



| PAVITR



Natural & Advanced Technologies for Wastewater Treatment and Reuse in India

Duration (so far)

60 months

Contribution

2.5M Euro 7.32M INR

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Scope and Objectives

The project validated, deployed and developed cost-effective & sustainable **solutions to tackle water challenges** and ensure the provision of safe water reuse, rejuvenate water quality of rivers, and restore ecosystems **in India**.

Develop and validate innovative, adapted and cost efficient wastewater & water treatment systems

Enhance natural-based and high innovative water & wastewater treatment technologies

Impel a cross-cutting issue that engages society and promotes gender equality

Develop and demonstrate applications for wastewater treatment and large scale nutrient recovery

Produce marketable secondary raw materials

Asses the technical, financial and environmental sustainability of PAVITR technologies

Provide evidence and policy recommendations

Improve acceptance from final users

Empower and support industries and SMEs in India

Scope and Objectives

Technology Enhancement

- Natural-based treatment technologies
- High-innovative treatment technologies & sensors
- Emerging pollutants removal technology
- Drink Water and Rainwater Harvesting
- Sensors development

Demonstrative Application

- 14 Pilot Systems in five Indian regions
- Treatment capacity to benefit around 50 000 people with sanitation and access to water

Road to the Market

- Training and know-how transfer
- Creating new business opportunities and green jobs
- Future upscaling and multiplying
- Decision support system



