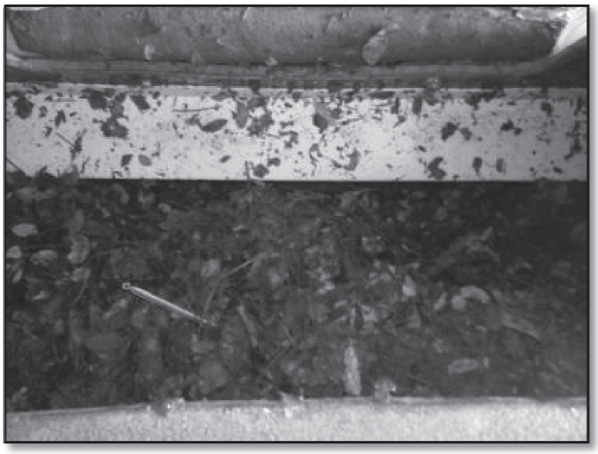
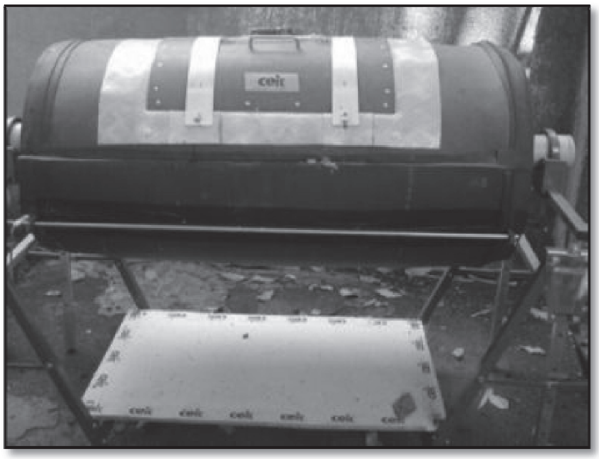
Flow Rate	$0.5m^3/d$
Effluent Quality	Compost
Intended Reuse	Agriculture
No. of Beneficiaries	500





Rotary Drum Composter

Department of Science & Technology

European Commission

SWINGS

SAFEGUARDING WATER RESOURCES IN INDIA WITH GREEN AND SUSTAINABLE TECHNOLOGIES

Safeguarding Water Resources in India with Green and Sustainable Technologies

1.1 Background

At a time when there is an urgent need to conserve water resources, efficient sanitation systems can play a key role. This vital resource can be ensured when water is recovered from waste, re-used, recycled and at the same time protect human health and the environment. Studies have reported that during the past decades, India and Europe are witnessing common challenges in the water sector. Some of the issues include water scarcity, over-exploitation, indiscriminate water pollution, challenges in municipal & industrial wastewater management and the need of improvement in water use efficiency. In addition, there is the effect of climate change; its impact on water resources, agriculture production and productivity vis-à-vis water use efficiency. The situation in India is more alarming than Europe. In India, there has been drastic reduction in annual availability of water resources per capita which has decreased from 5000 Km3 in 1950 to 1545 Km3 in 2011.

Moreover, in India, there are many towns and cities that lacks with adequate sewerage and sewage treatment facilities. As per the estimates of Central Pollution Control Board, India generates about 62000 million litres per day of sewage and only 23277 million litres per day is treated with the help of 816 Sewage treatment plants developed at different places, thereby leaving a gap of 62%. India is country of rising economy having other priorities and challenges to improve infrastructure facilities like water supply, drainage, housing, roads, and bridges and therefore sewerage is bit neglected sector. Estimates also indicate that to build sewerage network and sewage treatment plants, an investment of about Rs. 2, 25,000 crores is needed.

About 70% of Indian population lives in villages and small towns. These villages and towns are not provided with adequate sewerage facilities and therefore the wastewater being generated either goes to the nearby village pond, open fields or directly into the river as the situation is. Out of the total 45000 kms river-line length in India, about 12500 kms stretch is polluted. One of the most holy rivers, Ganga, is also facing a serious problem of pollution. About 144 major dirty water drains outfall into Ganga directly over its stretch of 2500 kms, passing through 98 towns and cities and thousands of villages. The Ganga basin constitutes about 26% of the country's land mass and supporting about half of India’s population.

However, past one decade or more, government has accelerated its focus on improving sanitation and pollution abatement schemes through implementation of sewerage and sewage treatment facilities. These schemes are mainly meant for towns and cities either falling under the on-going river action plans or large urban centres having population more than 1 million. However, no concrete plan has been planned to deal with problematic situation for villages, particularly those situated along the river-lines.

High rate treatment systems like activated sludge process, sequencing batch reactors, moving bed bio-reactor requires lot of energy, capital investments and operational cost to treat wastewater. These technologies may not suit Indian rural sector as energy is in scarce. Moreover lacks of resources like funds, skilled personnel and proper management system are some of the constraint to promote rural sanitation.

An alternative solution to this presenting situation is wastewater treatment through anaerobic system, and constructed wetlands. The SWINGS research project was aimed to deploy and develop low cost and sustainable wastewater treatment which combines anaerobic process, constructed wetlands, and solar driven disinfection methods obtaining treatment system which are more efficient, cost-effective and easy to implement than conventional treatment systems.

The SWINGS project elaborated as “Safe-guarding water resources in India with Green and Sustainable Technologies” is an initiative in between the Government of India and European commission under the Bilateral Cooperation Agreement for Science & Technology in the Water Sector through Seventh Framework Programme. The project was led by AIMEN from Spain with 9 other partners from Europe and Aligarh Muslim University (AMU) from India along with 8 other partners. SWINGS was conceived with an approach of “**Toilet to Clean Tap**”, making treated effluent potable, or directly use for irrigation, horticulture, fish farming, public cleaning systems.

1.2 Aim, Objective and Work Packages

The ultimate aim of this project is to deploy & develop low-cost and sustainable technologies for wastewater treatment so as to address and face challenge of likely water crisis in India by 2030.

Within this aim, the main objective of the project was to introduce either through deployment or develop low-cost optimized treatment schemes employing state of the art wastewater management and treatment systems to make full-use of water resources while maximising energy savings (high methane production and low excess sludge) at rural and community levels in India. The project aims at combining available “green” and sustainable technologies that can produce treated wastewater that can be reused in productive activities such as irrigation, nutrient supply, soil enrichment and aquaculture activities, while assuring no risk due to pathogen exposure and complying with all the national discharge standards.

Different low cost treatment alternatives are operated and validated through combined configurations. Amongst them: Anaerobic Digestion (AD) and Constructed Wetlands (CW) were the main technologies.

The solutions developed in the project are targeted for sanitation of rural sites of tropical regions. Integral configuration will be used to reuse wastewater to for applications and to safeguard the local drinking water supply in India.

There were 8 work packages under SWINGS Figure 1).

