

## **“Success Stories of Sustainable Sanitation Initiatives in India by ESF”**

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### **Abstract:**

*Sanitation has been always neglected area at local, regional, national and international level. The recent statistics declared that India is the most populated open defecated country i.e. 660 million people in rural and urban do not have access to safe sanitation, besides most town, cities, mega cities in India face serious problem in providing adequate sanitation, sewer and waste water management systems, collectively producing more than 27,000 million liters of waste water per day.*

*The continuous declining of fresh water quantity and quality (from 3400 cu m/cap to 1967 cu m/cap over last 50 years) is a major cause of concern. It is also estimated that by 2025, India will be water stress country which may lead to conflict between three major users of water i.e. Agriculture, Industrial and Domestic.*

*Thus innovative, decentralized, cost effective, environment friendly and energy efficient solution treating the waste as close to the source and reusing the same after proper treatment, there by taking care of environment is the need of an hour!*

*Ecosan Services Foundation (ESF), Pune based non-profit organization felt that there is need of appropriate knowledge sharing on the concept. Hence ESF in cooperation with gtz, Germany and seecon International Switzerland started to work in the field of capacity development along with pilot demo model to disseminate the knowledge of sustainable sanitation approach focusing to school to the future generations, there catching them young to make the open defecation free and livable cities in India.*

*ESF is working in the diversified sectors in rural, peri-urban and urban areas focusing to agriculture sector, schools, community, Eco-village project, sanitation plan for pilgrimage town and upcoming projects in local government bodies with participatory approach and cost effective sustainable sanitation solution.*

### **Introduction:**

Almost all sanitation systems are water centric systems and do not run without sufficient quantity of water. These systems are linear expensive, unaffordable in terms of operation and maintenance and not as per Bellagio principles accepted by Nations worldwide. Inadequate management of sanitation and sewerage system has posed enormous health and hygiene problems and ever increasingly urban population has further compounded the same. Loss of school days, man days on account of this is a major issue for poverty alleviation and overall economic development of the country.

With water centric sanitation system approach and the day by day increase in demand and supply gap in drinking water, it will be almost important that the concept of sustainability should always in focus while providing the solutions. 2/3<sup>rd</sup> of generated waste water which is 80% of supplied drinking water does not get any treatment which shows that there should be some paradigm shift in thinking is to approach while finding solution for these unserved population in providing sanitation. From 'Flush' and 'Forget' system to 'Recycle in consonance with 'Waste to Wealth' approach.

Ecosan services foundation, a Pune based NGO has taken up this imperative task of closing the loop between taking and giving, by providing the sustainable sanitation solutions.... the task to convert waste into wealth! ESF works in close association with German Development Cooperation, gtz, Seecon International; Switzerland has proven it's expertise to Department of drinking water supply and Ministry of Urban Development, Govt. of India in shortest span through knowledge, communication and implementation.

Ecological Sanitation, 'Ecosan', is endeavoring to provide economically viable, socially acceptable and technically appropriate sanitation solutions for protecting the environment and natural resources and achieving long term sustainability. With its philosophy of moving from flush and forget attitude towards Waste to Wealth recycle approach, Ecosan claims to have awakened in a resourceful dawn.

While closing the loop between sanitation and agriculture without compromising the health Ecosan has provided many eco friendly, user friendly, cost effective and low maintenance solutions for reuse of waste water as nutrients for crops. 'Ecosan' concept is based on segregation of different flow streams at source reuse after appropriate treatment.

