Cooperation Fund for the Water Sector

Pilot Demonstration Activity

Request Form

Activity Title: Operational Research on Decentralized Wastewater Management & its Dissemination	
Proposer (Name, Div/Dept): Dr. Roshan Raj Shrestha, Environment & Public Health Organization (ENPHO)	
Request Date: 7th October 2002	
Region: Asia	**Country:** Nepal
Activity Start Date: 2003	**Activity End Date:** 2004
Cost Estimate: USD 49,874	
Implementing Organization Contact: ENPHO, P.O.Box – 4102, Kathmandu, Fax : 977 1 4491376; Tel : 4493188; Email : enpho@mail.com.np; rshrestha@mos.com.np	
Consultant Identified? Yes	**If so, Consultant(s) Contact:** Dr. Roshan Raj Shrestha, ENPHO

Short Description:

1. Background and Rational:

Chronic shortage of drinking water and heavy pollution of rivers are the major problems in Kathmandu Valley. Several studies have been and are being carried out on water optimization and wastewater management. Unfortunately, however, many of them have not been implemented to date. Because past plans and programs were very much based on centralized and large-scale projects, they could not be implemented at local level through local authority. Responsibilities should be given to local authority for improvement of the environment by introducing various projects to the local communities. Local people should be involved to sustain the program and also to reduce capital investment. To facilitate this concept, several demonstration projects as operational research should be launched to make local people aware of various technologies and of their applicability. This proposal has been developed in view of the above concepts.

2. Objectives:

The objective of this Pilot Demonstration Activity (PDA) is to demonstrate appropriate technologies for managing domestic wastewater, recycling its nutrients and optimizing water at household level by carrying out operational research and to disseminate the findings at local to regional level. The PDA aims at improving environmental health condition especially for the urban poor, reduce pollution of the natural environment and provide opportunities for economic benefits through reuse and recycling. It also aims at generating information for the government, local authority, planners and professionals with an interest in promoting improved sanitation and alternative options for decentralized wastewater management.

3. Scope of Work/Description of Activities:

Following activities are proposed under this program:

1. Construction of a Community-scale Reed Bed Treatment System (RBTS) of wastewater in Thimi

   Thimi is one of the oldest settlements of Kathmandu Valley in Bhaktapur district. It became municipality only in March 1996. Therefore, most of the infrastructure development like sewerage system, water supply and road network is still under planning phase. Sanitation improvement is one of the urgent issues that need to be addressed by the city where still more than 50 % of the population do not have proper sanitary facilities. Around 1995, a part of this municipality was sewered and wastewater collected by the sewer was supposed to be treated through oxidation ponds. Some works like land acquisition and excavation of pond

was started but could not be completed due to unavailability of the fund required. Consequently, the collected wastewater is discharged completely untreated into the adjoining surface stream which is also a source of water for irrigation. This creates unacceptable environmental and public health risks. It is known that local vegetables grown are initially washed in the untreated wastewater before sold in the market and the downstream farmers irrigate their fields with this untreated sewage. As the connected population and water usage grow in this sewer catchment, the future environmental and public health risks will become more severe than at present. Therefore, there is a need to find sustainable wastewater management systems, which provide improved protection of the environment and public health.

In order to complete the uncompleted project mentioned above, ENPHO carried out a feasibility study in 2001 for building wastewater treatment plant. This study has come up with design and cost estimation of Reed Bed Treatment System. In this system, there will be two units of anaerobic ponds, and three units of reed bed systems (see annex A for detailed layout plan of this system). Fund for this study was provided by SIMAVI, a non-government organization in the Netherlands to Dr. Roshan Raj Shrestha, Executive Chairman of ENPHO who won runner up award in 2000 of SIMAVI's international competition for innovative and workable water and sanitation project.

There are already several RBTSs in Nepal currently being operated successfully. However, all of these systems are associated with private properties (e.g., hospital and boarding school). This will, therefore, be the first municipal system in Nepal, which is expected to set a valuable pilot precedent for larger systems that are envisaged under the ADB-funded Urban and Environmental Improvement Project (Loan 1966-NEP), which just became effective in October 2003.

2. Demonstrate Ecological Sanitation (ECOSAN) system in Khokana (a peri-urban communities in Kathmandu Valley).

Water shortage, poor sanitation and pollution of water resources are now becoming common phenomena in all urban centers in the country. It is time to address all issues together, which is possible through Ecological Sanitation (ECOSAN) approach. ECOSAN is an ecosystem approach to excreta disposal, which prevents diseases, protects the environment, conserves waste and recovers and recycles nutrients. ECOSAN recognizes :

- Human excreta as a resource, not a waste.
- Water is a precious resource that should not be used to transport excreta
- Excreta should be managed as close as possible to its source.