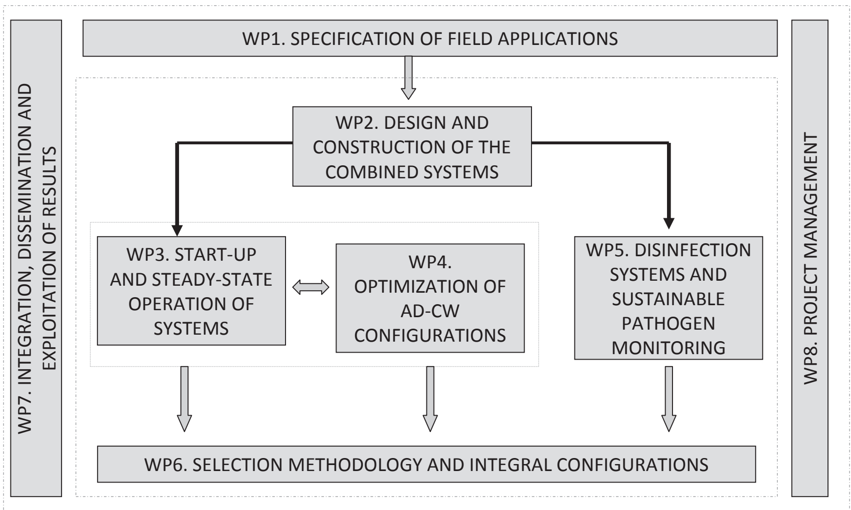


Figure 1: Work Packages - SWINGS

Activity under each work package:

WP1 To identify and specify the anaerobic, CW and low cost disinfection application cases and to establish a stakeholder forum to discuss and agree the business and opportunities of introducing the technologies proposed in India regions and other.

WP2 To design and test combined technologies from anaerobic, CW and disinfection systems to promote water reuse and to develop new innovative technologies for organic, nutrient and pathogen pollutant removal from WW

WP3 To cover start-up and steady state operation of the installed configurations

WP4 To know the behaviour of combined technologies when they are exposed to an organic and hydraulic overload.

WP5 To develop sustainable tertiary configurations which are able to disinfect pre-treated water. Development of a low-cost pathogen monitoring technique.

WP6 To develop a decision support system (DSS) for selection of sustainable and efficient treatment technologies operated in previous work packages. At the same time, Life Cycle Assessment (LCA) and Life Cycle Cost Analysis will be also carried out to evaluate and select appropriate WW treatment technology.

WP7 To disseminate the project results, making them well known to all relevant stakeholders, end-users relate to WW treatment and water management. To foster the exploitation of the project results to the benefit of the SWINGS partners and to improve the competitiveness of the water management sector.

WP8 Project Management

1.3 SWINGS Consortium

SWINGS consortia comprise 10 European partners and 08 Indian partners. The composition of partners is much diversified as it involves leading research organizations, universities, SMEs, NGOs and Urban Local Bodies.

European Partners:

Asociacion de Investigacion Metalurgica del Noroeste	**AIMEN Spain** **(Main EU Coordinator)**	aimen

Aarhus University	AU Denmark
Universitat Politecnica de Catalunya	UPC Spain
Helmholtz- Centre for Environmental Research	UFZ Germany
National Research Institute of Science & Technology for Environment and Agriculture	IRSTEA France
Autarcon GMBH	AUTARCON Germany
Kilian Water APS	KILIAN Denmark
Limnos Podjetje za Aplikativno	LIMNOS Slovenia
Solarspring GMBH	SOLARSPRING Germany
DHI	DHI Denmark

Indian Partners:

Aligarh Muslim University	**AMU Aligarh** **(Main Coordinator)**
International Centre for Ecological Engineering	KU Kalyani
Centre for Built Environment	CBE Kolkata

Indira Gandhi National Tribal University	IGNTU Amarkantak
UrbanPlan Consulting & Engineering Private Limited	UPPL New Delhi
Kalyani Shine India	KSI Kolkata
Uttar Pradesh Jal Nigam	UP Jal Nigam Agra
Aligarh Nagar Nigam	ANN Aligarh

Group photograph showing experts under this consortium is given in Figure 2.

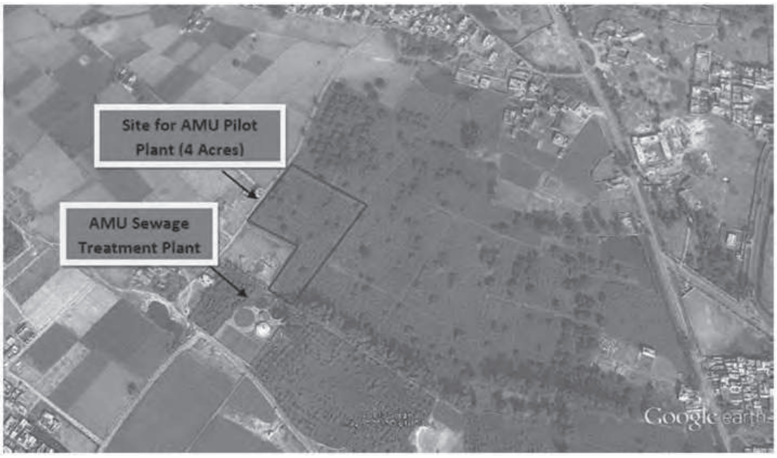
Experts of SWINGS Consortia

Members of SWINGS with Hon'ble Vice Chancellor AMU, Lt. Gen. Shah and PVC Brigadier S Ali and other officials at AMU Aligarh

1.4 Pilot Plant Sites and Technologies under SWINGS

In total, SWINGS has implemented 06 pilots at 03 places in India. Location and number of pilots are given in Figure 3.

Figure 3: Location and Number of Pilot Plants in India under SWINGS

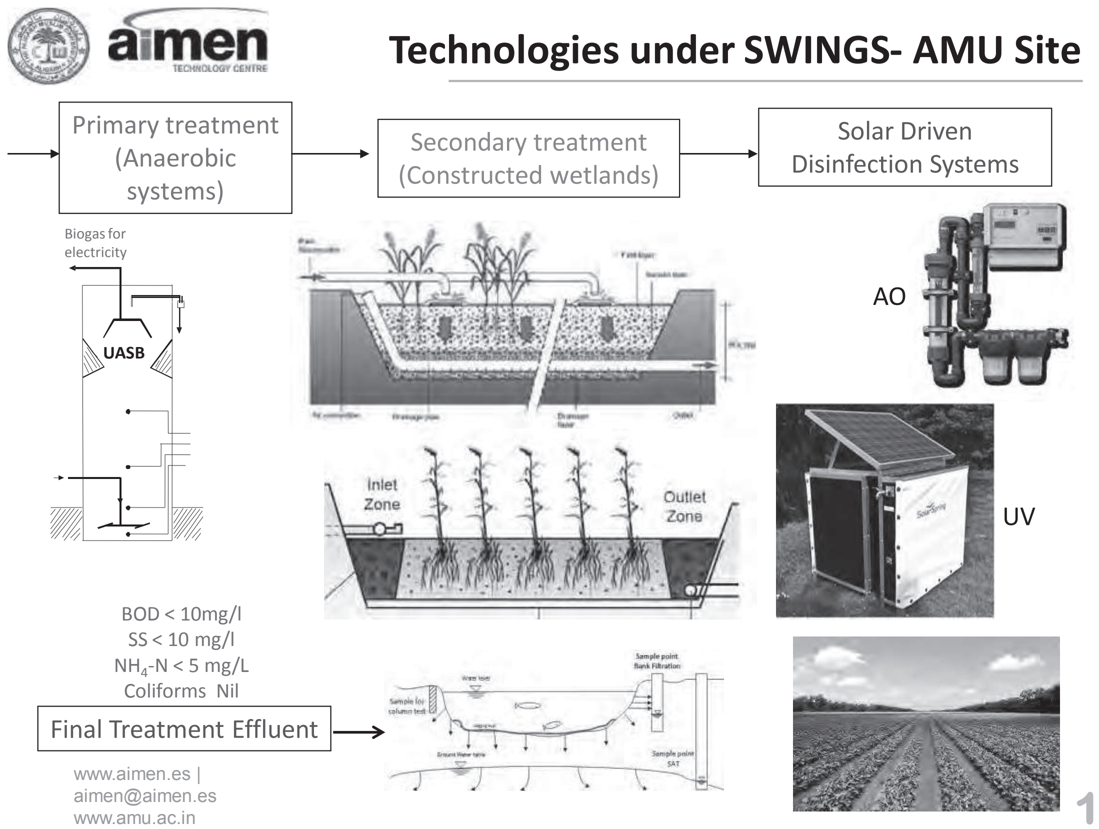


Land provided by the AMU to install Pilot Plants at Aligarh (total area 4 acres)

