Case study of sustainable sanitation projects

Improved traditional composting toilets with urine diversion, Leh, Jammu and Kashmir State, India - draft

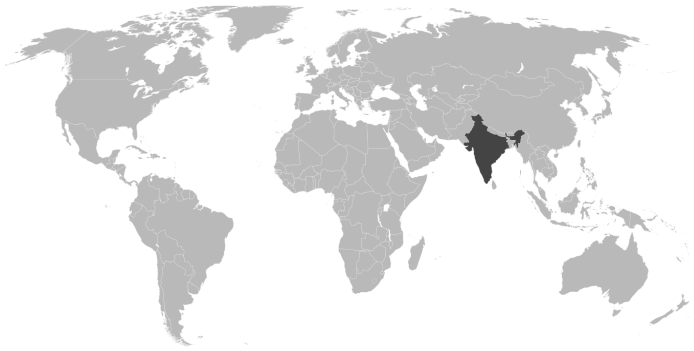

Fig. 1: Project location

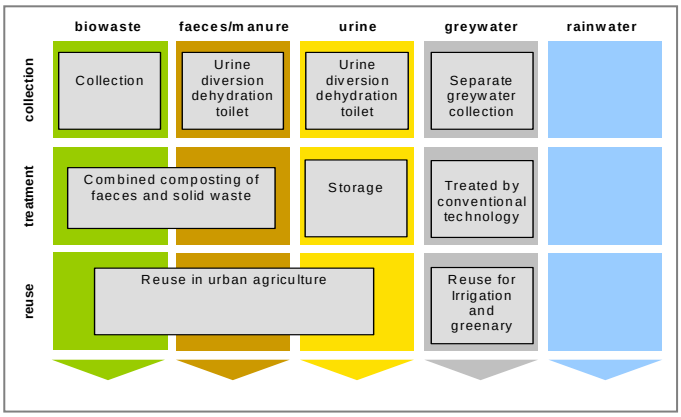

Fig. 2: Applied sanitation components in this project

1 General data

Project Part 1

Type of project:
New constructed demonstration facility in an Ecology Center guest house

Project period:
Start of planning: 1985
Start of operation: 1986

Project scale:
1 demonstration toilet (a traditional Ladakhi toilet, improved by ventilation). It is used by approx. 100 persons per day.

Address of project location:
Ladakh Ecological Development Group (LEDeG)
Karzoo, Leh, Ladakh 194101
Jammu & Kashmir, India

Planning institution and executing institution:
LEDeG

Supporting agency:
None

Project Part 2

Type of project:
Implementation of separation toilets.

Project period:
Start of planning: 2005
Start of operation: 2006

Project scale:
8 ecosan separation toilets (large scale promotion is planned)

Address of project location:
Leh, India

Planning institution:
LEDeG

Executing institution:
LEDeG
Technical support: Eco-Solutions, Kerela (India)

Supporting agency:
Financial assistance: BORDA, Germany

This case study is in draft form. Further information is currently being collected by GTZ-ecosan team.

2 Objective and motivation of the project

This project represents rather the revitalisation of the traditional ecological sanitation practice that is threatened to fall into oblivion than the introduction of innovative technologies. Therefore it serves educational purposes by

- presentation of the improved traditional Ladakhi sanitation and reuse concept to local, national and international visitors of the Ecology Center
- information about the advantages of the traditional system and research and development on possible improvements to optimise the utilisation and
- awareness raising that waterborne systems are no viable option for the region.

Fig. 3: The project region of LEDeG in Ladakh, Jammu and Kashmir, Northern India (Source : www.wikipedia.org)

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3 Location and conditions

Ladakh ("Little Tibet") is one of the last remaining traditional cultures on earth. It is located in the north of India in the east of the federal state Jammu and Kashmir and borders on China. Ladakh has about 270,000 inhabitants. The capital is Leh with 27,000 inhabitants. The region is sparly populated (3/km²) and the average household size is 4.7 (1981) persons per household. Leh is situated in a mountainous desert 3,500 m above sea level with long cold winters and severe water scarcity with rainfall below 100 mm per year. In the seventies of the last century, tourism came to Ladakh undermining traditional agrarian lifestyle and values.

In the case of sanitation, especially in Leh people try to replace traditional sanitation systems by waterborne toilet systems. This development e.g. increases water supply problems and pollution of surface and groundwater due to leakages and disposal of untreated wastewater. The waterborne systems often simply drain into the irrigation systems of the urban and peri-urban agriculture of Leh, leading to smell and hygienic concerns. An additional problem of waterborne systems in this region is freezing of pipes during winters with temperatures reaching minus 30 °C.

In 1978, the ecological Ladakhi project was founded with participation of the International Society for Ecology and Culture ISEC (GB) in order to preserve and develop ways of living adapted to the local conditions and values.

