basin–South Asia

Regional Knowledge Platform

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Environmental Improvement – Sanitation

Editorial

Sanitizing Human Settlements…

When sewer lines were introduced in our settlements, it was considered the solution to stop the inhuman practice of subjugating the *Bhangis* (the lower caste in Hindu society) from taking the night soil on their heads to the outskirts of the village. As I grew up, I realized that the person who came to clean our toilets in our house, and the people hired to clean and maintain the toilets with or without sewer lines, continued to be the *Bhangis.* Technologies have rarely been the solution to social problems if it is not accompanied with a rising consciousness, and strong legal provisions.

There is only 7% usage of Sewage Treatment Plants (STPs) in India, most of them do not work. In rural areas of India the number of toilets has grown from a mere 1% in the eighties to only 17.5 % in 2002. This too has happened because it coincided with the women's movement in the country, which has made access to water and sanitation as a stepping-stone in their empowerment trajectory. The story is very similar for other countries in South Asia.

Today environmental concerns are driving the development of technology in the sanitation sector as well. Two important technologies are at the threshold of large scale adoption; the Ecosan dry pit latrines and the Decentralized Waste Water Treatment Systems (DEWATS). I distinguish these technologies as a conservationist's approach to finding solutions as against the STP's that do not simplify a problem but add another layer without wanting to address the fundamentals of reducing needs, and making people responsible towards the environment.

Disasters have always accelerated the development and adoption of technologies. Much of the technologies we use today, are the result of innovations that developed in the two World Wars during the peak of the industrial revolution. 60 years later, after one of the largest natural disasters in recent history, all the Tsunami affected countries are struggling for a solution to sanitation, as they are all faced with the situation of high water tables that prevent the use of leach pits. I expect that the Governments will have little recourse except adopting these two technologies or any other non-conventional systems if they choose to be responsible towards their groundwater.

Faced with all these complications that increasing populations and their waste has caused, Arvindbhai (the Sarpanch of Nalia village that is fast turning into a town) has been struggling to get funds to put a sewer line for his village. He often tells me how he misses the simplicity of walking into the village outskirts, *lota* (tumbler) in hand… *neem* stick in the mouth… and watching the rising sun squatting on a mound.

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Focus

Stakeholders participation in government sanitation schemes

Photo – Nirmal Gram Patrika

Panchayat Leader receiving Nirmal Gram Puraskar, 2006 from the President of India

The day every one of us gets a toilet to use, I shall know that our country has reached the pinnacle of progress.

– Jawaharlal Nehru

Water, hygiene, and sanitation are the most important requirements needed to ensure public health, yet almost half of the world's population (2.4 billion people) lacks adequate sanitation and one sixth of the world (1.1 billion people) has no access to safe and affordable water. The lack of these basic necessities is concentrated in poorer, developing countries, and affects both the urban and rural areas. According to the World Health Organization, 80% of all disease in the developing world is associated with lack of access to safe drinking water, inadequate sanitation and poor hygiene.

Sanitation refers to safe management of human excreta and includes both the "hardware" (for example latrines) and the "software" (for example hygiene promotion) needed to reduce faecal-oral disease. Environmental sanitation is a broader term, which encompasses excreta disposal, solid waste management, wastewater disposal, vector control and drainage; in addition to activities covered by the definition of sanitation.

India has traditionally been lagging behind in the area of sanitation coverage, remaining a great cause of concern to the people and governments. Till 1981, sanitation coverage remained abysmally low especially in rural areas, at about 1%. It is estimated that 30 million people in rural areas suffer from sanitation-related diseases. Only 36.4% of the total population in India has latrines, making it one of the weakest nations for sanitation coverage in the world. This results in widespread open defecation causing contamination of the water supply by leaching and runoff, and spread of disease through insect transport. Additionally, there is the problem of dry or basket-type latrines, which require manual removal of feaces. Due to improper removal of human waste, easily preventable diseases as diarrhea, malaria, cholera, hepatitis, typhoid, and polio remain primary causes of death in India, as well as in other developing countries. 2.2 million people in developing countries, most of them children, die every year from diseases associated with lack of access to safe drinking water, inadequate sanitation and poor hygiene. *(WASH Facts & Figures, 2003)*