Location of pilot plant at Kalyani, West Bengal

Technologies Deployed / Adopted:

Anaerobic Digestion - UASB Technology
Constructed Wetlands - Horizontal Flow, Vertical Flow and French Type
Disinfection Methods - Solar driven Anodic Oxidation
Solar driven UV System



AMU

UASB + Vertical flow CW with recirculation + Horizontal flow CW

French Type Vertical Flow CW + Horizontal flow CW

Solar Driven AO and

Solar Driven UV

KALYANI

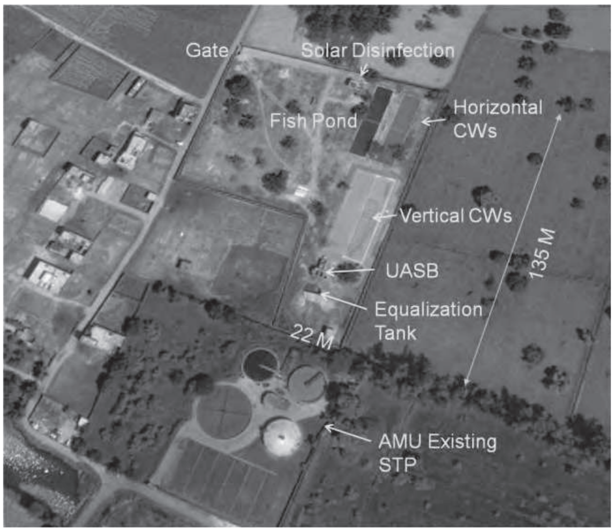
Bank Filteration + Disinfection (Solar Driven AO and UV)

IGNTU

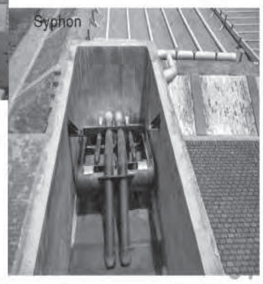
Gravel Filter Bed + Solar Driven AO

Pictures of the Pilot Plants are given below:

AMU Pilot Plants:

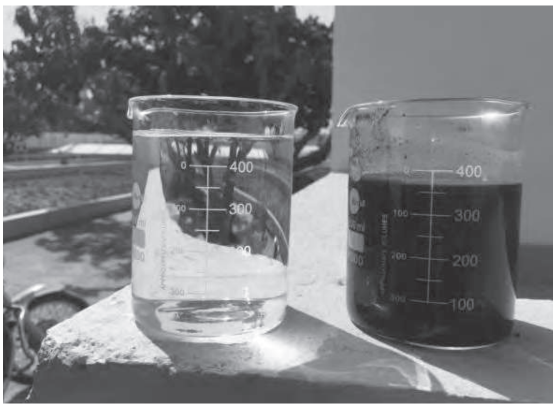


AERIAL VIEW OF SWINGS DEMONSTRATION PLANT – AMU ALIGARH



VERTICAL FLOW CONSTRUCTED WETLANDS

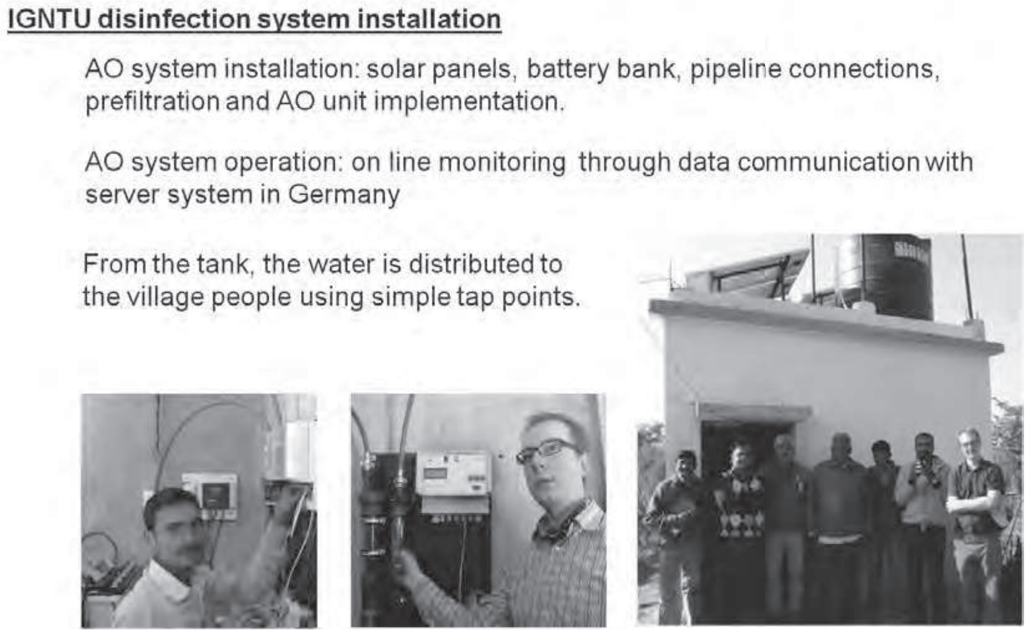
HORIZONTAL FLOW CONSTRUCTED WETLANDS



INFLUENT AND EFFLUENT QUALITY FROM SWINGS PILOT UNIT AT AMU

EFFLUENT QUALITY ACHIEVED:

BOD < 5 MG/L
TSS < 5 MG/L
COD < 10 MG/L
NITROGEN < 5 MG/L
PHOSPHORUS < 2 MG/L
TURBIDITY < 1 NTU
COLIFORMS – NIL



KALYANI PILOT INSTALLATION

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www.swingsproject.com

Energy-efficient Community-based Water and Wastewater Treatment Systems for Deployment in India (Eco-India)

Department of Science & Technology, Govt. of India and European Commission funded Research Project within FP-7 Framework (EU-India Research Project)

The overall target of this collaborative research project is to supply the safe and sustainable innovative cost-effective solutions for community based drinking water based on surface as well as groundwater treatment schemes. Surface water will be treated by using HRF-SSF-ACF unit followed by disinfection. Disinfection will be done by simple chlorination. As an EU intervention activated glass media with aerator will be used rather than mixed oxidants system will be used for alternative filtration technique against bacteriological contamination instead of slow sand filter media. Disinfection with the use of mixed oxidants will be employed as an alternative to chlorination. Efficacy as well as cost effectiveness of these filtration systems will be evaluated based on the field performance through continuous monitoring system. The extent and magnitude of Arsenic is being analyzed using AAS, UV Spectrometer, arsenic field kit and it also by using Biosensor. Arsenic removal unit will be installed based on oxidation-co-precipitation-adsorption-filtration method. Feasibility study of Graphene Capacitative Deionization (GCDI) Cells may be used for water treatment. Continuous water quality would be monitored through online and offline monitoring system and their performance evaluations. Wastewater can be treated using three stage reed-bed system and the quality may be upgraded by using activated glass and thus treated wastewater be used for agriculture purpose.

Objective:

The overall aim of Eco-India is to design and develop innovative cost-effective solutions for community- based water- and wastewater- treatment systems. These systems will be deployed at pilot site in an arsenic affected water stressed region in India. The following are the core objectives of all activities of the project. Development of community managed surface and groundwater based sustainable water supply system emphasizing water safety and security.