As a continuation in the meanwhile, the influential indigenous non-governmental organisation (NGO) LEDeG has been actively promoting, among others, adapted ecological technologies for renewable energy generation and locally manufactured household and agricultural devices which can now be found all over Ladakh. LEDeG is running an Ecology Center for visitors in Leh establishing a soft tourism and facilitating close contact of tourists to the nature-based life of the Ladakhi society. In the center, a demonstration facility of the traditional Ladakhi toilet system is implemented.

Fig. 4: Ecological farm house in Ladakh (source: ISEC)

4 Project history

The start of planning was in 1985 to revitalise the traditional waterless sanitation system. In 1986, the demonstration toilet was build.

The second component of the project includes the implementation of different sanitation systems. Therefore 8 ecosan separation toilets were built in 2006.

5 Technologies applied

Traditional Ladakh toilet system:
The toilet at LEDeG is used by the workers and visitors of the LEDeG Ecology Centre in Leh. It is based on the traditional local toilet system, improved by a black-painted vent-pipe (like in VIP latrines) to ventilate the collection chamber and reduce annoyance by flies. The traditional Ladakhi toilet system is well described in the book "Ecological Sanitation" published 2004 at SEI: "Most traditional houses have an indoor toilet on the upper floor (see Fig. 6).

Due to an extremely dry climate it is possible to process human excreta indoors without prior diversion of urine, by using a combination of soil composting and dehydration. On the floor of a small room upstairs, typically in some distance to the kitchen/living room, there is a thick layer of soil from the garden. In the floor, a drop hole leads to a small ground-floor room. This room can only be reached from the outside. People excrete on the soil which is on the floor. Then they push soil and excreta together down the drop hole. Urine goes the same way. Ashes from the kitchen are added from time to time.

The household members bring loads of soil into the room when necessary. For the long winter (September–May), a supply of soil is piled into one corner of the toilet room upstairs. A spade or shovel is also kept in the room. Normally there is no anal cleaning. The decomposed excreta are removed in spring and again at the end of summer and spread on the fields.

As long as the toilet is well maintained and enough soil is pushed down the drop hole every day, there are no odours. In some cases there might be a faint smell of ammonia from urine splashed on the soil-covered floor of the toilet room. There is no fly breeding due to the dryness of the soil/excreta pile. The system has worked well in rural areas for hundreds of years, but in recent years there have been some problems in the central part of the town of Leh where households have no easy access to soil."

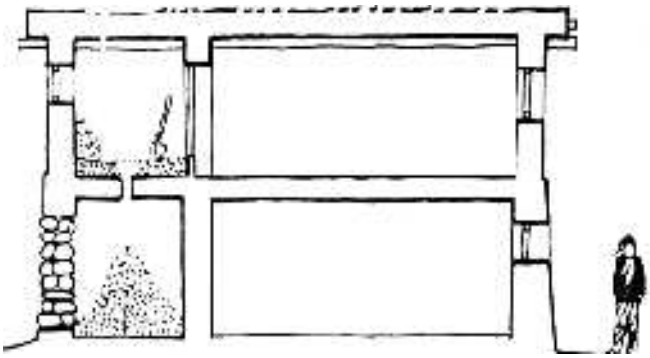

Fig. 5: Section of Ladakhi toilet (source: EcoSanRes)

Other problems occur e.g. in places rented out to people with different toilet behavior like utilisation of water for anal cleansing. This increases the moisture of the material to be disposed and thus odour and fly breeding. Also the removal of humid excreta mixture gets more difficult, so that people sometimes refuse to do it properly.

Open question and interest of LEDeG is to design, improve and promote the system in a way, that it can be commonly used in guesthouses etc. were currently waterborne systems are introduced and causing problems for Leh.

In the authors´ perception, the owners of the guest houses as well as the visitors simply anticipate the necessity of flushing toilets without thinking of the consequences. It is hoped that awareness raising campaigns and information material can help to understand the advantages of an improved traditional system. It shall be a visible advantage of the guesthouse to have a toilet system which is both based on traditional practice and ecologically sound.

Two pit traditional Ladakh toilet system
Another modification is the use of a two pit toilet, where urine and excreta are collected separately. The urine pit is connected to a diversion pipe. The excreta are collected for further treatment (like in the traditional system).

Trombe wall solar passive toilet system
Additionally, the LEDeG has implemented an ecological sanitation system with a Trombe wall solar passiv toilet. The Trombe wall is a sunfacing-wall with a solar collector to heat the air between the tombe-wall and the second wall of the room, where the excreta are stored. The temperature is rising inside and even in the night it keeps a higher temperature inside than outside. The higher temperature enforces the composting process.

Further information on used technologies and number of systems in use is yet to be collected.

6 Design information

The toilet is designed according to the traditional knowledge.

Fig. 6: Traditional toilet (source: LEDeG)

7 Type and level of reuse

In India, faecophobia is prevalent. Not so in the upper Himalayas, where excreta were composted and seen as important resource for nutrients traditionally since centuries.