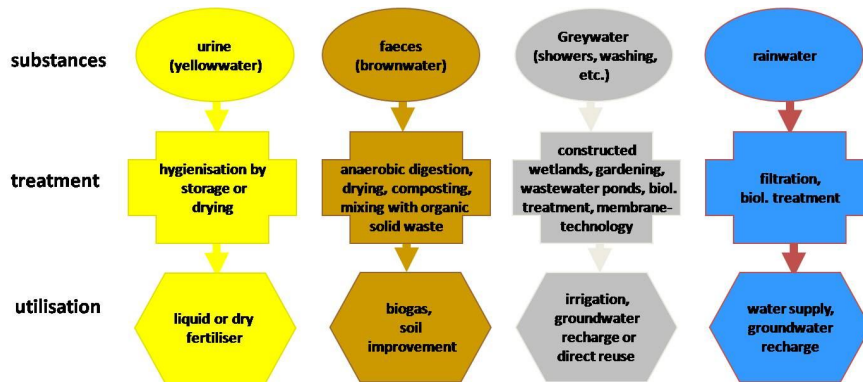


Figure 1 Separation of stream flow

There are various technological options in Ecosan.

### 1. Urine Diverting Dehydration toilet

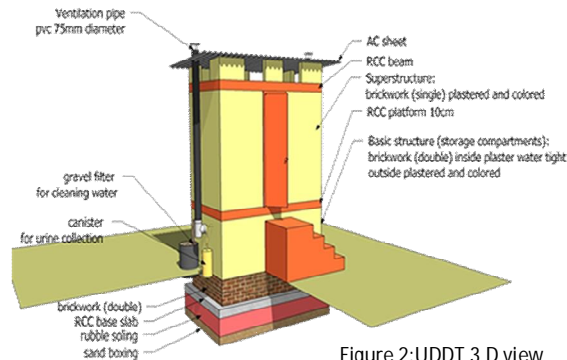


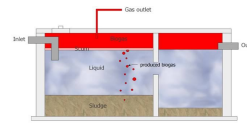
Figure 2:UDDT 3 D view

The 'Urine diverting dehydration toilet' is principally a collection system of separating human urine at the source before it mixes with faeces. Here Urine, human excreta and anal cleansing water is separated by three holes pan. Urine is stored separately for about 90 days, Faecal is separately collected which is flushed with dry material for dehydration and composting and anal cleansing water is percolated in to the ground through sand filter.

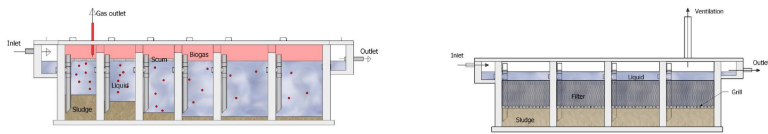
### 2. Decentralised treatment system

The 'Decentralized treatment system' treats waste water making maximum use of natural gifts like gravity, microorganisms and temperature. The core system consists of four treatment steps in respective modules, which are

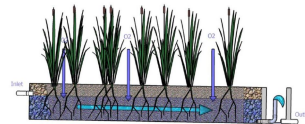
- Primary treatment and sedimentation in biogas settler



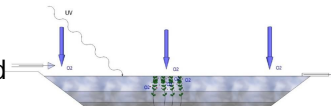
- Secondary treatment in anaerobic baffle reactor and anaerobic upflow filter



- Tertiary treatment in aerobic and anaerobic tertiary filter ie. Planted gravel filter



- And Tertiary aerobic and anaerobic treatment i.e. polishing pond



### 3. Water Saving Urinal



Membrane valve from Shital



Simple urinal bowl



Fixing of Membrane Valve at urinal pot

Figure 3: Water saving urinal device by Sheetal ceramics

The **'Water Saving Urinal technology'** promoted by ESF which is made by Sheetal Ceramics is a state of art solution saving substantial amount of flush water, energy (for pumping) and plumbing cost. It is an odor free operation and saves about 45,000 liters of water per year per urinal and the concentrated urine can be stored.

So far ESF has converted more than 2000 regular urinals in to water saving urinals at different places in all over India like some industries, schools, forest department offices and MoUD office in Delhi.

#### Case studies of ESF:

ESF has established case studies with replication potential in rural, peri urban, urban contest in support from European Union's Asia Pro-eco program, gtz Germany, MPCB, Tamilnadu State Govt. with different technological options which are economically, socially and environmentally acceptable with participatory approach with the beneficiaries and involvement of community based organization for further operation and maintenance (O and M).