- Development of community managed surface and groundwater based sustainable water supply system emphasizing water safety and security.
- Introduction of appropriate technology for removal of contaminants and up-gradation of surface and groundwater quality as well as evaluation of performance of water purification system.
- Application of offsite as well as online water quality monitoring systems and their performance evaluation.
- Conducting field based study for assessment of technical feasibility, economic viability and social acceptability of water management system introduced for the community.

- Development of low cost wastewater treatment (Reed bed system) collected from dense populated rural cluster.

Project Site Selected (Fig.1)

State: West Bengal;

District: Murshidabad;

Block :Murshidabad Jiagung;

Gram Panchayet : Dahapara;

Village: Jyot Sujan;

Latitude: 24˚09'02.5" (N)

Longitude: 88˚15'21.3" (E)

Village Population: 2000 (Approx.)

The groundwater of this area is contaminated with arsenic.

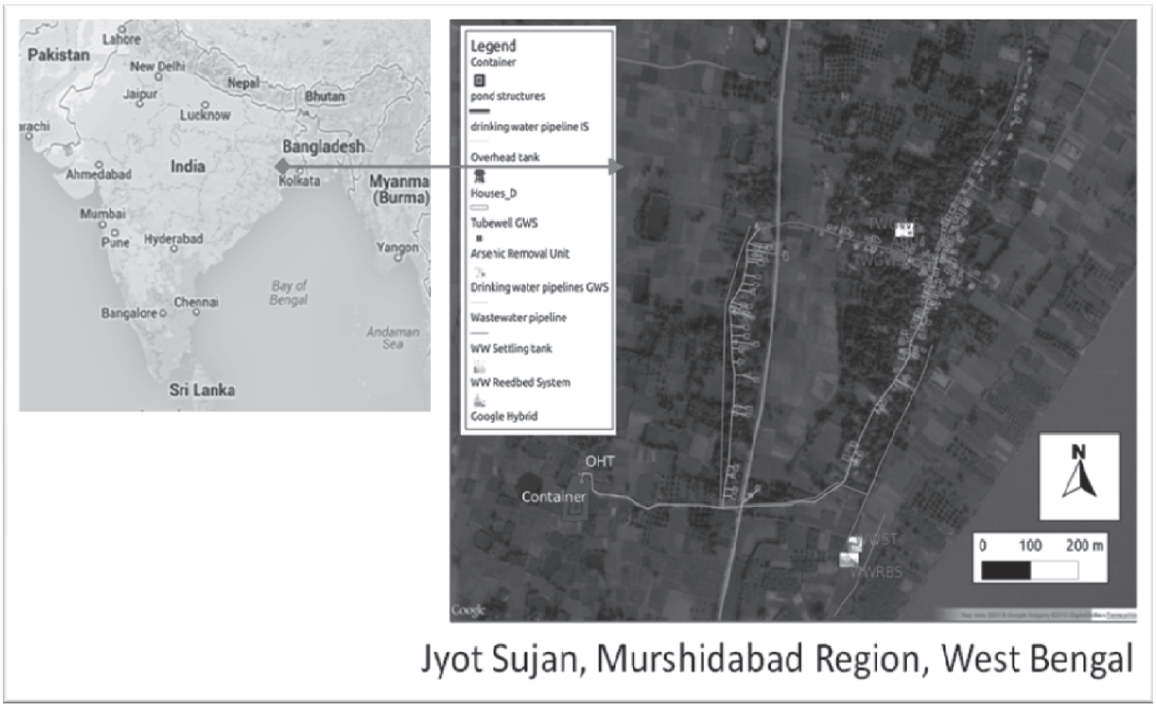
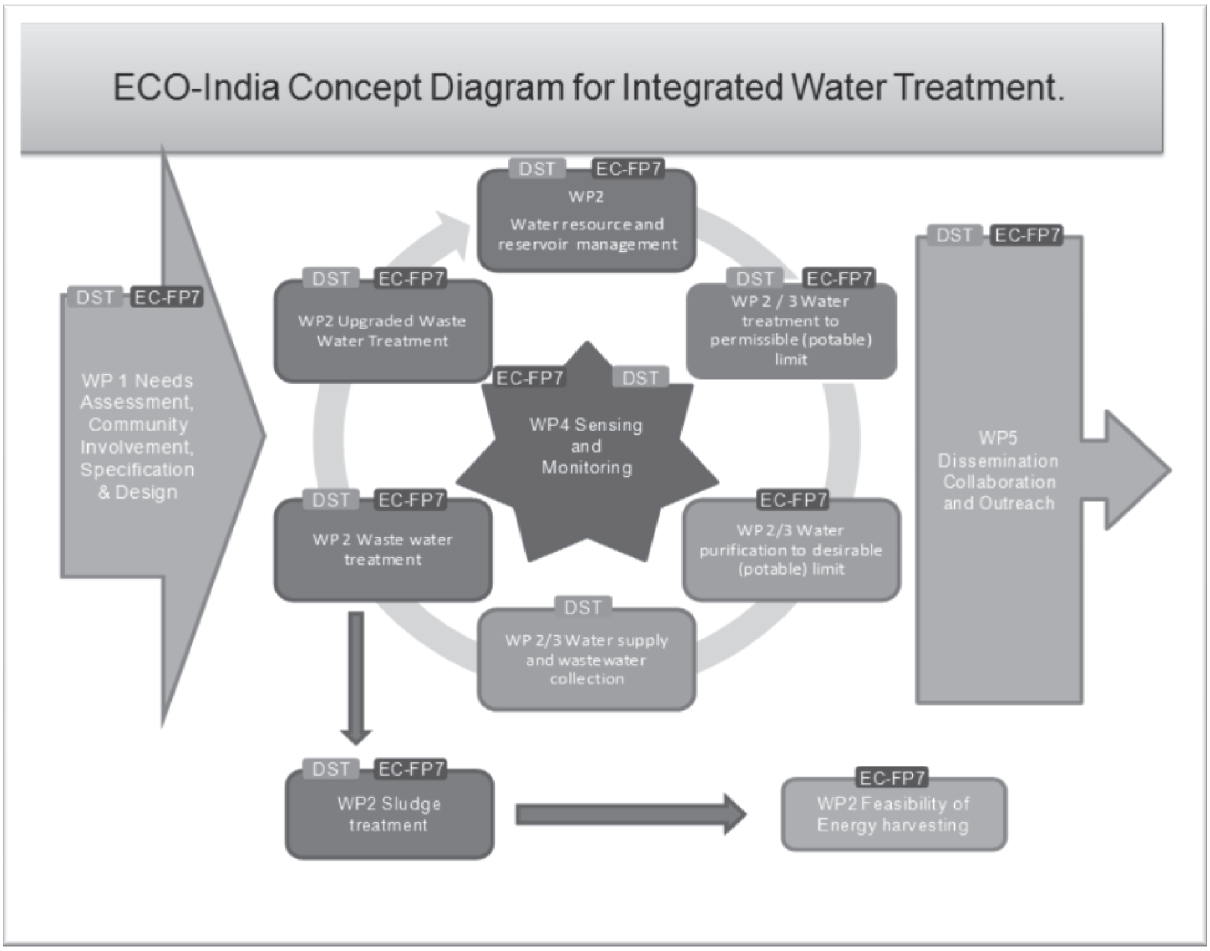