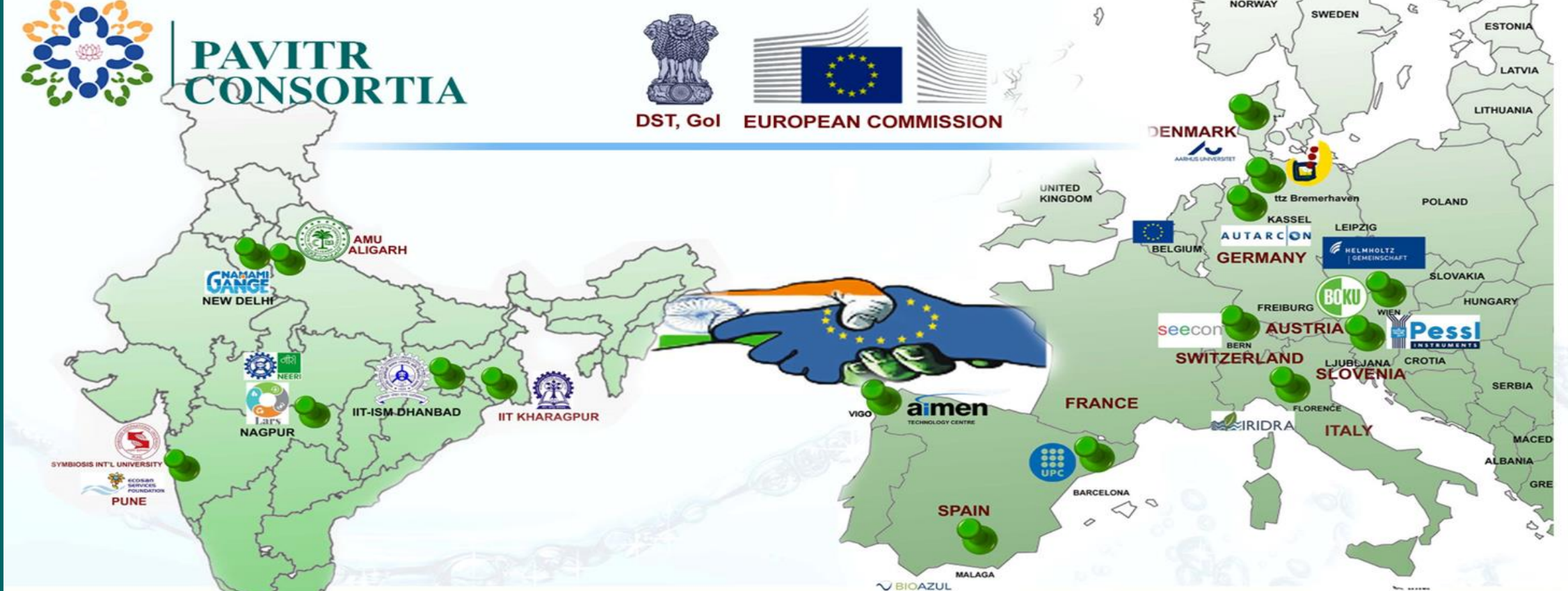
PAVITR CONSORTIA



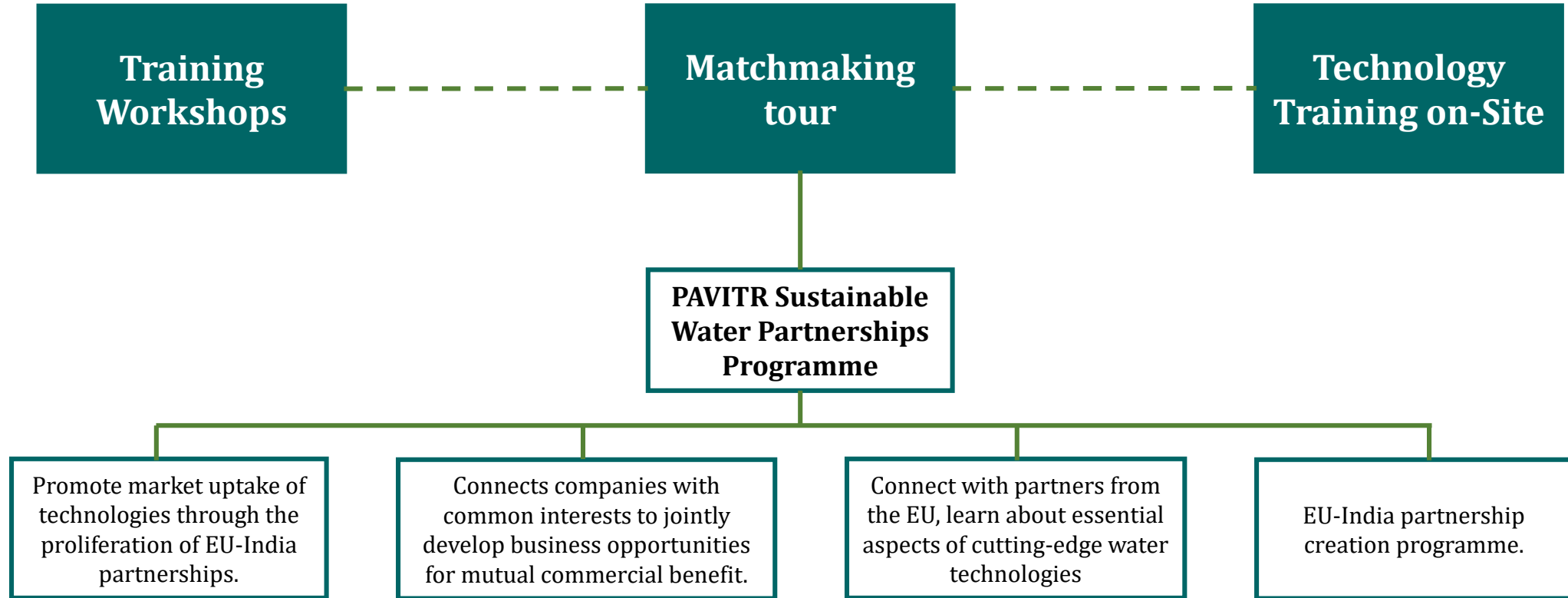
DST, GoI



EUROPEAN COMMISSION



Transfer/Exchange of Knowledge and Technology



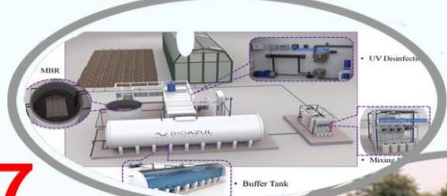
27 Letters on Intent (LoI) have been signed between EU and Indian SMEs