Sanitation and water affect not only health, but other important aspects of life as well. Girls drop out of school once they reach adolescence because of lack of privacy due to no toilet facility. Rights of women are also tested as they are forced to wait until nightfall to defecate in order to preserve their privacy, only to face teasing and harassment by onlookers. The situation is such that in 2001, the United Nations declared sanitation to be one of its main priorities of the Millennium Development Goals, aiming to reduce by half the current population that lacks access to clean water and sanitation by the year 2015. There is a critical need for efforts from all the stakeholders to be able to provide sanitation coverage to all in India.

Total Sanitation Campaign

As a way forward, a "Total Sanitation Campaign" (TSC) programme has been launched by the Government of India in 1999. TSC is the most comprehensive community based programme on rural sanitation in the country, which involves Central Government, State Government and community as partners to provide various sanitation facilities. This programme has reportedly shown some very encouraging results. Sanitation coverage is estimated to have increased from 22 % in 2001 to 30% in 2004. Even the school sanitation coverage is estimated to have increased significantly from 9.15 % in 1993 to 45 % in 2004-05. (Nirmal Gram Patrika, March-May, 2005)

Nirmal Gram Praskar

To further strengthen the role TSC, and recognizing the role of Panchayati Raj Institutions (Village level institutions of local governance) and to motivate them for promoting rural sanitation on a mass scale, an incentive scheme called Nirmal Gram Puraskar (NGP) has been initiated under TSC on 2nd October 2003. The whole concept of NGP is to reward those districts, blocks, and Gram Panchayats, which have achieved full sanitation coverage. The incentive pattern is based on population criteria, with Gram Panchayat getting a minimum of Rupees Two hundred thousand and Districts getting a maximum of Rs. 5 million. These cash incentives are to be utilized by the winners for improving and maintaining sanitation facilities in their respective areas with more focus on solid and liquid waste disposal and maintenance of the sanitation standard. The application forms for Nirmal Gram Puraskar are available on *www.ddsw.nic.in*

Pilicode Village Panchayat – Winner of Nirmal Gram Puraskar

The Pilicode Village Panchayat of Kasaragod District with 5013 families has been selected as one among the 38 Village Panchayats in the country for outstanding excellence in Environmental Sanitation.

This Panchayat, which won the 'Gram Swaraj' Trophy in 1997-98, started its sanitation efforts way back in November 1996, when a survey was conducted and it was found that 2020 families did not have any toilet facilities (i.e. nearly 50% of the then number of families). The Panchayat submitted a project to Government of India for support under RCRSP and received an assistance of Rs. 309 millions. It constructed latrines for all the families and the then Chief Minister Shri E. K. Nayanar declared the Panchayat as a total sanitation Panchayat in November 1997.

The Village Panchayat again conducted a survey after eight years in 2004 and found that 249 houses were without toilet facilities. In the Annual Plan 2004-05, a project was prepared to cover these families as well. In the last two years the Village Panchayat has been taking several other sanitation projects like protecting drinking water wells, construction of sanitation complexes in all schools and holding awareness camps. It has also started paper bag units to eradicate plastic usage and to manage solid waste, linking it with the anti-poverty Kudumbashree programme. The Panchayat has been recognised for its systematic and holistic approach to sanitation taking into account its total coverage with sanitary latrines and prevention of plastic waste from accumulating.

Role of NGOs

NGOs also play a pivotal role in rural areas as they remain in close contact with people. Government personnel many times are not able to develop the necessary rapport with the community and also due to their limitations they are not able to face the challenge of carrying out community centered social development programmes. NGOs are an important resource to adopt

innovative approaches and provide services to support sustainability and effective use. NGOs with personnel work as community activators and good communicators. Thus, the NGOs are equipped to ensure community participation for providing sustainable benefits to the people. They act as catalysts for bringing about a harmonious interaction between technology and social engineering.