This approach has already been introduced in some of the communities in peri-urban areas of Kathamndu Valley. ENPHO has introduced this technique in Khokana village, Lalitpur district (one of the oldest settlements of Kathamndu Valley and was the business center in the past). Though the area is close to the Patan city, it has its unique character with traditional living style. More than 90 % of the people are still farmers and almost all families have their own land where they cultivate rice and vegetables to sustain their life. Sanitary condition is extremely poor. Only few people have toilet facilities and there is no proper drainage system to carry their excreta. Open defecation is still a common practice of this community. Due to high water table, pit latrines and septic tank systems are not feasible. This area has many ponds, all of which are in hypereutrophic condition due to discharge of wastewater and run off.

After installation of 10 ECOSAN toilets in this community, people are quite impressed with this technique and demanding more. These toilets are spread around the village and, therefore, its impact still cannot be measured. This program is intending to build ECOSAN toilet in one cluster having 20 to 25 households (see Annex B for design cost estimation of ECOSAN system) so that overall concept of ECOSAN system can be demonstrated. Following are some of the benefits that are expected under this program :

- people will stop buying chemical fertilizer to apply in their field,
- sanitary condition will be improved
- water borne diseases will be reduced
- the community will become a demonstration site for others

3. Demonstrate ENPHO building as a Water Optimized House.

   ENPHO is not only providing services for environmental studies in Nepal, but also planning to use its premises as a demonstration site for water and wastewater management. It is currently recycling its wastewater through RBTS and now planning to install Ecological Sanitation Toilets and rainwater harvesting system. Under this program, a partial support will be provided to ENPHO for completion of its plan especially for plumbing for rainwater harvesting and Ecosan toilets.

4. Conduct National Seminar to demonstrate the projects

   Findings of this program will be disseminated through national-level seminar for politicians, policy makers, and stakeholders.

5. Development of Information, Education and Communication (IEC) materials

   Standard IEC materials will be developed for the dissemination of the findings. Materials will be audio/visual, booklets and posters.

4. Implementation Schedule, Institutional Management Arrangements, and Proponent Qualifications:

	I Year				II Year	
Activities	I	II	III	IV	I	II
1. Recruitment of professionals and preparation of detailed plan of action						
2. Project sites investigation, negotiation with local authority						
3. Community consultation & formation of user committee for program implementation						
4. Detail design of the RBTS						
5. Construction of RBTS						
6. Performance evaluation of existing RBTS						
7. Operation of new RBTS						
8. Selection of community for ECOSAN						
9. ECOSAN implementation						
10. Establishment of Water Optimized House						
11. Development of IEC materials						
12. Monitoring and supervision of all projects						
13. Data compilation and quarterly report write up						
14. Organize national workshop						
15. Final report						

Institutional Management

This project will be jointly implemented with Thimi Municipality and communities of Khokana in Lalitpur District. ENPHO will act as a consultant for ADB, which will administer the consultancy contract. Local users' committee will be formed through municipalities and VDCs for maximum utilization of public participation. All of the project expenditures will be administered by ENPHO as per agreement between ADB. For the civil work, ENPHO will hire

local skilled and unskilled labor. Materials will be procured as per ENPHO rules and regulations. It will also be a demonstration project for cost minimization by involvement of local community.

Proponent Qualifications:

Key Professionals :

Name	Proposed Position	Working Experience	Key Qualification	Input
Dr. Roshan Raj Shrestha	Team Leader/Wastewater Management Expert	15 years	Ph.D in Applied Natural Sciences	3 months
Mr. Suresh Shrestha	Civil/Sanitary Engineer	26 years	BE in Civil Engineer	2 months
Ms. Palpasa Tuladhar	Sociologist	2 years	M.Sc in Environment Management	1 months

5. Expected Results (outputs/outcomes/impacts):

1. Introduction of appropriate technologies for community scale wastewater treatment system
2. Demonstration of reuse and recycling of human excreta with ecological approach.
3. Implementation of these technologies at the community level with public participation
4. Awareness on household level water optimization and waste recycling technique
5. Replication of these technologies with people's demand and involvement
6. Capacity building to set up such technologies in future
7. Information and data generation on the various technologies which will help the government and the non-governmental organizations in planning and policy making with regard to water and wastewater issues
8. Dissemination of all techniques at national and regional level.

6. Measurable Performance Indicators:

- River water quality before and after demonstration site of Reed Bed System
- Quality of Wastewater before and after treatment
- Quality of soil after use of human excreta after implementation of ECOSAN system
- Yield of agricultural product
- Sanitary condition within the project area
- Public attitude and awareness towards the technologies

7. Stakeholder Participation:

Municipality, VDCs, Local Communities and Civil Societies will be the main stakeholders of this project who will participate in this project from the beginning.