LOCATION OF THE PILOT PLANTS IN INDIA TECHNOLOGIES, THEIR CAPACITIES & RESPONSIBLE PARTNERS

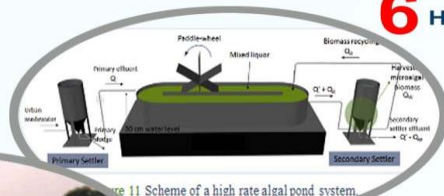


PAVITR

5 Rich Water SBR
(Capacity- 75 m³/d)
(BIOAZUL + AMU)



6 High Rate Algal Pond System
(Capacity- 50 m³/d)
(UPC + AMU)



10 French Reed Bed
(Capacity- 50 m³/d)
(AMU + IRIDRA)
ALIGARH



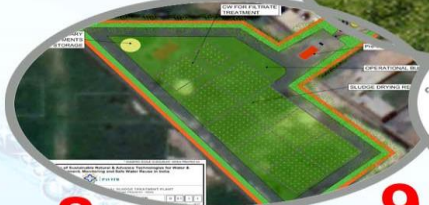
7 Short Rotation Plantation
(Willow+Bamboo+Poplar)
(Capacity- 198 m³/d)
(TTZ + AU + AMU)



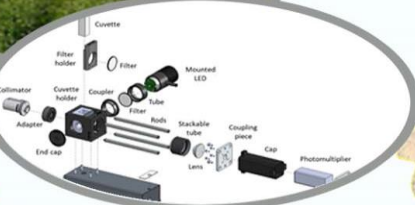
3 Rain Water Harvesting
(Capacity- 30 m³/d)
(KRETA + IIT – ISM)



8 Reed Bed For
Fecal Sludge Treatment
(Capacity- 5 m³/d)
(AMU + IRIDRA)



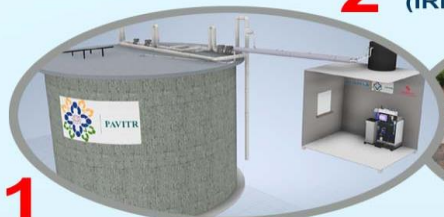
9 Sensors UASB optimization
(Capacity- 250 m³/d)
(AIMEN + AMU)



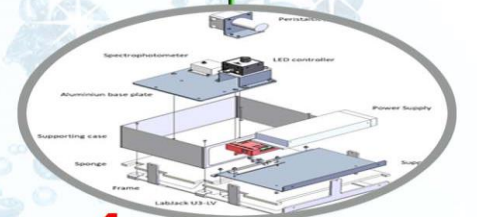
AMU ALIGARH

Anaerobic Baffled Reactor
+ Constructed Wetlands
(Capacity- 75 m³/d)
(IRIDRA + SIU + NEERI)

2



4 Optimized SBR
(Capacity- 150 m³/d)
(BIOAZUL + IIT – ISM)



IIT-ISM DHANBAD

1 Electro-Chlorination (ECI2)
(Capacity- 30 m³/d)
(AUTARCON + SIU)

SIU PUNE

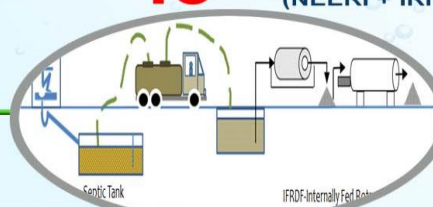
MBBR & SAAF
(Capacity- 100 m³/d)
(NEERI)