Fig.1: Location Map of the Study Area

Information of Indian EU Partners and their Scientific Roles

Sl No	Name of Institution/ consortium member (Indian followed by EU)	Scientific roles and responsibilities (in brief bullet form)
Indian Consortium **Prof.(Dr.) Asis Mazumdar** Coordinator of Indian consortium, Jadavpur University (JU), India		
1	**Jadavpur University** **Prof.(Dr.) Asis Mazumdar** , Coordinator of Indian consortium, JU, India **Dr. Pankaj Kumar Roy** Co-Investigator **Gourab Banerjee** Senior Research Fellow **Somnath Pal** Research Fellow	Deploying community based water and wastewater treatment plants (pilot sites) incorporating of Water Resources Management, Water and Wastewater Treatment Facilities and Sludge Disposal Facilities. Fabrication and Installation of Arsenic Removal unit (ARU) including design, monitoring and evaluation of treatment units of surface and groundwater system.
2	**IIT Kharagpur** **Prof. Subhasish Dey** Principal Investigator	Catchment area and surface water management scheme
3	**Super Technicians, India** **Mr. Sumit Ganguli,**	Installation of Surface water, Groundwater treatment units and integrated (drinking water and wastewater) scheme
European Consortium **Dr. Aidan Quinn** Coordinator of European Consortium		
4	**Dr. Aidan Quinn,** EC-FP7 Consortium Coordinator, Tyndall-UCC, Ireland	Pathogen sensor for online monitoring Design and development of capacitive deionization (CDI) module
5	**Mr. Edmond O'Reilly,** CEO, Trustwater, Ireland	Commissioning of mixed-oxidant water disinfection system (including training at pilot site) Collaboration with Tyndall on capacitive de-ionization module development
6	**Mr. Ronjon Chakrabarti**, Adelphi, Germany	On site (India) interface between EC-FP7 and DST consortia Co-organizer of onsite Needs assessment Programme, community workshops and training facilitation Design and Evaluation of overall surface water supply scheme Design and optimization of Pre-treatment system
7	**Prof. Irini angelidaki,** DTU, Ireland	Feasibility study on biogas recovery from sludge and municipal waste for energy harvesting
8.	**Ms. Sonja Hahn-Tomer**, UFZ, Germany	Arsenic detection using new biosensor technology
9.	**Dr. Howard Dryden,** Dryden Aqua, UK	Replacement of sand with activated filter media (produced from recycled glass) to reduce bio-fouling, labour and improve overall water quality

10.	**Mr. Moshe Sela,** AGM, Israel	Sensor and system automation and integration for remote data access, performance monitoring and system control



ECO-India Concept Diagram for Integrated Water and Wastewater Treatment

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Meeting With Villagers in Jyot Sujan Village

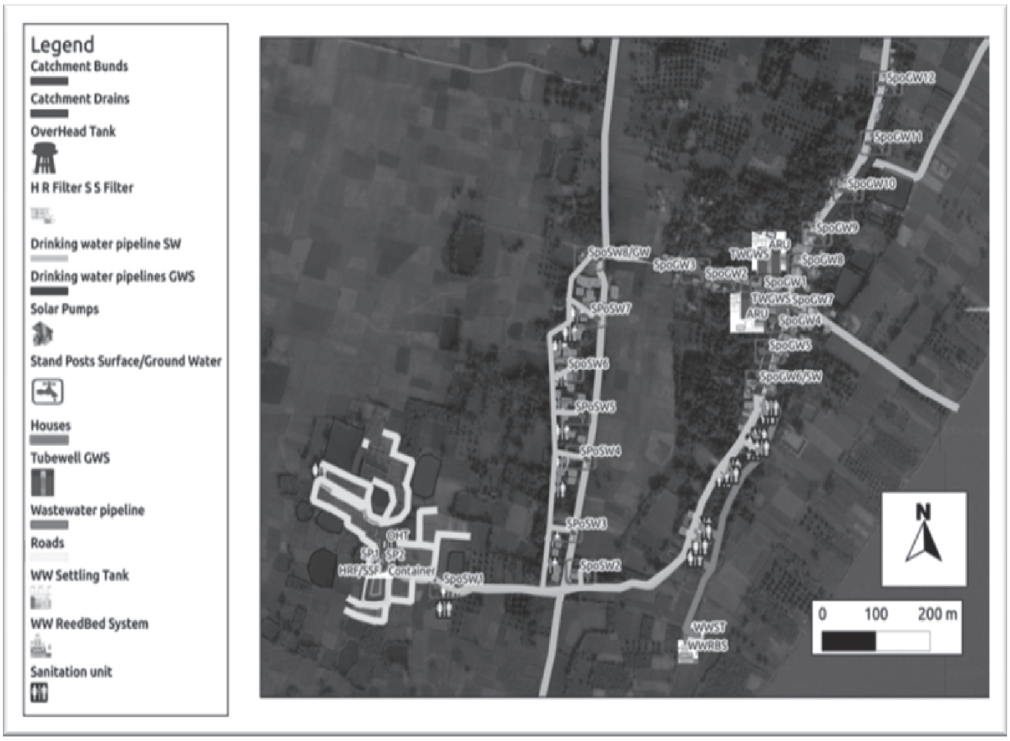
Eco-India Team at Brussels

Eco-India Research team at Surface Water Scheme

Eco- India Team Field Workshop at Murshidabad

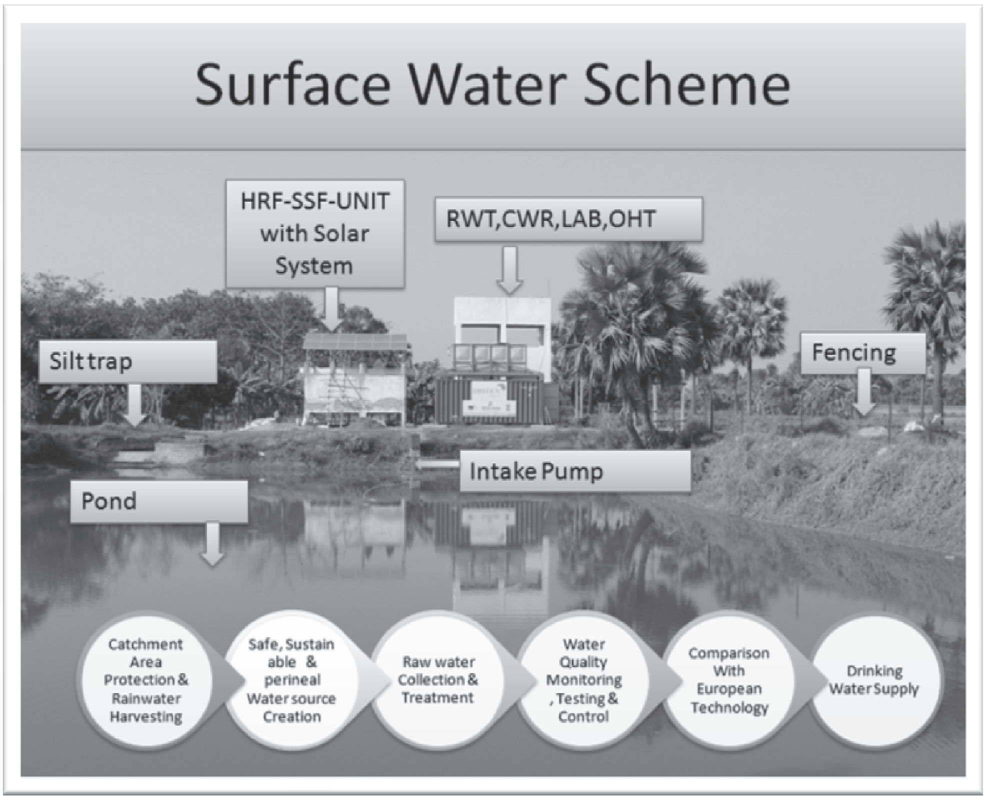
Project Meeting at Jadavpur University, Kolkata & Edinburg, Scotland

Eco-India Technology Description



Surface Water Scheme

The field equipment is major asset created for comparative evaluation of different Indian and European scientific technology, research components at field level and to ensure drinking water security by mitigating the arsenic contamination at study area. At study area major field equipments are Arsenic removal unit attached with tube well for groundwater treatment scheme , Surface water treatment unit consist of HRF-SSF unit, Water tanks, field laboratory, Catchment area treatment and protection structures as fencing, silt trap earthen bund and drinking water distribution network along with stand posts. Sanitation unit and waste water treatment plant are the other two major civil structures constructed in the field. To make energy efficient and sustainable and solar energy system with back up of electrical connection also installed in site along with required machineries pump, transformer etc. European partners also contributed their treatment systems assembled in two containers at sites. Above mention all assets is termed as permanent field equipment will utilized at site under the supervision of Panchayat and Zilla Parishad (Local Govt. Authorities) and village committee trained by ECO-India Team.



