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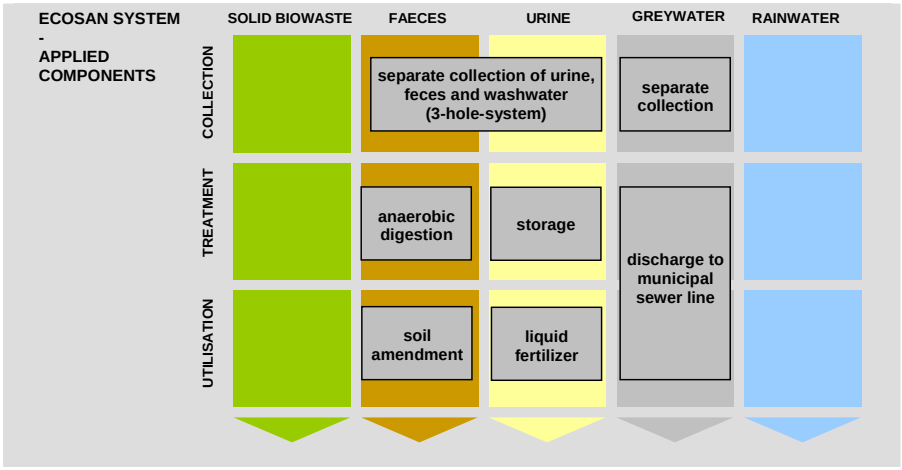
ACTS Eco-friendly Public Toilet Centre

Bangalore, India



1 General Data

Type of Project:
Upgrading of an ecosan public toilet centre in a slum (transition) area

Project Period:
start of planning: 06/1999
start of construction: 03/2000
start of upgrading: 07/2005
expiry of demonstration phase: 01/2006

Project Scale:
one public toilet centre,
ca. 500 - 600 users per day

Address:
Rajendra Nagar Slum, Bangalore, Karnataka State, India

Planning Institution:
seecon gmbh

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, ecosan program

Suma Khadi Gramodyoga Sangha

Executing Institution:
ACTS

Supporting Agency:

Swiss Agency for Development and Co-operation (SDC)

2 Objective of the project

Objectives of establishing an eco-friendly public toilet centre in Rajendra Nagar:

- Improving the living conditions in the slum, minimizing the risk of disease spreading during monsoon flood periods and increasing women's security;

- Recycling of nutrients and organics due to the collection, treatment and reuse of urine and faeces for the production of fertilizer and compost;

fig. 1: ACTS eco-friendly public toilet centre in Rajendra Nagar, Bangalore, India. (source: seecon)

- Generating income for the development of the slum by charging for the use of the toilet, selling of compost and bananas produced;

- Changing attitudes of people and encouraging them to consider human urine and faeces a valuable resource.

Objectives of upgrading the eco-friendly sanitation project:

- As the originally designed logistics concept was often discussed to constitute not only a cultural, but also a hygienic problem, the upgrading should bring about considerable improvement in such conditions;

- Replacing the previously used composting trenches by a biogas plant for the hygienically safe treatment off faecal matter and recovery of biogas;

- Use of biogas as a substitute to LPG (liquid pressurised gas) in cooking;

- Providing capacity for the extension of the sanitation project for future public toilet centres.

3 Location and general conditions

By 2001, the majority of households in Rajendra Nagar, a huge slum with inhabitants of different caste, religion and race, did not have their own toilets. Residents had access to only one functioning communal toilet. Lack of sanitary facilities has not only brought inconvenience but also unhygienic conditions

gtz ecosan program recycling oriented wastewater management and sanitation systems
commissioned by
Federal Ministry for Economic Cooperation and Development

and social problems to the society, particularly to women and children, as they had been forced to defecate in the open field before dawn or after dusk. The toilet centre aims to bring about considerable improvement in such conditions.

4 Technologies applied

The eco-friendly public toilet centre, which comprised 8 cabins (4 for females and 4 for males), was designed in such a way that the squatting slabs were raised about 1.5 metres above the ground level and provided with 3 holes for the separate collection of faeces, urine and water used for primary handwashing.

fig. 2: Squatting slap provided with 3 holes. (source: seecon gmbh)

Collection of urine and faeces (including anal cleansing water) was first done in barrels that were stored in compartments below the squatting slabs. Once a day, the barrels were picked up and conveyed to the ACTS Rayasandra Campus. Faecal matter was co-composted with waste paper and biodegradable waste; urine was applied as a nitrogen-rich liquid fertilizer to banana plantations after storage.