School Sanitation Programme in Gujarat

Reasons

- 40% of schools do not have arrangements for drinking water and 38% schools have separate sanitary units for girls.
- 24% of primary school children were found having diseases like anaemia, worm infection, skin diseases, ear infection, myopia, toothache, nightblindness etc.
- As children are more receptive to new ideas, therefore school is the best suitable institution in changing the conditioned habits of people from open defecation to the use of lavatory through motivation and education.

Implementation

The Government of Gujarat launched a project of construction of school sanitation units for girls in primary schools and Safai Vidyalaya (ESI) was appointed as the nodal agency for implementation. The design and estimate of the unit was prepared by ESI and approved by the Government and UNICEF. 110 NGOs in Gujarat were selected to carry out the construction of the units. Before the beginning of construction work, representatives, motivators and masons of NGOs were trained by ESI to ensure standard quality of construction. The teachers of the schools were also trained to train children in toilet usage and maintenance of hygiene.

Maintenance

The success of the whole scheme depends on the proper maintenance of sanitation unit. Emphasis was given on cleaning of toilets and careful personal usage including washing of hands. A workable maintenance system such as buckets, brush and broom were provided before the units came into operation.

Environmental Sanitation Institute

The Environmental Sanitation Institute, along with its parent NGO Safai Vidyalaya in Gujarat, has been working for more than 40 years to implement proper sanitary practices like washing hands, using latrines for human waste, using soakage pits for wastewater, and using trashcans for garbage through both training and construction to improve these conditions. In order to sensitize sanitation workers to the needs of the community so that their efforts are successful, proper training and education is a necessity. Training that is holistic and practical is given at all levels, from professionals in the field of water and sanitation to grassroots NGO workers to village panchayat to ensure materialization of concepts as well as sustainability.

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Ecological Sanitation: Success story from Sri Lanka

Ecological sanitation is a sustainable, closed-loop sanitation solution. This is in contrast to most conventional solutions, which in many situations discharge pathogens (the tiny agents causing disease in humans), and nutrients into groundwater, rivers, water bodies or the sea. Ecological sanitation regards excreta as a resource rather than a waste. Though ecological sanitation has widespread applicability, it is especially suitable for use in waterlogged or water scarce areas and also in situations where sewers are overloaded or there are impermeable strata such as rock at the surface.

The concept of ecological sanitation was introduced in Colombo when the National Water Supply and Drainage Board, Rural Water Supply Division,(NWSDBRWS) faced problems in delivering sanitation to communities in waterlogged areas in Kalutra District, Sri Lanka. The idea of implementing ecological sanitation was initially crystallized when the experience of developing dry-compost toilets with communities in south India was shared in a conference in January 2000. In early 2001 the island's first workshop, training course and pilot demonstration of this ecological approach to sanitation took place.

Under the initiative, the NWSDB contributes the construction costs of the demonstration toilets while EcoSolutions, a private agency, provides workshops, trainings, support and follow-up costs. In the system approach being promoted, the urine is diverted at source and, since it contains up to 90% of the plant nutrients, it is fed directly to bio mass. Vegetables, flowers and fuel wood may be grown on this resource. The faecal matter is contained, without odour, in a pair of small chambers beneath the toilet where its volume is reduced by dehydration or decomposition and the pathogens are destroyed. Once a year this material can be applied to plant beds, horticulture etc. as it is an excellent soil improver.

EcoSolutions, NWSDB, Sarvodaya Rural Technical Services and Sevantha have started the construction of demonstration toilets in Kalutara District, Matale and on the edge of Colombo in Ratmalana and Moratuwa. Now 30 toilets have been built and are in operation out of which 10 are in rural areas with high water table.

Photo – Hunarshala

Ecosan Drypit Latrine

What does ecological sanitation do?

- Sanitizes human excreta (making it safe by killing the pathogens it may contain)
- Prevents the pollution of rivers, sea, groundwater and water bodies
- Minimizes water use (conserving this precious resource for more useful purpose such as drinking, cooking and bathing)
- Safely recycles the valuable plant nutrients that are contained in our excreta (thereby helping to improve soil structure and fertility and reduces dependence on chemical fertilizers and pesticides).