Parameter	Dimensions
Length of the Pond	60 m
Breadth of the pond	32 m
Total pond area	2406.6 m^2
Catchment area	7.23 ha
Wetted pond area	920 m^2
Average depth of the pond	3.5 m

Pond Water for Surface Water Source

Salient features HRF/SSF/ACF

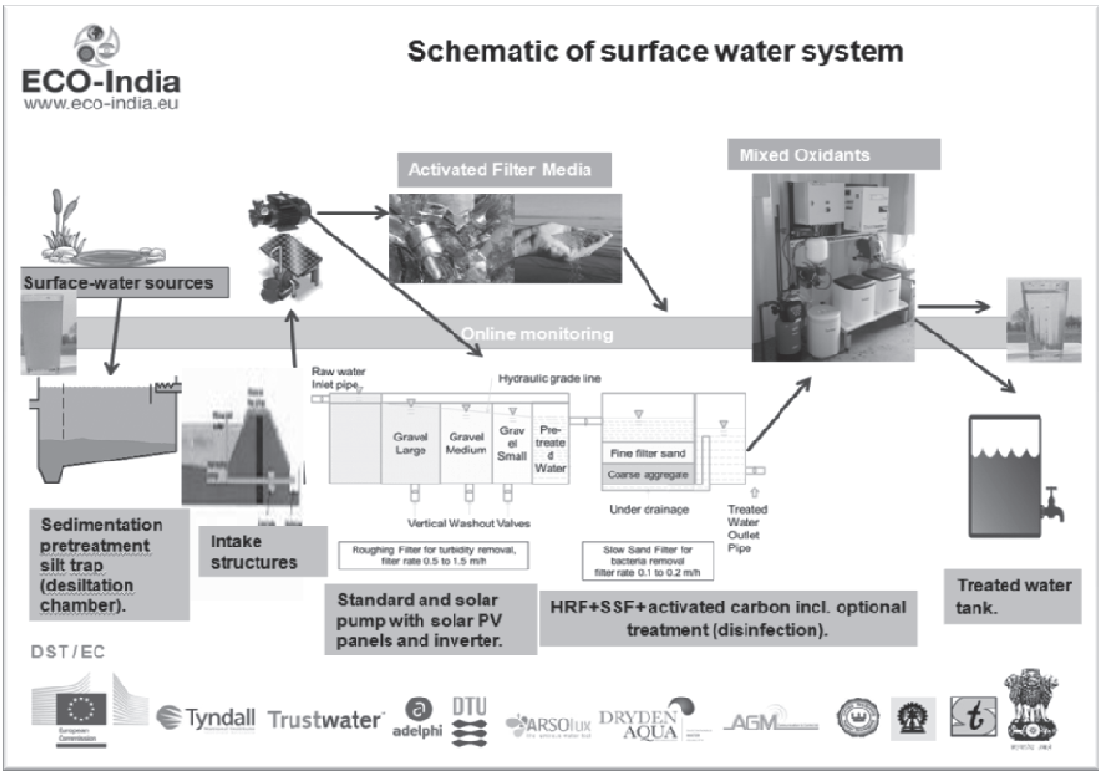
Water Source: perennial pond
Source Enhancer: surface rainwater harvesting with catchment channels Catchment Channel
Quantum of Treated water: 28,000 LPD (Max)
Source Protection: catchment area management, bunds and fencing around pond
Components: Silt Trap, Sedimentation pond, Tank tower with Raw-, Clear- and Distribution (OHT)-water tanks
Filtration System: Sedimentation, Horizontal Roughing filter, Slow Sand Filter, Activated Carbon Filter, Post Chlorination

Top view on HRF/SSF/ACF filters with PV cover

Salient features Activated Filter media

Source of Water: Tube Well and Pond
Quantum of Treated Water: 60,000 LPD (Max)
System Components: RWT and CWT of GRP on container,
fine aeration diffusion, ZPM mixer,
pressure filter with]AFM media, magphlow,
Filtration System SW: APF and AFM filtration
Filtration System GW: ferric chloride and AFM filtration
Online (SW) and offline monitoring (SW+GW)
Reject Management of Arsenic Rich Sludge: Brick, Concrete bl

Water



Water Quality Result of Surface Water Treatment System

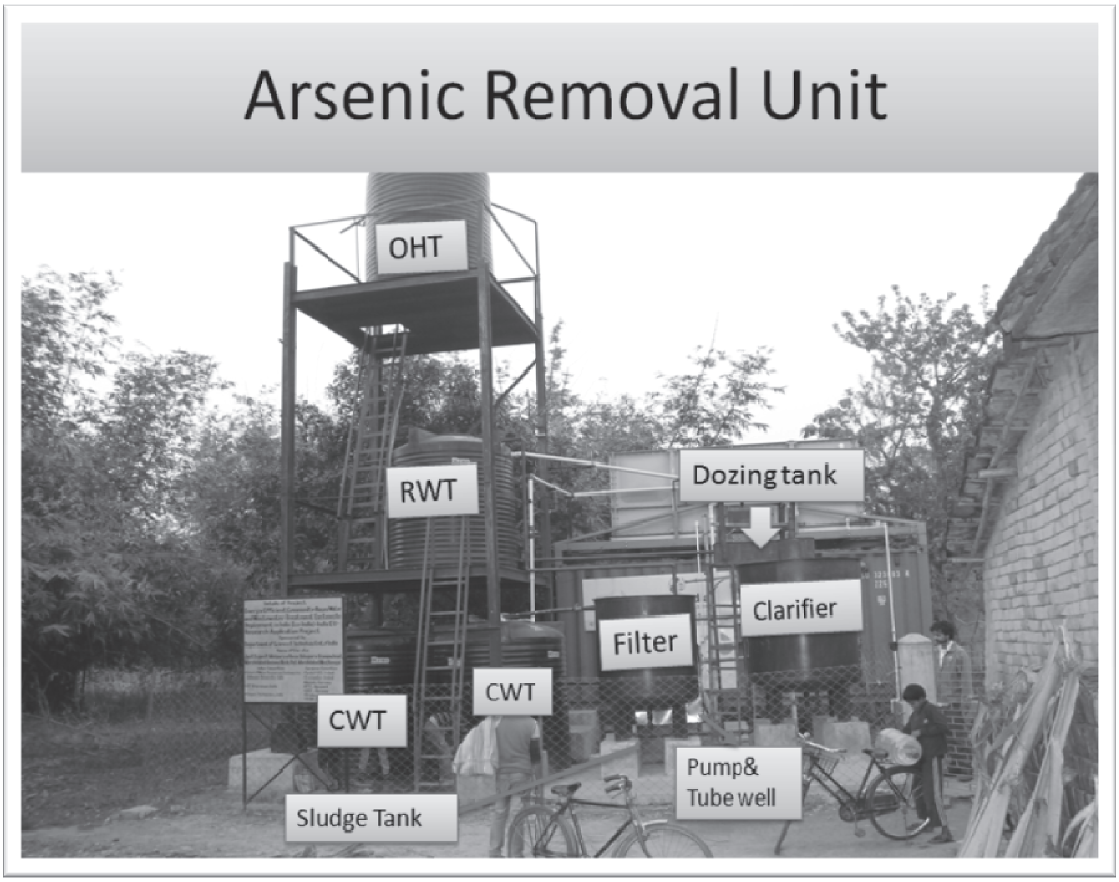
Parameter	Pond Water (Source)	HRF-1	HRF-2	SSF-1	SSF-2	Treated Water (after disinfection)
Turbidity (NTU)	10-41.8	3.02-15.5	5.09-30.9	0.37-2.63	0.227-2.41	0.51-1.51
Total Suspended Solids (mg/L)	20-110	7-22	5-15	<2	<2	<2
pH	5-8.15	5.1-8.08	5.4-8.1	4.9-8.12	4.9-8.2	6.8-8.3
TC (MPN/100 ml)	102-2800	0.1-810	0.1-945	45-412	15-405	0.1-10
FC(MPN/ 100 ml)	0.1-450	0.1-120	0.1-90	0.1-85	10-85	absent
DO (mg/L)	4.29-9.24	2.83-7.6	2.57-7.5	2.35-7.34	3.38-7.4	5.65-7.77
Ammonia (mg/L)	0.-0.99	-	-	0-0.9	0.01-0.7	0.01-0.12
Nitrate (mg/L)	0-2.9	-	-	0.07-1.9	0.07-1.3	0.4-1.5
TDS (mg/L)	227-942	258-258	363-450	210-405	216-391	215-400
Residual Chlorine	-	-	-	-	-	0.4-1.5
BOD (mg/L)	7.9-13.6	-	-	-	-	0
COD (mg/L)	10.14-26	-	-	-	-	-