#### Completed Projects

1. **Thergaon UDDT Project:** Urine Diversion Dehydration Toilets (UDDTs) at Thergaon village, District Nashik, Maharashtra, India

The project is implemented with the support of European Union's Asia Pro Eco Program at village Thergaon at two locations: 1 UDDT for family of Farmer for 30-35 members and 2UDDTs for 10 male and female labours in grape farm. In UDDT diverts urine, fecal matter and anal cleansing water into separate collection chambers. Urine and fecal matter are sterilized and composted respectively and being reused as a natural fertilizer in the owners' farm. This technology includes minimal maintenance expenditure along with large reuse potential output.

This project has been carried out on a pilot scale and has achieved success in its expected working and output. The farmers are experiencing 20 to 30% increase in the yield.

No. of people served: 40

Reuse potential: Urine generated is 40 lit/day and faecal generated is 12.8 kg/day so amount of fertilizer generated from urine and faecal in form of NPK is approx. 300 kg/year.

- 2. Sarole Pathar Tribal School Project:** Decentralized Wastewater Treatment System at Shree Baleshwar Anudanit Primary and Secondary Ashram School, Sarole Pathar, District Ahmednagar, Maharashtra, India.

The project is supported by European Union's Asia Pro Eco Program. The school is a tribal residential school with around 500 resident students and staff members. It is a water scared area. The treatment system has been designed to treat only the grey-water from school premises. It comprises of 3 organic filters for grey-water coming from toilets and kitchen which gets further treated in a planted gravel filter treatment system. This treatment system has been designed for the school students and staff members.

With regards to long-term impacts of the project, the main expected impact of the project is improved sanitation at the grass root level and develop awareness regarding water conservation and reuse aspects in the students and the staff members.

No. of people served: 500 girls, boys and staff members

Reuse potential: Treated grey water generated is 12 cum/ day for reuse in kitchen garden and for gardening for plants in school premises.

- 3. DTS system at Adarsha Vidya Mandir college:** Decentralized wastewater treatment system at "Adarsh Vidyaprasarak Sanstha's College of Arts & Commerce", Badlapur, District Thane, Maharashtra, India

This project has been implemented with the initiative of Kulgaon Badlapur Municipal Council and supported by "European Union's Asia pro Eco Program". The whole system comprises of toilet blocks for students including waterless urinals for male students and a treatment system for wastewater generated from the toilet blocks. This wastewater gets treated through a decentralized wastewater treatment system and urine from waterless urinals is collected separately. This system is designed for about 3000 users. The treatment system consists of i) Biogas settler; ii) Anaerobic Baffle reactor; iii) Anaerobic up-flow filter; iv) Planted Gravel Filter; and v) Polishing pond. The treated wastewater and urine as a natural fertilizer is being reused for gardening purposes. This concept not only meets the sanitation needs of the users, but also protects the environment and raises awareness amongst them about the importance of water and sanitation in promoting health and hygiene.

This project has received '**National Urban Water Awards (NUWA)**', 2009 in Special Category by Ministry of Urban Development, Government of India by the hands of Honorable President of India Smt. Pratibha Devisingh Patil.

No. of people served: 3000 students, staff members and floating population during vacation period.

Reuse potential: Treated waste water generated is 8 cu m/day is using for garden in school premises.

Urine 300 lit/day of which fertilizer value in form of NPK is 1890kg/yr which Kulgaon- Badlapur Municipal Council is using for school premises and the gardens in the town.

#### **4. Urine Diversion Dehydration Toilets (UDDT), Mahabalipuram, Tamil Nadu:**

The project comprises of 3 UDDTs squatter families; 1 UDDT each for 3 families of having 5 members in each family. The UDDT diverts urine, fecal matter and anal cleansing water into separate collection chambers. Urine and fecal matter are sterilized and composted respectively and being reused as a natural fertilizer in their gardens. Before construction of UDD toilets, wastewater from all the toilets in the project site was directly discharged into their gardens. This technology includes minimal maintenance expenditure along with large reuse potential output.