11&12 NEERI

NAGPUR



13 FSSM (Fecal Sludge Mgt)
(Capacity- 25 m³/d)
(NEERI + IRIDRA)

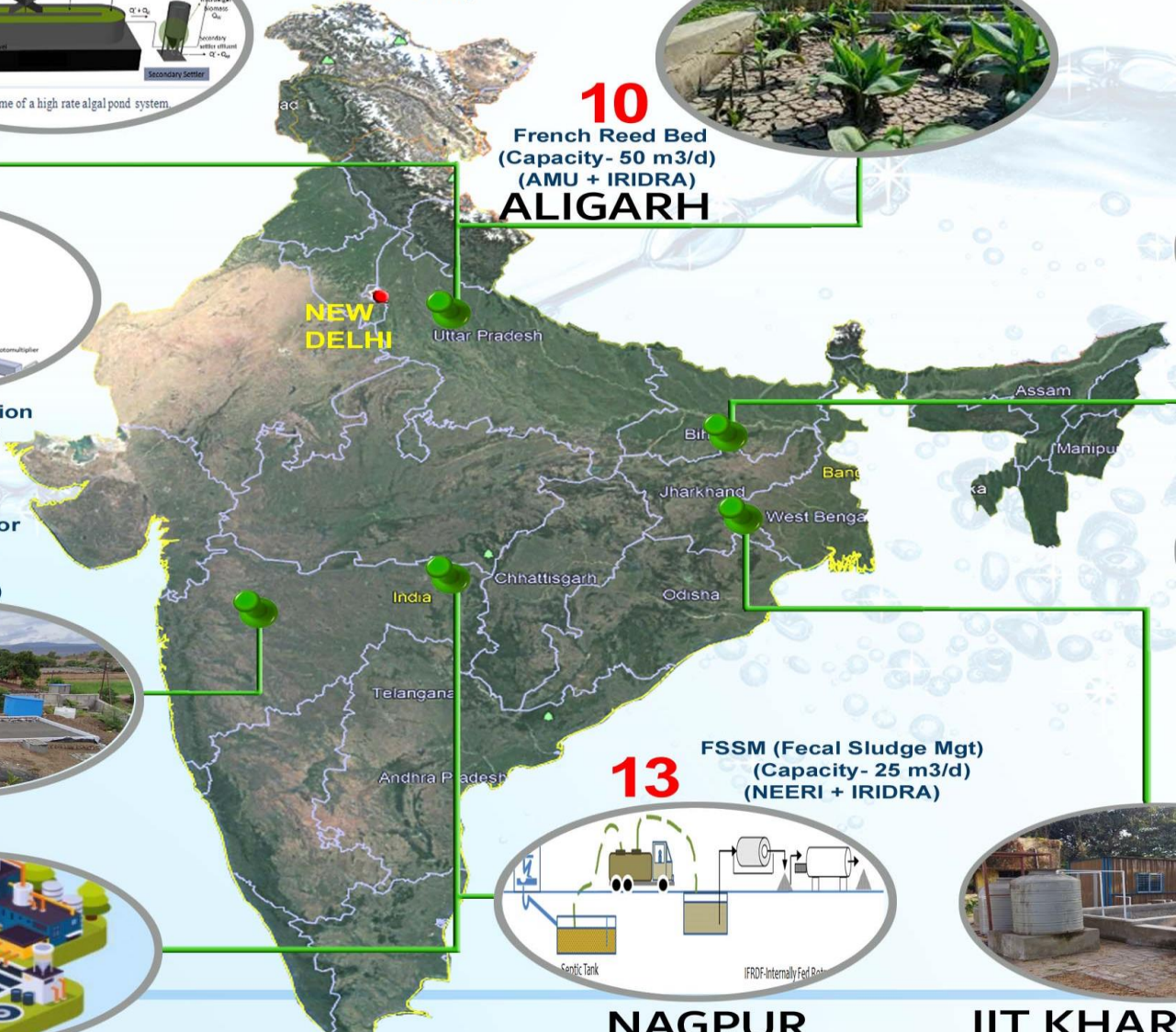


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14 MBBR- VFCW –TOXIDATION
(Capacity- 3 m³/d)
(AUTARCON + IIT-KH)