8. Scope for Replication/Use in Other DMCs:

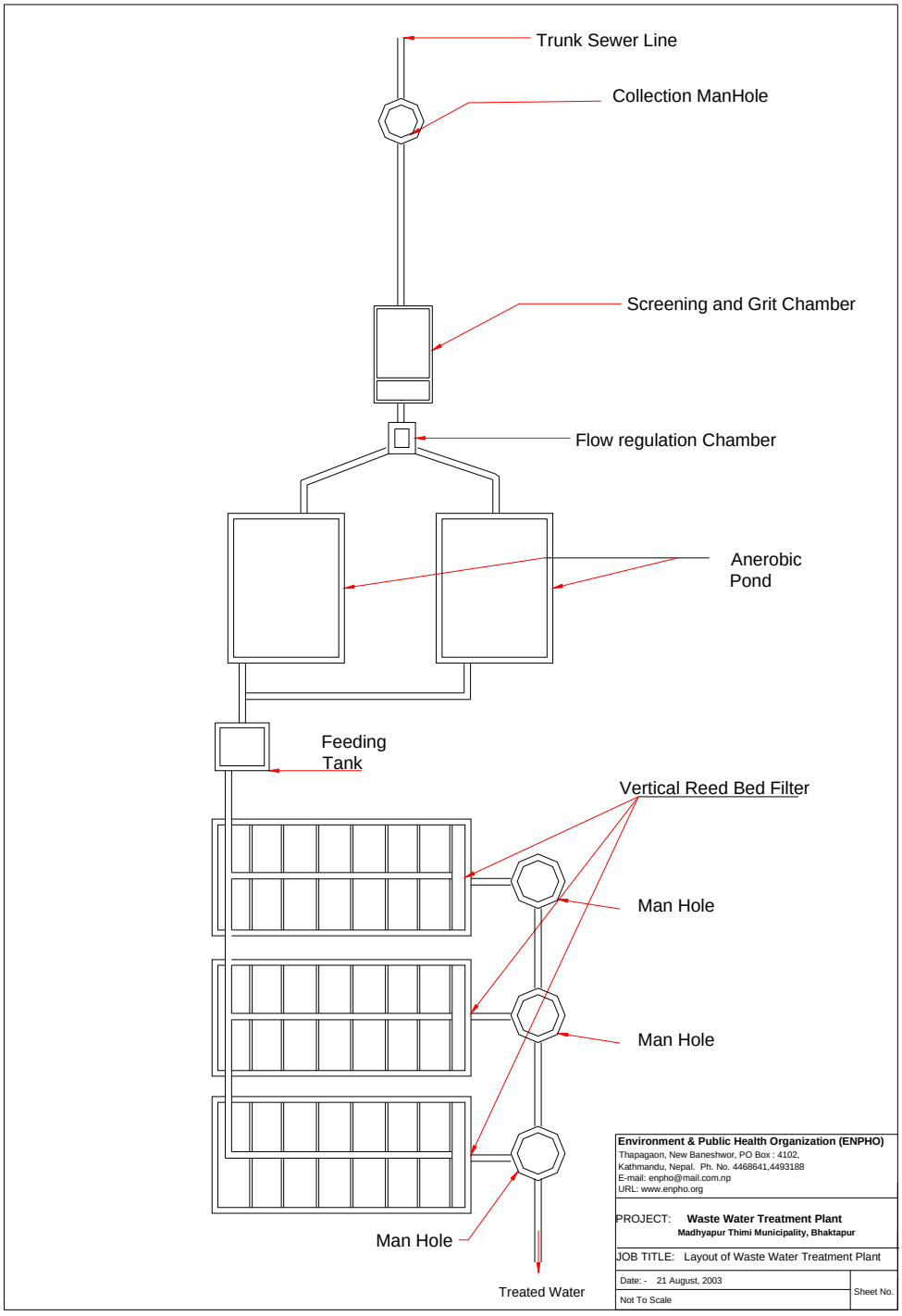
Since the project itself has been designed to prove the system effective at local level, there will not be any doubt for replication of these technologies at national as well as regional level.

9. Cost Estimate:

Activities	Unit man/month	Rate in US $	Total in US $	Remarks
A. Civil Work				
A.1. Construction of RBTS			28000	See detail in annex A
A.2. Demonstrate Ecological Sanitation (ECOSAN) system			4000	See detail in annex B
A.3. Demonstrate Water Optimized House in Kathmandu			1000	See detail in annex C
Sub-Total			**33000**	
B. Awareness & Educational Materials				
B.1. Conduct National Seminar to demonstrate the projects		LS	2000	
B.2 Development of IEC Materials		LS	1500	
Sub-Total			**3500**	
C. Professionals				
C.1 Water and Sanitation Expert, Team Leader	3	1100	3300	
C.2 Civil/Sanitary Engineer	2	650	1300	
C.3 Sociologist	1	650	650	
C.4 Technical Support Staffs 1	6	200	1200	
C.5 Admin Support Staff 1	12	200	2400	
Sub-Total			**8850**	
Total			**45350**	
Overheads 10%			4535	
Grand Total in US $			**49885**	