Adapted from the original article by
Paul Calvert; Ajith Seneviratne;
D.G.J. Premakumara; Udani A. Mendis
from Volume 21No.1issue of Waterlines magazine
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www.itdgpublishing.org.uk/waterlines.htm

Focus

Sanitation Solutions in Post-Tsunami Reconstruction

Photo – Hunarshala

DEWATS, Nagapattinam Experience

Nagapattinam district of Tamil Nadu in India has become synonymous with tsunami reconstruction with over 20.000 new houses being built through various reconstruction initiatives. Prior to the tsunami, most houses in the district did not have access to proper sanitation facilities. Defecation along the sea coast, in open spaces and bushes was common. This resulted in lack of privacy and concentration of pollution of ground water. Contamination of water is relatively easier in these areas due to high water table from ground level to a maximum of about 18 feet. The soil types in the district vary from sandy soil to sandy silt soils and sandy clay soils.

The ground water was extracted from shallow hand pumps on site, and used for various purposes according to its quality, from drinking to bathing and washing, as in addition to the public supply. Nevertheless, the mentioned quality was not based on pollution but on acceptability by taste, color or odors.

Health and safety issues were an important concern, particularly amongst women. Due to the lack of privacy, they could only go for defecation in the earliest hours of the day or after sunset. Lack of basic hygiene facilities led to health problems mainly for teenage girls. Similar ill effects of bacterial infection were seen in children.

The open disposal of excreta led to easy contamination and spread of diseases from faecal matters. Saline water was creating major health problems, not only to do with the skin, but also kidney.

The women population of the village showed a strong will to have individual toilets for themselves and their children. With the efforts of the community people now have the opportunity of having a toilet close to the house, particularly when suffering from any sickness, age related problems, or situations like rainy days and floods.

One of the most commonly used sanitation methods is the Septic Tank Method with direct soak pits in area of low water table. Though used for many years, septic tanks with leach pits pollute the high ground water. They do not work in cities and have higher chances of failure in villages.

However, there are a few new techniques that have been implemented to make proper sanitation available in the reconstructed houses in Nagapattinam.

ECOSAN

Another method is to use the '*ECOSAN*' dry pit latrine. This resembles a dry toilet where human waste and urine are collected separately. The user drops the human waste in the drop hole, passes urine, which flows down and gets collected in a pot outside the toilet. The 2 feet rests are longer than the steps in normal toilets. This allows the users to move a few inches backward and wash. The wash water is collected by a pipe in a small filter bed outside the toilet where salt absorbing plants like Canna indica are grown. After using the toilet every time a cupful of ashes/sand/saw dust is sprinkled over the excreta before it is closed with the lid. The first pit is used for 9 -12 months, when full, is sealed and the second pit is used. The excreta in the first pit becomes nutrient compost within 6 - 9 months, and is taken out and used in the farms. The ash prevents foul smell, keeps the flies away and absorbs moisture.