IIT KHARAGPUR



Technologies/ Prototypes

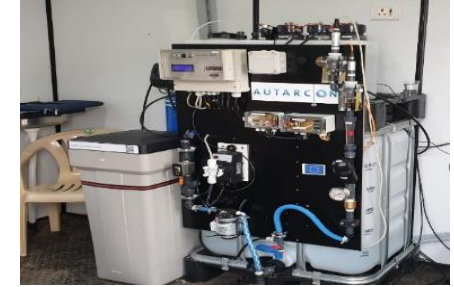
Technology: Electro- Chlorination System (ECL2) for decentralized water disinfection

TRL: 8-9

Outputs: Disinfected drinking water

Application: Drinking water supply

Capacity installed: 300 m³/d



Technology: Anaerobic Baffle Reactor (ABR) + Constructed Wetland (CW)

TRL: 8

Capacity installed: 50 m³/d

Outputs: Treated water, composted sludge after 5-6 years

Application: Reuse for irrigation; composted sludge as soil conditioner in agriculture

Technology: Rain Water Harvesting (RWH) system

TRL: 9

Capacity installed: 100 m³/d

Outputs: Slowly discharged rainwater

Application: Groundwater recharge, water reuse



Technologies/Prototypes



Technology: Sequencing Batch Reactor (SBR) optimization

TRL: 8

Capacity installed: 150 m³/d

Outputs: Treated and disinfected effluent

Application: Reclaimed water for irrigation and fertigation

Technology: RichWater® Sequencing Batch Reactor (SBR)

TRL: 7-8

Capacity installed: 75 m³/d

Outputs: Treated and disinfected effluent

Application: Reclaimed water for irrigation and fertigation



Technology: High Rate Algal Pond (HRAP)

TRL: 7-8

Capacity installed: 50 m³/d

Outputs: Treated effluent/microalgae biomass

Application: Reclaimed water for irrigation and biofertilisers from microalgae biomass

Technologies/Prototypes

Technology: Water fertigated Short Rotation Plantation (wfSRP)

TRL: 8-9

Capacity installed: 300 m³/d

Outputs: Treated water (groundwater recharge) & Biomass production

Application: Production of bioenergy, biochar, renewable raw materials



Technology: French Reed Bed (FRB)

TRL: 8

Capacity installed: 50 m³/d

Outputs: Treated effluent, Composted sludge (after 8-10 years)

Application: Water for irrigation, Composted sludge as soil conditioner in agriculture

Technology: Sensors for Up flow Anaerobic Sludge Blanket (UASB)

TRL: 7-8

Capacity installed: 250 m³/d

Application: Monitoring devices for operation and control



Technologies/Prototypes



Technology: Faecal Sludge and Septage Management (FSSM): Sludge Drying Reed Bed (SDRB)

TRL: 7-8

Capacity installed: 5 m³/d

Outputs: Treated filtrate, Nutrient rich soil after 6-8 years

Application: Land irrigation of treated filtrate, Soil conditioner in agriculture

Technology: Moving Bed Biofilm Reactor (MBBR)

TRL: 6-7

Capacity installed: 50 m³/d

Outputs: Treated disinfected effluent, Nutrient rich soil (after several years)

Application: Water for irrigation



Technology: Submerged Aerobic Fixed Film Reactor (SAFF)

TRL: 7-8

Capacity installed: 50 m³/d

Outputs: Treated effluent

Application: Water for irrigation

Technologies/Prototypes

Technology: Faecal Sludge and Septage Management (FSSM): Mechanical Dewatering and Drying System (MDDS)

TRL: 7-8

Capacity installed: 25 m³/d

Outputs: Treated sludge

Application: Re-use of sludge as biofertilizer



Technology: Integrated MBBR-VFCW – Toxidation unit

TRL: 6-7

Capacity installed: 3 m³/d

Outputs: Treated disinfected effluent

Application: Not defined yet

Technologies/Prototypes



Technology: Faecal Sludge and Septage Management (FSSM): Sludge Drying Reed Bed (SDRB)