ANNEX A : Wastewater Treatment System

Layout Plan of Wastewater Treatment Facilities
Detail Cost Break Down of Treatment System


Trunk Sewer Line
Collection ManHole
Screening and Grit Chamber
Flow regulation Chamber
Anerobic
Pond
Feeding
Tank
Vertical Reed Bed Filter
Man Hole
Man Hole
Man Hole
Treated Water
Environment & Public Health Organization (ENPHO)
Thapagaon, New Baneshwor, PO Box : 4102,
Kathmandu, Nepal. Ph. No. 4468641,4493188
E-mail: enpho@mail.com.np
URL: www.enpho.org
PROJECT: Waste Water Treatment Plant
Madhyapur Thimi Municipality, Bhaktapur
JOB TITLE: Layout of Waste Water Treatment Plant
Date: - 21 August, 2003
Not To Scale
Sheet No.

Wastewater Treatment Plant, Thimi

Breakdown of Material and labour cost

SN	Description of material	Total quantity of material	Rate	Amount in NRs	Amount in US$
1	Cement	864.82	355	307009.33	4148.77
2	Sand	63.27	750	47449.56	641.21
3	Aggregate	7.61	1300	9887.68	133.62
4	MS rod	0.00	29	0.00	0.00
5	Brick	275492.11	2.8	771377.91	10424.03
6	Barbed wire	275.00	10	2750.00	37.16
7	Aggle	612.00	60	36720.00	496.22
8	PVC Pipe (75 mm)	375.00	300	112500.00	1520.27
9	PVC Pipe (100 mm)	100.00	450	45000.00	608.11
10	Fittings		L/S	38000.00	513.51
11	Others (binding wire, nail etc)	LS		4795.49	64.80
11	Plantation	2220.00	20	44400.00	600.00
12	Filter material				0.00
	Sand	245.70	1000	245700.00	3320.27
	Gravel	56.70	1500	85050.00	1149.32
15	Sk. Labour	363.95	250	90987.79	1229.56
16	Usk. Labour	2350.58	150	352587.73	4764.70
		Sub Total		2194215.48	29651.56
17	Contigency @ 5%			109710.77	1482.58
		Total		**2303926.26**	**31134.14**

Summary of Project Cost

SN	DESCRIPTION	AMOUNT in NRs	Amount in US$
1	Anaerobic ponds	371234.08	5016.68
2	Reed Bed System	1277254.40	17260.19
3	Feeding tank	42066.88	568.47
4	Drain, Pavement etc.	503660.13	6806.22
	Total	2194215.48	29651.56
5	Contigency @ 5%	109710.77	1482.58
	Gross Total	**2303926.26**	**31134.14**

Note: 1 US$ = NRs. 74.00/-

Fund Sharing

ADB Fund		28000
Community Contribution	in kind	3134
Total		**31134**

ANNEX B : ECOSAN System

Design of ECOSAN Toilet
Detail Cost Break Down

Detail cost breakdown of one unit of ECOSAN Toilet

S.No.	Items	unit	**ECOSAN with double vault**		
			Quantity	Rate	Amount in NRs
1	Bricks	Nos	1070	3	3209
2	Cement	Bags	8.21	345	2832.45
3	Sand	Cuft	28	21	588
4	Aggregate	Cuft	16	35	560
5	MS Bars	Kg	10	30	300
6	Staircase (steel)	Nos	1	900	900
7	Pipe Fittings	Gross	1	800	800
8	CGI Sheets	Nos	2	250	500
9	Angle frame and door	per unit	2	400	800
10	Mason	Nos	6	250	1500
11	unskilled labor	Nos	14	150	2100
12	Door frame, panel	Nos	1	1500	1500
13	Pan	Nos	1	800	800
14	Pan cover	Nos	2	400	800
				Total	**17189.3**
Note: some volume of sand (~ 2 cuft) and aggregates (~4 cuft) is increased					
as these volumes will be filling up reed bed system.					

Fund Sharing per ECOSAN Unit

	Amount in NRs	**in US$**
Community Contribution (in kind)	5000	67.6
ADB contribution	12189.3	164.7
	total	**232.3**

Total number of ECOSAN to be built = 17 units.
Total ADB contribution = US$164.7 * 17 units = US$2,799.9

ANNEX C : Water Optimized House

Detail Cost Break Down

Cost Break Down for Water Optimized House

SN	DESCRIPTION	COST
1	Gutters & its accessories	11,000.00
2	Pipes & its accessories	20,000.00
3	Storage tank	28,835.33
4	ECOSAN toilet	14,100.00
	Total	73,935.33
	in US$	**999.13**