Water used for primary handwashing was drained to an infiltration bed in front of the toilet block and any surplus of water that didn't trickle away was collected in a subsurface collection tank that was emptied when full.

Any surplus of washwater that was not taken up by the planted infiltration bed in front of the public toilet centre was drained to a nearby municipal sewer.

Upgrading of the system with a new haul and pump system for the faeces and a new biogas-plant.

Although the ACTS eco-friendly demonstration toilet centre was successfully in operation for several years, the originally designed logistics and processing concept was often discussed to constitute not only a cultural, but also a hygienic problem. Hence, a socially and culturally more acceptable, sustainable and hygienically safe collection, transportation and processing scheme was developed and implemented with support of the GTZ and seecon gmbh in 2005.

With the improved pump and haul system, holding tanks replaced the barrels for the separate collection of urine and faecal matter. Transportation was done with the existing truck, which was equipped with a vacuum suction unit for the evacuation of faecal material and a self-priming pumping system for emptying the urine tanks.

fig. 3 and 4: Evacuation of faecal matter with the newly installed vacuum system (top). Emptying of urine collection tanks (bottom). (source: seecon gmbh)

The composting trenches at the ACTS Rayasandra Campus were dismantled and Suma Khadi Gramodyoga Sangha, a local NGO, did the design and construction of a new biogas plant so that the faecal matter could be treated hygienically and safe, and so that valuable energy in the form of biogas could be recovered.

fig. 5: Biogas plant at ACTS Rayasandra Campus (source: seecon gmbh)

fig. 6: Sludge drying beds. (source: seecon gmbh)

5 Type of reuse

Faecal matter was treated in a biogas plant and subsequent secondary treatment of the digested slurry was done in sludge drying beds. The dried slurry was applied as soil amendment at the ACTS Rayasandra Campus.

fig. 7: Use of biogas as substitute to LPG in cooking. (source: seecon gmbh)

Source-separated urine was stored in large-capacity plastic tanks before being applied as nitrogen-rich liquid fertilizer to a banana plantation.

fig.8: Banana plantation. (source: seecon gmbh)

6 Further project components

Experiences gained during the demonstration phase (years 2001 to 2006) will now be used for up-scaling of the ACTS sanitation project and future projects in Bangalore and its surroundings.

7 Project history

Grand opening and inauguration of the ACTS eco-friendly public toilet centre in Rajendra Nagar Slum was in August 2001.

The up-grading started in July 2004 and the implementation of the new, mechanized collection and transportation scheme was completed on November 24th, 2005.

The demonstration phase of the ACTS sanitation project expired in beginning of 2006 and the eco-friendly public toilet centre in Rajendra Nagar was therefore closed down on January 8th, 2006.

At present, a survey on new sites for establishing future eco-friendly public toilet centres is conducted.

8 Costs

In connection with the phasing-out of the demonstration project in Rajendra Nagar and the intended upscaling of the eco-friendly sanitation project, a cost-revenue analysis was conducted. This was based upon experiences gained during the last five years of successfully running an eco-friendly public toilet centre in a slum area; assumptions in regard to capital costs; operation & maintenance requirements; travel costs; the fertilizer equivalent of human excreta; the nutritional requirements of banana plants; and the income generation by collection of user fees and selling of bananas.

The findings of this analysis, which are summarized in table 1, indicate that running a large scale eco-friendly sanitation project that is relying on a pump and haul service system for the collection and transport of source-separated flow streams, can be economically viable under certain conditions (e.g. optimizing frequency of service runs, collection of user fees, reuse of biogas as a substitute to LPG, reuse of recyclates in agricultural production and selling of produce, etc.).

9 Operation and maintenance

Project supervision was done by the local NGO ACTS.

Operation and maintenance of the toilet centre, the transport of faecal matter and urine to the processing and reuse site at the ACTS Rayasandra Campus and operation and maintenance of the biogas system were done by a trained group of 6-8 local employees.