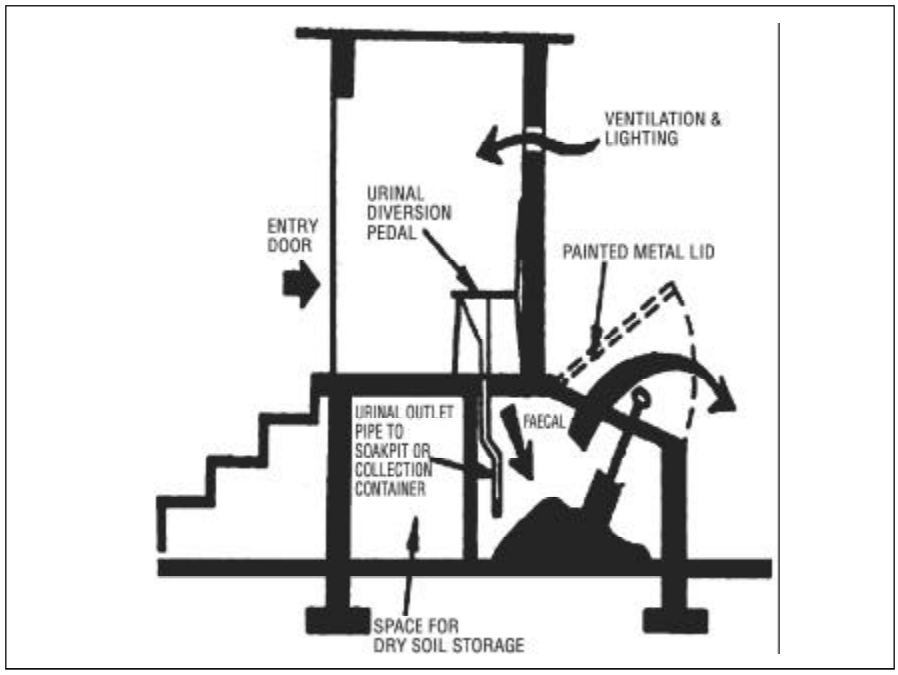
Trickling Filter Sewage Treatment Plant

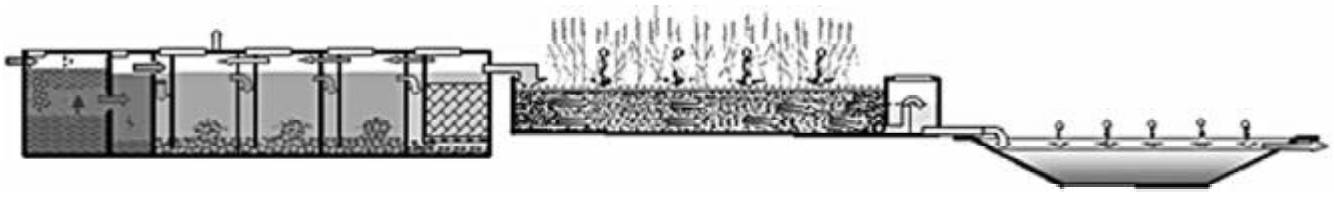
Another option being used is to have a Trickling Filter Sewage Treatment Plant in the village vicinity. Here the water is collected through house chambers from the households and is taken to a collection sump. Then it is pumped to septic tank and gravity carries it to recirculation sump. It is once again pumped to filter bed. This process is repeated five times. Then gravity takes the wastewater to treated collection sump and finally it is disposed for irrigation.

Decentralised Waste Water Treatment System

By most standards, the most effective answer to the sanitation problems of the newly reconstructed settlements is to have '*Decentralized Waste Water Treatment System or DEWATS* installed. DEWATS is a sewerage recycling technology that has been developed using the experience of several existing technologies.

This technology has been developed for countries of the southeast with primary support from the German cities and





government. In India this technology is being used for the past 15 years with varying capacity up to 3 lakh litres per day. This technology has been approved by CPCB (Center Pollution Control Board). There is a consortium for dissemination of DEWATS with 27 organizations in India. This existing capacity can be mobilized for designing and implementing DEWATS.

The different components of DEWATS include settler, anaerobic baffle tank reactors, aerobic filter, horizontal gravel filter and polishing pond. Baffle reactors & anaerobic filters act as breathing chambers for bacteria which digest sewerage and bring the BOD and COD down to 100 mg per litre and 30 mg per litre respectively which are acceptable standards.

Community toilets for permanent shelters may not function very well. DEWATS can be used at settlement level or at cluster level. It has lot of design flexibility and can be designed for few to many toilets. This technology doesn't require high investment like centralized treatment plant. However, this requires more space to implement the design. As it works mostly on the basis of gravity, very little pumping is needed and hence energy and maintenance costs are low. However, a good technical know-how for this system is essential for its proper functioning. More than 100 DEWATS based sanitation systems are functioning in the country. Prefabricated systems are also available and they ensure quality & fast construction.

The above-mentioned technologies, as per the need and capacity of the people, may be used separately or in a suitable combination to give the sanitation profile of the district a much-needed facelift. Many people who did not have access to proper sanitation before the tsunami are now enjoying improved and hygienic sanitation coverage through the implementation of some of these technologies. This has resulted in improving the overall health scenario of the area by not giving any breeding ground to potential epidemics and other water borne and sanitation related diseases. This has helped save many lives and also improved the overall quality of lives of the residents of coastal areas. However, more such efforts are required across the country if India has to achieve its UN Millennium Development Goal of making the nation open-defecation free by the end of 11th Five Year Plan in 2012.