No. of people served: 3 families i.e. 15 persons

Reuse potential: 15 lit of urine /day and faecal compost 4.8 kg/day. The amount of fertilizer generated from urine and faecal in form of NPK is approx. 112.5 kg/year.

#### **5. Kamalini Kuteer Resort Project:**

Decentralized wastewater treatment system at Kamalini Kuteer Resort, Distric Pune, Maharashtra, India.

The resort is at the bank of river and the owner of the resort was aware of the need of water conservation and thus, interested in implementing some reuse techniques in his resort, due to which the resort can treat its wastewater. Along with a one-day outing refreshment place, it also has residential facilities encompassing maximum customers during weekends. The system has been designed considering the peak inflow of the customers. The system consists of i) Settler; ii) Anaerobic Baffle Reactor; and iii) Anaerobic up-flow filter. This system treats the wastewater coming from all the sections of the resort. The treated wastewater is being reused in the resort premises for irrigation purposes.

Water quality tests of the treated water have been carried out and are well within the norms subjected for reuse of wastewater for irrigation purposes.

No. of people served: Fixed and floating 30

Reuse potential: 5 cu m/day treated waste water.

#### **6. Oasis resort Project:**

Oasis resort had an already existing treatment system. Due to its inefficiency in treatment; constructing an efficient treatment system was the client's requirement. The present treatment system has been designed in accordance with the basic structure of the earlier treatment system.

A decentralized wastewater treatment system has been designed for approximately 1000 users which include permanent residential staff members and floating population of customers. The treatment system consists of i) Oil and grease trap; ii) Settler; iii) Anaerobic Baffle Reactor; iv) Anaerobic up-flow filter. The

wastewater from all the sections of the resort will get treated in the system; get collected in a collection chamber and the treated wastewater will be reused for irrigation purposes in the resort premises only.

This is an on-going project. Reuse aspects, reuse potential and other details can be stated after project commencement.

No. of people served: fixed and floating 700

Reuse potential: 14 cu m/day treated waste water generation, which is used for gardening purposes in the resort premises which is of 3-4 acres.

### **Feasibility Studies done by ESF:**

#### **1. Feasibility study for Proposed Dronagiri SEZ project of Reliance Limited at Navi Mumbai:**

The proposed SEZ was for development of integrated township at Dronagiri area in Navi Mumbai. Requirement of sanitation facility was for logistic center which was expected to be there for five years so the study was made for sanitation facilities for the period of five years and which can be dismantled later. The treated water was proposed to reuse for the existing nursery.

No. of people proposed to serve: 1073

No. of reuse potential proposed: 70 cum/day treated waste water generation

#### **2. Techno economic feasibility study for sanitation and sewerage management for Pandharpur Town:**

Pandharpur town – a prosperous 'B' class Municipal Council in Solapur district – is famous for ancient temple of Lord Vitthal and has become one of the most important pilgrimage towns in India. Millions of devotees 'warkari's' take great efforts to visit the town. Annually about 1.5 crore devotees visit Pandharpur. Maximum pilgrims visit Pandharpur during four wari periods whereas daily visitors' influx exceeds 20'000 per day.

The Maharashtra Pollution Control Board (MPCB) has taken up the issue of improving the sanitation situation, initiating the Program called "Environmental Improvement Program at Religious Places in Maharashtra" in which Pandharpur has been selected as one of the places. The task was to prepare "Techno Economic Feasibility Study for the Sanitation and Sewage Management for Pandharpur and the adjoining areas", based on ecosan principles.

The study is aimed at improving the sanitary situation of the town by offering a sufficient and properly maintained number of sanitary facilities with an effective and sustainable treatment of the wastewater. The main issues considered were to decongest the core area of the city, to offer adequate staying facilities and decentralizing the pilgrims thus breaking down the challenge into more controllable units.