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capital costs:		
5 toilet centres	38,000 – 50,000	53,000 – 76,000
treatment facilities (biogas plants, large capacity urine storage tanks)	22,000	47,000 – 53,000
2 trucks equipped with vacuum suction units	50,000	90,000 – 100,000
total	**110,000 – 122,000**	**190,000 – 229,000**
recurring costs:		
operation of vehicle (fuel, insurance,taxes, maintenance, …)	5,300 – 8,400	5,300 – 8,400
wages (caretakers, drivers, aids to drivers, plantation manager, …)	7,400	7,400
O&M of toilet block	800 – 1,300	800 – 1,300
land lease and banana suckers	2,900	2,900
total	**16,400 – 20,000**	**16,400 – 20,000**
income:		
user fees	6,000 – 12,200	6,000 – 12,200
savings due to use of biogas as a substitute to LPG in cooking	8,600 – 10,400	8,600 – 10,400
selling of banana	1,600 – 26,800	1,600 – 26,800
savings due to use of humanure instead of chemical fertilizers and selling of compost	2,900 – 12,900	2,900 – 12,900
total	**19,100 – 62,300**	**19,100 – 62,300**

1 € = 59,60 INR (as per 03/08/2006)

Table 1: Findings of a cost-revenues analysis on the upscaling of the eco-friendly sanitation project

10 Design information and technical specifications

The source-separate collection of urine and faeces was developed, considering wet anal cleansing habits in India.

The toilet centre with 4 toilet compartments for women and 4 for men was designed to serve up to 1,000 users per day.

The floating-drum type biodigester with water jacket, which was installed at the ACTS Rayasandra Campus, has a reactor capacity of ca. 40 m^3 (inner diameter: 3,80 m; height: 3,70 m).

11 Practical experience and lessons learned, comments

- The slogan "ecosan - an approach to human dignity, community health and food security" is clearly implemented in this project: The project shows a positive impact on the dignity and health of the toilet users and the urine and faeces are successfully used to produce high quality food (bananas) and biogas.
- "Closing the loop" in terms of nutrients-cycles between urban areas (consumer areas) and rural areas (production areas) is feasible and opens new economical options.
- A strong local organizational embedding and a good long-term management of the ecosan-technology are key prerequisites for a successful and sustainable project operation. A strong local project partner and manager is crucial for the project.
- Planning an ecosan-system is not a green-desk-job but needs stakeholder involvement.
- Communication plays an important role to prevent misunderstandings and political or institutional problems. Involvement of "critical voices" helps to develop the projects efficiently. Public or individual concerns have to be considered as deciding inputs for project planning, improvement, adjustment, etc.
- The project development has to consider and synthesise relevant political, institutional and technical issues into an integrated system and communication design.
- Even generating income and workplaces the project depends on external financial support. This problem could be solved developing new contracting systems involving and obligating the local authorities (private-public-partnership approach).
- Failures are unavoidable and have to considered essential elements of the learning process.
- Long-term experiences and internationally embedded research are very important: After 4 years of project operation, communication, the project reached a national and international recognition.

12 Available documents and references

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Wafler, M. et al. (2005): Conference pre-printings "9th International Conference 25-26 November, 2005; Mumbai, India"

Wafler, M. et al. (2006): Conference pre-printings "The International Ecocity Conference 6 (ecocity6)" 6-9 August, 2006; Bangalore, India

13 Institutions, organisations and contact persons:

Project owner:

ACTS
P.O. Box 9529, Bangalore - 560095, India
phone: +91-(0)80-25531154
phone: +91-(0)80-25531024
fax: +91-(0)80-25533387
email: gnanakan@vsnl.com
web: http://www.acts.co.in/

Technical consultancy:

seecon gmbh
Bahnhofstrasse 2, 6110 Wolhusen, Switzerland
phone: +41-(0)79-3666850
email: johannes.heeb@seecon.ch
email: martin.wafler@seecon.ch
web: http://www.seecon.ch

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH
ecosan program
P.O. Box 5180
65760 Eschborn, Germany
phone: +49-(0)6196-794420
fax: +49-(0)6196-797458
email: ecosan@gtz.de
web: http://www.gtz.de/ecosan

Technical planning/implementation:

Suma Khadi Gramodyoga Sangha
532, 2nd Main Road, Gandhi Nagar, Kolar-563101, Karnataka State, India
phone: +91-(0)815-2225370
email: biogas@vsnl.com

Supporting agency:

Swiss Agency for Development and Co-operation (SDC) - Head office
Freiburgstrasse 130, 3003 Berne, Switzerland
phone: +41-(0)31-3223475
phone: +41-(0)31-3241348
email: info@deza.admin.ch
web: http://www.sdc.admin.ch

data sheets for ecosan projects

authors: Ken Gnanakan, S.S. Wilson, Martin Wafler, Johannes Heeb

Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

ecosan program

Dag-Hammarskjöld-Weg 1-5
65760 Eschborn, Germany
T +49 6196 79-4220
F +49 6196 79-7458
E ecosan@gtz.de
I www.gtz.de/ecosan