SWOT

	Strength	Weakness	Opportunity	Threat
Sewage Treatment Plants – Conventional	social acceptance	maintenance cost very high	centralized system – easy to control	most STPs do not work in cities
	water reusable for irrigation	capital cost very high		chances of failure in villages is higher
		need technical people for operation		
		chemicals required		
		need to be disposed into sea or irrigation (not ground water)		
Decentralized Waste Water Treatment System	design flexibility	water table below 6 feet for construction	applying alternative solution model	implementation construction
	water reusable for irrigation	more space required	prefab solution – quality control	delay in design preparation
	minimal maintenance	need to be disposed into sea or irrigation (not ground water)	fast installations	relatively new technology
	low cost of maintenance			
	can be maintained by panchayats			
EOCSAN	organic process	people's acceptance crucial for success	applying alternative solution model	people's acceptance
	no groundwater pollution		simple & environmental solution	
	low cost			
	upgradation from existing options			

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Report

Decentralized Waste Water Treatment System (DEWATS) for Anna University Campus, Tamil Nadu, India

Project Background

Funding Agency	:	Bremen Overseas Research & Development Association (BORDA)
Supporting Organization	:	Fertilizer Development & Consultation Organization (FDCO)
Implementing Agency	:	Centre for Environmental Studies (CES)
Construction Period	:	3 months
Construction Cost	:	4.8 lakhs
Start of Operation	:	February 2003

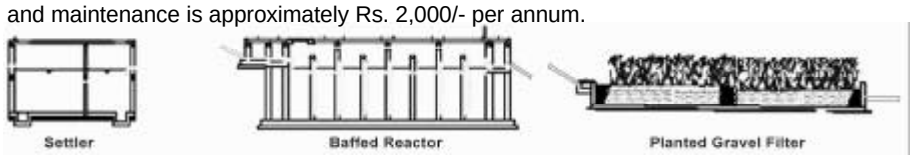
System in brief

The pre-treated wastewater streams are channeled from all sources and collected in a common feeding tank near the treatment systems, which consists of the following modules:

1. Baffle reactor (7 chambers, design capacity of 17.3 m^3 per day) ensures anaerobic degradation of suspended and dissolved solids by mixing fresh wastewater with an active sludge blanket.
2. Anaerobic filters comprise of 12 chambers (design capacity-5.8 m^3 per day) with filter bed for treatment of dissolved organic matter. The system works by bringing wastewater in close contact with active bacterial mass. The bacterial mass grows on the filter material.
3. Planted gravel filter (design capacity – 6 m^3 per day) is the tertiary treatment unit where aerobic and facultative degradation of dissolved organic and pathogen occurs. 6 different filters are used in 6 chambers to analyze its efficiency.

Operation and Maintenance

The wastewater treatment plant is operated and maintained by the university staff. A regular schedule is followed for maintenance, like periodical check of sewer line systems, removal of sludge in settler and baffle reactor. In the planted gravel filter, regular harvesting of plants is done and the filter media is washed once in five years. Cost incurred for operation and maintenance is approximately Rs. 2,000/- per annum.



Reuse Options

Reuse of treated water for gardening and horticulture. Sludge can be transformed into good manure through composting.

Monitoring Results

Monitoring of wastewater flow and its quality is carried out regularly.

Photo – EXNORA International

DEWATS field laboratory at Anna University, Chennai

Salient Features

Source	: Toilets, bathrooms, urinals
Design Capacity	: 20m^3
No. of Users	: 200
Peak flow	: 16 hours
Influent quality	: BOD – 291 COD-461
Effluent Quality	: BOD – 2 COD-31
Efficiency	: Above 95%

Modules Adopted

Baffle Reactor		
Volume	:	20m^3
Area of construction	:	20m^2
Anaerobic Filter		
Volume	:	11m^3
Area of construction	:	7m^2
Filter material used	:	Gravel & Slag
Planted Gravel Filter		
Volume	:	6m^3
Area of construction	:	34m^2
Filter material used	:	Sand, Gravel, Pebbles
Plants used	:	Reed juncas, Canas indica