The study considered essential in the planning of the future evolution of Pandharpur as a town as well as important pilgrimage place. The study aimed at improving the sanitary situation by offering a sufficient and properly maintained number of sanitary facilities alongside with an effective and sustainable treatment of the wastewater. In order to achieve the objectives the overall management of the pilgrims has to be addressed, such as to decongest the core area of the city, to offer adequate staying facilities, decentralizing the pilgrims and the according businesses and waste production – hence actually breaking down the challenge into more controllable units. The participatory approach with the stakeholders and future beneficiaries of the outlined strategy, especially the Pandharpur Municipal Council and its staff and other local stakeholder representatives under the guidance of MPCB Zoning Atlas team enabled the Team

and Partners of Ecosan Services Foundation to carry out the study, taking into consideration all the essential facts, figures and numbers that shall lead the way to the bright future of Pandharpur Town.

The project findings are forwarded to the concerned stake holder for further implementation. MPCB is keen to ensure that the projects proposed are implemented in time bound & systematic manner.

### **Ongoing Projects**

#### **1. Eco-village project at Katewadi, Taluka Baramati, District Pune:**

Under 'Katewadi Eco-village' project, Ecosan Services Foundation (ESF) has been assigned the task of providing sustainable solution for sanitation facilities and wastewater generated in different community locations.

Toilets attached to a decentralized treatment system have already been constructed in the primary school and have been proposed facilities for bus stand and public health care centre for the users.

The three locations are:

- **Primary school:** The toilets and treatment system is designed for 520 students and staff members. Such sanitation projects help to develop positive attitude towards wastewater management systems in the children and the authorities' in-charge. This completed school project is one step in the entire 'Katewadi, eco-village' project.
- **Bus stand:** The toilets and treatment system is designed for wastewater generated from 400 to 500 commuters daily.
- **Near Hanuman temple:** The facilities are designed for wastewater generated from 300 people daily from temple visitors, Panchayat office, marriage hall and public health care center.

Apart from that IEC strategy focusing to sustainable sanitation and reuse of resource oriented approach.

The project will help to promote the Ecosan concept in the village.

No. of persons proposed to serve: 1400 in all three projects

Proposed reuse potential: expected treated waste water generation 14 cu m and urine 500 lit / day. The amount of fertilizer in the form of NPK will be 4000 kg / year.

#### **2. Thane DTS:**

Decentralized wastewater treatment system at Desai and Khidkali housing complex, Thane, Maharashtra, India

A decentralized wastewater treatment system has been designed for about 232 s resident families of the housing complex. Treatment system for the housing complex has been divided into 5 locations having different amount of wastewater generated due to hard rock strata in the premises. The wastewater will get treated in the following 5 components: Settler, Anaerobic Baffle Reactor (ABR), anaerobic up-flow filter (AF), Planted Gravel Filter (PGF). Each house has their own sanitation facilities, the wastewater from which will get treated into the treatment system and will further get reused for gardening purposes.

The project will help reuse and conserve water.

No. of people served: 1100

Reuse potential: treated waste water generated will be 325 kld which will be used for gardening and or flushing.

**Capacity building activities:**

Successful sanitation programs depend critically on effective public awareness and mobilization through ‘Information’, ‘Education’ and ‘Communication’ (IEC). Experiences over the past decades demonstrate that even the technically best designed program fail or produce meager result, because decision makers and intended beneficiaries are not adequately consulted, informed, educated or mobilized.

Hence to promote the reuse of resource oriented approach i. e. ‘Ecosan’, we ESF started capacity building activities with different stakeholders like NGOs, students, professionals, decision makers, builders, educational institutes, technologists, agricultural sectors through training programs, workshops, conferences, village meets, face to face interactions or dissemination of knowledge distribution of material.

In an era of cyber world, philosophy joining hands of technology is also need of an hour! “E” learning courses and internet based school sanitation exchange programs between developed and developing nations has proved to be impacting factor.