TRL: 6-7

Capacity installed: 5 m³/d

Outputs: Treated filtrate, nutrient rich soil after 6-8 years

Application: Land irrigation of treated filtrate, Soil conditioner in agriculture

Technology: Moving Bed Biofilm Reactor (MBBR)

TRL: 6-7

Capacity installed: 50 m³/d

Outputs: Treated disinfected effluent complying with NGT norms

Application: Water for irrigation



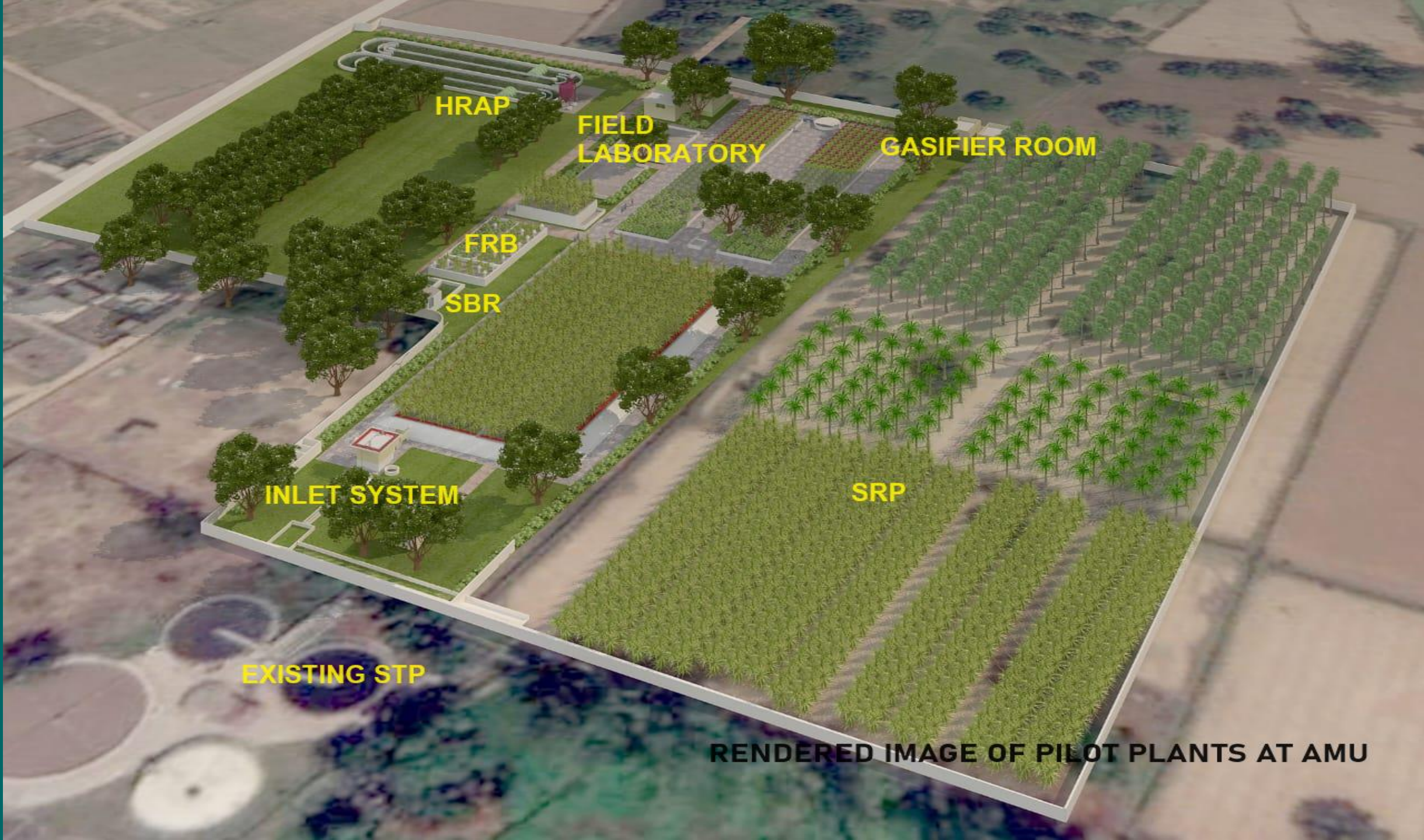
Technology: Submerged Aerobic Fixed Film Reactor (SAFF)