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ANNOUNCEMENT

Decentralized Basis Needs Services in Urban Planning

A One Day Conference to be held at YASHDA, Pune, Maharashtra, India
12th October, 2006

Workshop Objectives:

- To help local governments to develop a holistic approach for policy, strategic planning and implementation of a sanitation programme.
- To identify opportunities for Decentralized Waste Water Treatment System (DEWATS), Decentralized Solid Waste Management (DESWAM) and integration in mainstream planning for sanitation services.
- To establish a cost effective approach for providing decentralized basic services for Pune and its hinterland with replicability to other Indian cities and towns.

For further details, contact:
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EXNORA International – *info@exnora.org*
International Office – Agenda 21- *ioa21pune@yahoo.co.in*

Regional Knowledge Platform

South Asia

Auroville Earth Institute aims to research, develop, promote and transfer earth-based technologies which are cost and energy effective. These technologies are disseminated through training courses, seminars, workshops, publications and consultancy within and outside India.

Centre for Ecocentric Development and People's Action is a non-profit, non-governmental organization working over the last 14 years for "People Centered, Eco-Centric Development."

Coastal Area Disaster Mitigation Efforts is a network of twenty voluntary organizations working for upliftment and disaster preparedness of Fishing Communities in India.

Exnora works as a catalyst in bringing about local initiative and community participation in overall improvement in quality of life. It aims at developing civic and environmental consciousness among citizens through self-help, enactment of suitable legislation and environmental protection initiatives.

Gram Vikas is a rural development organization, working with poor and marginalized communities of Orissa since 1979 making sustainable improvements in the quality of life of the rural poor. The mission of Gram Vikas is to promote processes which are sustainable, socially inclusive and gender equitable, to enable critical masses of poor and marginalized rural people or communities to achieve a dignified quality of life.

Grambangla Unnayan Committee, Bangladesh is a non-profit, non-governmental voluntary development organization working over the last 12 years for people whose lives are affected by extreme poverty, exclusion, deprivation, illiteracy, disease and handicaps.

Orissa Development Technocrats' Forum is a registered society working to facilitate an effective rural housing delivery system in Orissa through formalizing the rural construction sector and the "Promotion of Appropriate Construction Technologies and Opportunities for Sustainable Livelihoods."

Society of Environmental Journalists, Nepal is a national level media organization working in the sector of environment. Their mission is to build up public awareness on environmental issues by enhancing capacities of local journalists for improved quality, accuracy and visibility in environmental reporting.

Trust for Village Self Governance is a charitable trust focusing on local self governance in villages using Panchayat as a tool. Their focus is on creating sustainable employment and providing opportunities in habitat development.

Unnati is a non-governmental organization working over the last 15 years for "civic leadership promotion and strengthening local self governance."

Aga Khan Planning and Building Services, Pakistan works to improve the built environment, particularly housing design and construction, village planning, natural hazard mitigation, environmental sanitation, water supply, and other living conditions. These goals are achieved through the provision of material and technical assistance and construction management services.

Development Alternatives is a not-for-profit sustainable development enterprise that designs and promotes programmes and products which, through the use of alternative technology, contribute to the enrichment of human life.

Swiss Agency for Development and Cooperation (SDC) is Switzerland's international cooperation agency within the Swiss Foreign Ministry. The Rural Housing Project (RHP) supported by the SDC focuses on providing choices and access to poor rural families for improved housing, especially for affordable, energy and resource-efficient and environment-friendly building material and technologies.

basin-*South Asia* Regional Knowledge Platform (basin-*SA*) is committed to *"developing knowledge systems and promoting collaborative action within South Asia to enable access by the poor to sustainable habitat and livelihoods."*

The South Asian node of global '**basin'** network was set up in 2004 to enable knowledge development and sharing. It seeks to promote collaborative action in the area of habitat and livelihoods for poverty reduction. The parent Network has successfully provided relevant and timely knowledge and resource links to government agencies, financiers, builders and developers, architects, planners and producers of building materials. It houses an intensive knowledge base and supports the regional node in quality management of its products and services.