Construction of Surface Water Scheme

DST Expert Committee Visit to Surface Water Scheme

Salient features Arsenic Removal Unit

Source of Water: Tube Well
Quantum of Treated Water: 15,000 LPD (Max)
Source Protection: Fencing
No of Structure: RWT, Clarriflocculator, Filter Unit, CWT, OHT, Arsenic Sludge Tank
Filtration System: Pre-chlorination, Alum Dosing, Up-flow
Filter (Gravel-AA-Gravel), Post Chlorination
Offline monitoring: Arsenic Test Field Kit, DO, pH, TDS, Hardness, TC, FC, Al etc.
Reject Management of Arsenic Rich Sludge: Brick, Concrete block etc



Arsenic Removal Unit installed at Project Site

Specification of Arsenic removal Unit

Parameter Specification	Unit
Clarifier (Inner Diameter) Ht. of Clarifier (including Joist)	1350 mm 1900 mm
Floculator (Inner Diameter)	450 mm
Clarifier Thickness	6 mm
Mixing Channel	1350 mm (Length) 300 mm (Breadth)
Upflow Filter unit (Inner Diameter) Ht. of Upflow Filter Unit	1250 mm 1788 mm
Filter Media	300 mm (Gravel)
	300 mm (AA)
	300 mm (Gravel)
Max. Pumping rate of well	1.25 m3/hr

Construction of Groundwater Scheme

Water Quality Result of Ground Water Treatment System

Parameters	Pre-treated Water	Post Treated Water
Turbidity (NTU)	4.46-16	0.42-1.7
Total Hardness (mg/L)	150-200	120-150
pH	7.2-8.1	7.9-8.0
TDS(mg/L)	301-351	280-371
As (mg/L)	0.2-0.1	0.007-0.005
Iron (mg/L)	0.37-2.11	0.06-0.74
E Coli (MPN/100 ml)	>20	Absent
Total Coliform (MPN/100 ml)	8	Absent

DST Expert Team Visit at ECO-India Field

Salient features of Water Quality & Online Monitoring

- Development of data acquisition and control module using Virtual I/O.
- Remote telemetry unit(radio/GPRS)
- Command centre (Dedicated PC-Ethernet connectivity)
- Secure website for trending/alarms/control supervisory control and data acquisition (SCADA)
- Integration of Automatic online sensors for turbidity, flowrates, oxygen levels, pH, free available chlorine, pump activity and mixed oxidant generation system input/outputs (I/O) to supervisory