TRL: 6-7

Capacity installed: 50 m³/d

Outputs: Treated effluent complying with NGT norms

Application: Water for irrigation



HRAP

**FIELD
LABORATORY**

GASIFIER ROOM

FRB

SBR

INLET SYSTEM

SRP

EXISTING STP

RENDERED IMAGE OF PILOT PLANTS AT AMU

Results

19 international workshops and training sessions

22 MSc/PhD theses developed within the PAVITR project

16 articles published in scientific journals, 3 submitted and 5 articles are planned to be submitted in 2024 (vs 8 initially planned)

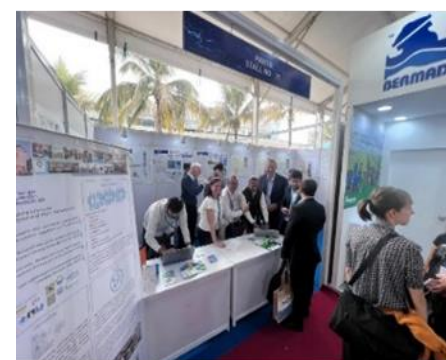
International colloquium of stakeholder and business matchmaking Tour (27 letters of intent for potential partnerships signed).

Technical visits and demo sessions for students, academics, professionals and local authorities

Agreements with local authorities and end users for sustainability and maintenance after the end of the projects

Joint activities for community involvement

Reports on indian media regarding PAVITR project



LCA/Potential for Market Uptake

- **High-Rate Algae Ponds (HRAP)**- for wastewater treatment and the production of algae biomass, which can be transformed into biofertilisers, biostimulants, biogas.
- **Wastewater fertigated Short-Rotation Coppice(wfSRC)**- for the cultivation of biomass using wastewater.
- **Constructed Wetlands** for storm water, domestic, and industrial wastewater treatment, as well as sludge drying.
- **Integrated concepts for rainwater utilization, reuse, and groundwater recharge.**
- **Portable optical sensing devices** for the in-situ monitoring and control of Escherichia coli within wastewater treatment and drinking water plants
- **Decentralized drinking water disinfection systems**
- **Sequential Batch Reactors (SBR)** for the treatment of domestic and non-toxic industrial wastewater
- **Monitoring devices** to optimize field management, including on-demand irrigation and crop protection

Sustainability Challenges

Sustain and maintain prototypes installations

- Demo cases, produce data and results
- Support cost benefit calculations
- Production of documentation material

Sharing results with relevant stakeholders

- Potential clients, politicians, authorities

Multiply the technologies in different regions to generate more case studies

Establishment of national/regional training centre for NB treatment and drinking water solutions

Official listing of approved technologies

Outcomes so far

- ✓ **14** technologies installed serving more than **50,000** people in different geographical locations
- ✓ Approx. **1,500 m³/d** wastewater treated (vs 422 m³/d initial envisaged)
- ✓ LCA and CBA completed for 3 technologies
- ✓ Successful prototypes- proven technologies- **READY** to enter the market (TRL 9)
- ✓ Capacity building of interested Indian SMEs (**27 LOIs**)
- ✓ Trained stakeholders (experts and companies) in **19 workshops (~1500 participants)**
- ✓ **16 PhD and 6 MSc theses** developed within the PAVITR Project
- ✓ **16 articles published** in scientific journals
- ✓ Outreach and dissemination activities through national and international electronic media and print media (**DW Video**)

Thank You for your Attention