEWOH global programme.

Rural-Urban Nexus



Potential products of biodegradable waste treatment from an agricultural view

organic fertilizer / manure:

→ **Compost**
Decomposed organic material (wet waste or wastewater)

→ **Phosphate Rich Organic Material (PROM)**
Mixture of compost and additionally enriched with P

→ **Terra preta (black soil)**
Mixture of organic waste, excreta and charcoal, high carbon content

- **Relevant aspects for farmers:**
  - ✓ Improvements of soil quality and crop productivity
  - ✓ Decrease of soil degradation (erosion, nutrient depletion, salinity,…)
  - ✓ Soil rehabilitation possible
  - ➢ **Long-term yield security**
  - ➢ **Food and income security**

Benefits of the Rural-Urban NEXUS

including the recovery of nutrients and energy

Urban	Rural	Global
- Waste management - Renewable Energy production - Public health - Life quality - Job generation	- Compost/Organic fertilizer - No soil degradation - Long-term yield safety - Income safety - Resilience	- Food security - poverty alleviation - Livelihood conservation - Environmental health - Resource efficiency - **Mitigating GHG** - **Adaptation to Climate Change** - **Natural Carbon sink** - **Biodiversity**

Holistic and Integrated Waste Management

Link of to climate change

Mitigation of GHG

- Reducing CO2, methane and nitrous oxides among others through integrated waste management

Adaptation to Climate Change

- Resource efficiency and resilience through recovery of nutrients and enhancement of soil quality

Conserving natural carbon sinks

- Soil health and carbon storage through closing the carbon cycle and sustainable agricultural practices

Conserving biodiversity

- Ecosystem preservation through holistic waste management and environmental sound farming

44 % of soil in India threatened with degradation

Only multi-sectoral approach is holistic: Sustainable Development Goals!

THANK YOU and

Reduce costs by

- ✓ Avoid organic waste going into the landfills
- ✓ Prevention of uncontrolled CH_4 emissions
- ✓ Energy production
- ✓ CO_2 emission reduction
- ✓ Manure cost
- ✓ Waste processing costs
- ✓ Landfill cost
- ✓ Water Cost
- ✓ Transportation Cost
- ✓ Septage treatment cost
- ✓ Over all Green House Gas reduction
- ✓ Leachate prevention
- ✓ ….

Further information:
www.urbansanitation.org

Contact:
Dirk Walther (MSc./ME),
Project Director
dirk.walther@giz.de

Jitendra Yadav,
Technical Expert
jitendra.yadav@giz.de