School children, future generation of decision makers sharing the ideas on sustainable sanitation is yet another school sanitation initiative along with preparation of school sanitation manual.

No. of people trained through different training programs so far is about 384 as below.

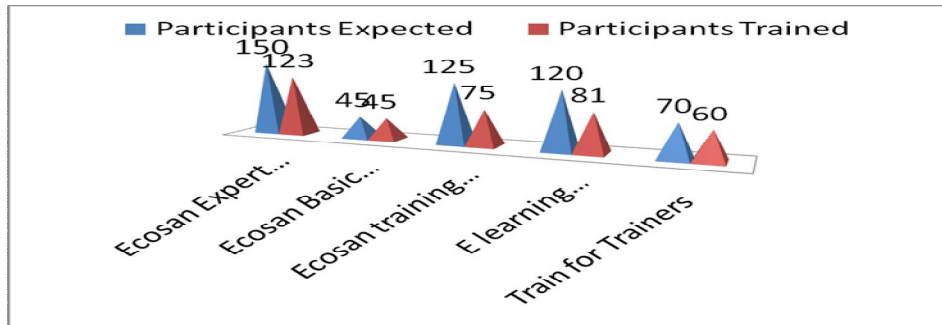


Figure 4: Graph of statistics of training activities

**Conclusion:**

Thus the socially acceptable, economically viable and environmentally sound solution is ‘Ecological Sanitation (Ecosan)’ which closes the loop between agriculture and sanitation. Thus it should be recognized and introduced as the new, promising, holistic and sustainable approach to provide safe and decent sanitation, reduce poverty, contribute to food security, reserve our environment and maintain the natural basis of life, in industrialized, developing and emerging countries.

**References:**

1. en-ecosan-closing-the-loop-2006, Paper by Christein Werner
2. UN (United Nations) (1992): "Agenda 21." – Report from the Conference on environment and development (Earth Summit) in Rio de Janeiro 3-14.6.1992 – Chapter 18 / 18.47, New York, USA, digitally available at:



<http://www.un.org/esa/sustdev/documents/agenda21/english/agenda21toc.htm>

3. UNSECO/GTZ (2006): "Capacity building for ecological sanitation"; 160 pages, digitally available at: <http://www2.gtz.de/Dokumente/oe44/ecosan/en-ecosan-capacity-building-2006.pdf>
4. Including the CD-ROM "Capacity building for ecological sanitation" with educational material on ecosan, digitally available at: <http://www.gtz.de/de/dokumente/en-ecosan-capacity-building-material-2006.pdf>
5. WHO (World Health Organization) (2003): "Looking back, looking ahead. Five decades of challenges and achievements in environmental sanitation and health." - WHO World Health Organization, Geneva, Switzerland digitally available at: [http://www.who.int/entity/water\\_sanitation\\_health/hygiene/envsan/Lookingback.pdf](http://www.who.int/entity/water_sanitation_health/hygiene/envsan/Lookingback.pdf)
6. WHO (World Health Organization) (2006): "Guidelines for the safe use of wastewater, excreta and greywater." – Volumes 1-4; WHO World Health Organization, Geneva, Switzerland digitally available at: [http://www.who.int/water\\_sanitation\\_health/wastewater/gsuww/en/index.html](http://www.who.int/water_sanitation_health/wastewater/gsuww/en/index.html)
7. WHO/UNICEF JMP (World Health Organization and United Nations Children's Fund Joint Monitoring Programme for Water Supply and Sanitation) (2005): "Water for life: making it happen". - World Health Organisation, Geneva, Switzerland, digitally available at: [http://www.who.int/water\\_sanitation\\_health/monitoring/jmp2005/en/](http://www.who.int/water_sanitation_health/monitoring/jmp2005/en/)
8. WHO/UNICEF JMP (World Health Organization and United Nations Children's Fund Joint Monitoring Programme for Water Supply and Sanitation) (2000): "Global Water Supply and Sanitation Assessment 2000 Report." - World Health Organisation, Geneva, Switzerland.