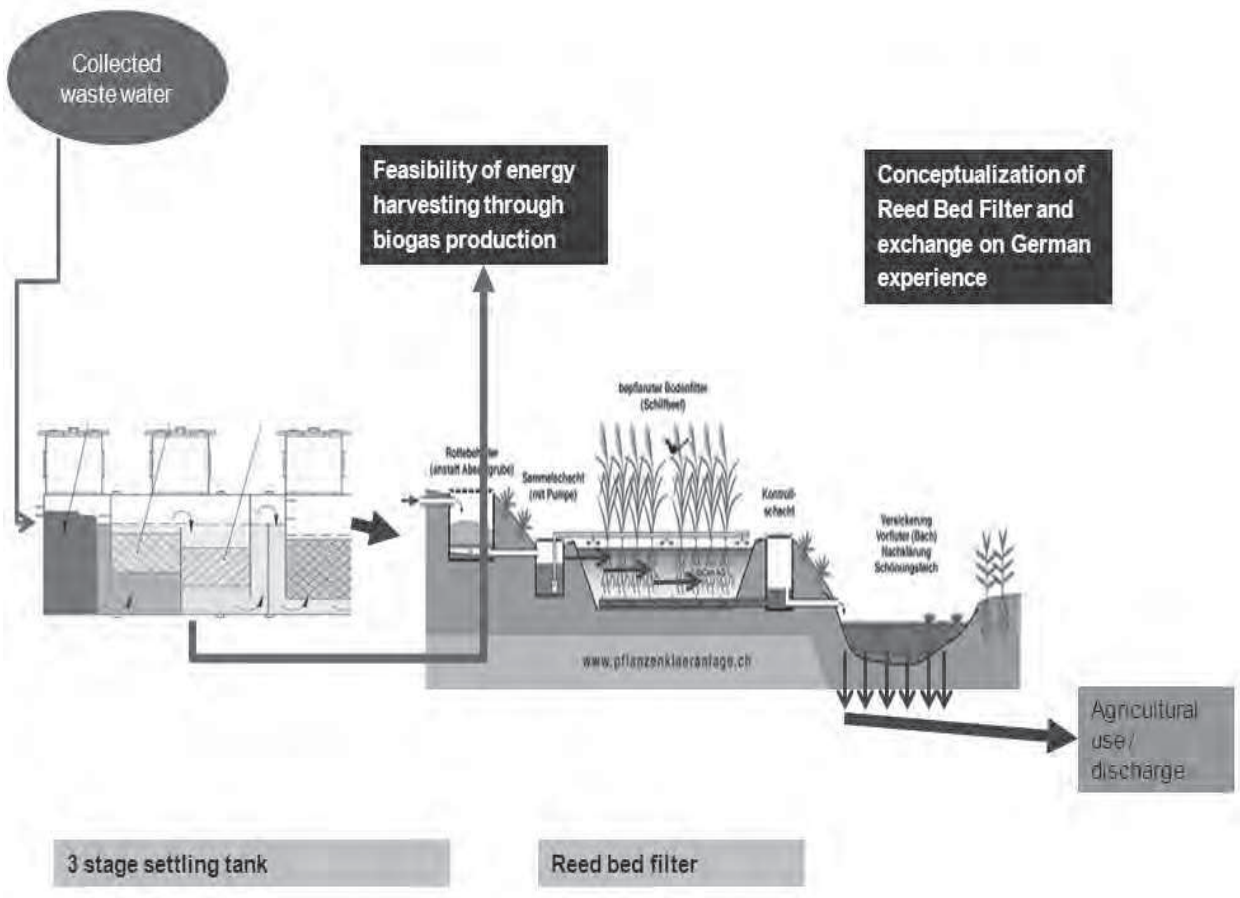
SCAD System for online monitoring

Water Quality Monitoring in Field laboratory

Wastewater Treatment Technology

To develop and installed the model this waste collection network has been proposed for JoytSujan village, Murshidabad for the ECO-INDIA project. This gravity sewer network system has been designed for 20 household and we take only flushing water to make this waste water collection network system, assuming that every house has five persons so, this network is proposed for (5x20) =100 persons. The network has been designed for a rural area and we have assumed that per capita sewage production is 30 L/day. So, the total sewage production is (30x100) = 3000 L/d which will be treated and reused for harvesting. The map of the study area is prepared by using QGIS and redlines show the proposed waste water distribution network and from the map we found the ground elevation of the study area which is necessary to develop the software model. Since this project is an integrated water and wastewater management. Keeping in view, the study area as well as the no of houses in this wastewater distribution network was considered to develop a pilot model for wastewater management particularly in rural area.

The wastewater pipeline was adapted to the results of the total station survey. A slope of 1% was considered allowing the waste water to freely flow by gravity. With this slope a height difference on 1m per 100 m is necessary. The place of the wastewater treatment system is around 3.5 m below the level of the village settlement allowing a maximum length of 350 m. Thus only the southern part of the JyotSujan village (Murshidabad) can be connected to the sewerage. Two types of RCC Hume pipe is used to developed this network, for branch lines 100 mm and for main line 150 mm. The individual network systems are defined as a) CATCH BASIN, collect the sanitary sewage from the house hold and it is the first structure of the software model, b) JUNCTION CHAMBER, joins the branch and main sewer line. C) MANHOLE, to provide the provision for cleaning the sewer line. All the structures are made by brick to ensure that the proposed project will be cost effective network and internal faces of all the structure are smooth plaster to ensure that friction loss will be minimum and get the maximum velocity.



Horizontal reedbed filter for domestic wastewater treatment at project site

Constructed Sanitation Unit

Key Design Parameters of Reed Bed Filter

Supply of drinking water	40	LPCD
Total Population	30	persons
Population for 1 unit	15	persons
Black water generation	10	LPCD
Grey water generation	22	LPCD
Total grey water generation for 1 unit	330	L/day
	0.33	m3/day

Scientific and Technological achievements

- ✓ The ARU is basically worked for two stage treatment units with the principle of oxidation-co-precipitation-adsorption-filtration system. This cost-effective ARU unit is a proven technology developed and deployed at rural level being very cost-effective and easily adoptable technology. This sustainable as well as cost effective technology already attracts recognition from the DST Govt. of India. The output water quality results were found to be satisfactory and the results conforms the desirable limit which is less than 0.01 mg/L. The arsenic rich sludge may be treated through the application of manufacturing of concrete, ornamental brick and even it can be discharged to the septic tank under anaerobic condition.
- ✓ The catchment area surrounding the water body has been demarcated in such a way that the entire runoff could be collected in a big collection chamber. A silt trap has been designed to collect the debris materials as well as the sediment load. The pond water would be pumped to fill up the raw water tank. This raw water will go directly to the filtration unit through pipe by gravity. Here the main principle of filtration unit is applied through the Horizontal Roughing filter-Activated

Carbon Filter-Slow Sand filter with standard grading specification. The microorganism free safe drinking water is distributed to the consumers.

- ✓ Ecasol is a broad-spectrum biocide which is more effective than chlorine in the inactivation of *E coli,23* and is also effective in killing resistant pathogens such as *Cryptosporidium4 oocysts* Very significantly, Ecasol™ has proven to be phenomenally effective at removing stubborn biofilm. Biofilm has traditionally been very difficult to control and this is one area in particular where Mixed Oxidant for disinfection system has been proven to have a significant advantage over traditional chemicals. The Mixed Oxidant system requires only small amount of salt and water to function. Its power requirements are also low (<1 kW).
- ✓ AFM is a direct replacement for sand in any pressure or gravity flow sand filter. AFM is an Active Filter Media that will remove 30% to 50% more solids, and much smaller particles from the water than can be achieved by using sand. In addition AFM will adsorb and crack organics, which helps to reduce the colour of the water as well as turbidity. The higher performance of AFM reduces the load on bio-filters and ozonation systems and reduces the production of nitrate. AFM filtration media is used just like sand, and back-flushed at standard flow rates requiring only around half the amount of water to clean the AFM.
- ✓ Online monitoring systems have been developed an integrated multisensory platform capable of the sensing physical and chemical parameters which is of significance for water quality testing. The key features of the platform development will include its cheapness, low power and simplicity of the platform maintenance to allow use of the platform even in case of small water treatment volume.
- ✓ Arsenic biosensor test kit ARSOlux has been developed and compared its performance to the already established chemical water tests on the market. The evaluation of the biosensor test kit will take place under field conditions in India and will focus on monitoring the effects of different groundwater compositions (pH, oxygen, iron etc.), high ambient temperature and humidity on measured arsenic concentration.

Replicability Potential

The pilot models so developed may be replicated in the rural/peri-urban areas even where the population is suffering from arsenic and fluoride contaminated drinking water and where no alternative public drinking water and waste water treatment scheme exists and neither would be planned for near future. Being cost effective and energy efficient, the Panchayet or local governments may deploy the model in such areas. Through the involvement of the SMEs in the project, deployment will be more effective in terms of technology transfer and entrepreneurship development.

Benefits of Project

- Local Villagers are getting Arsenic free drinking water which will reduce the health problem.
- Creation of perennial drinking water source for sustainable water supply throughout the year
- Knowledge exchange and training of Young Researcher in field level.

- Online monitoring system and cost-effective treatment of surface water and groundwater to good quality by using GCDI, Mixed Oxidants, Activated Glass, Aerator system etc.
- Wastewater minimization and conversion of zero discharge as pilot scale model including pipeline design and feasibility study on the usage of wastewater for the generation of biogas.
- Integrated water and wastewater management
- Catering around 2000 population if not more with 20 L per capita per day for drinking and cooking purpose.

Old village women collect arsenic free water

Village women collecting water from Stand post

Impact on society

- Around 2000-3000 people having access to drinking water as per IS 10500 standards in an arsenic affected rural areas of West Bengal
- Averted cases of water borne diseases
- Increased number of households/people which have access to proper hygiene and sanitation
- People having access to stand posts/ house connections
- More time available in community's disposal to be used for more productive activity in daily basis due to available drinking water (working days) at stand posts
- Reduction of disability days (working days)
- Availability of water during prolonged dry season
- New cultural exposure (no. of field visits by external staff)
- Knowledge exchange especially in the field of water provision technology (no. of participants in workshops)
- Participation in capacity building workshops
- Employment in water treatment plant

Impact on environment

- ✓ Safe and sustainable drinking water sources- reducing water borne and other diseases.
- ✓ Sanitation System developed at project site by making two-pit flush toilets - resulting reduced open defecation – step towards clean India
- ✓ Wastewater (black and grey water) treatment – avoiding water pollution and clean environment and reuse in agriculture
- ✓ Solar System – energy efficient through green energy