The quantity of composted excreta material collected for reuse is about 3 m³ per year. The amount of soil added per year is about 2 m³. The excreta material (plus soil) is traditionally collected for reuse as fertiliser and soil conditioner once a year. It is taken out by laborers (or in villages by the farmers themselves) and brought to the fields. This work is not related to problems due to being related to dignity questions in this region. The material is seen as valuable, usually produced and used by the same farmers' family to grow barley or vegetables. Urban agriculture is common in Leh.

Due to the very low temperatures, the material has not always finished the composting process before collection. It is therefore taken out, brought to a nearby field (200 meters) and covered with soil to finalise the composting process. After a period of 20-30 days, it is applied to the fields.

Fig. 7: Agriculture in Ladakh (source: ISEC)

8 Further project components

As mentioned in the beginning, LEDeG, amongst other activities, also promotes:

- Wind and solar energy as well as small scale water power for diverse household purposes, crop drying, greenhouses and grain grinding
- ecological farming and food production without pesticides and artificial fertilisers
- adapted ecological building
- a women association supporting female autonomy, amongst others, by business activities like handicraft etc.
- tours serving sensitisation for the local natural, social and political conditions.

9 Costs and economics

The construction of the toilet was included in the ordinary construction of the Ecological Center. Total investment for the demonstration toilet was 40,000 Indian Rupies (INR) (≅ 650

EUR). The costs for each ecosan toilet in a household was 15,000 – 20,000 INR (≅ 225 – 300 EUR[1]).

Direct economic benefits of the project are not described, but the complete dependence on natural fertilisers will prevent the farmers to buy artificial fertilisers for food production recovering all the nutrient contents in human excreta.

Further information on costs and economics is yet to be collected.

10 Operation and maintenance

Operation and maintenance of the traditional and the diversion system is done as collaborative work. Most of the farmers collect and reuse the excreta by themselves, so there is not much operation and maintenance cost for the system as the work is carried out by the farmers themselves.

Further information on costs is yet to be collected.

11 Practical experience and lessons learnt

- If the demonstration toilet in the Ecology Center is properly used and maintained, it is accepted as the traditional solution.
- Ashes from the kitchen are added from time to time to reduce moisture and thus improve compost quality.
- Improving the traditional system with a ventilation increases the comfort of the system.
- If compost process is not finished, it is brought to a nearby field and covered with soil to finalise the process.
- Problems in the system occur, when people practice anal cleansing with water. It increases the moisture of the material and thus odor and fly breeding.
- Adding water or other liquids, apart from urine, makes removal of the humid excreta mix more difficult and people refuse to do it properly
- It may not be suitable for people with different toilet behavior (if the are clueless about the system)

Future:

- Information material in or near the toilet is presently discussed as it would probably raise the awareness about the advantages of the traditional toilet and explain some of the visitors (mainly tourists) how it works.

There are different problems caused by the long cold winters:

- The urine diversion does not work, because the urine is freezing in the diversion pipe.
- The urine is freezing inside the storage container. To hygienise the urine for reuse, the storage time has to be extended, because the temperature is to low during wintertime.
- The quantity of the “human fertiliser” is too high for reuse, because agricultural activities are taking place only a few months of the year.

Further information on experiences and lessons learnt is yet to be collected.

[1] Exchange rate April 2009: EUR 1 ≅ INR 65.5.

12 Sustainability assessment and long-term impacts

A basic assessment (Table 1) was carried out to indicate in which of the five sustainability criteria for sanitation (according to the SuSanA Vision Document 1) this project has its strengths and which aspects were not emphasised (weaknesses).

With regards to long-term impacts of the project, the main expected impact of the project is that the re-introduction of traditional sanitation system combined with modern components creates a useful system to reduce water consumption and to provide the population with high quality compost.

Table 1: Qualitative indication of sustainability of system. A cross in the respective column shows assessment of the relative sustainability of project (+ means: strong point of project; o means: average strength for this aspect and – means: no emphasis on this aspect for this project).

	collection and transport			treatment			transport and reuse		
Sustainability criteria:	+	o	-	+	o	-	+	o	-
• health and hygiene		X			X		X		
• environmental and natural resources	X				X		X		
• technology and operation		X			X			X	
• finance and economics	X				X			X	
• socio-cultural and institutional		X			X			X	

Sustainability criteria for sanitation:

Health and hygiene include the risk of exposure to pathogens and hazardous substances and improvement of livelihood achieved by the application of a certain sanitation system.

Environment and natural resources involve the resources needed in the project as well as the degree of recycling and reuse practiced and the effects of these.

Technology and operation relate to the functionality and ease of constructing, operating and monitoring the entire system as well as its robustness and adaptability to existing systems.

Financial and economic issues include the capacity of households and communities to cover the costs for sanitation as well as the benefit, e.g. from fertilizer and the external impact on the economy.

Socio-cultural and institutional aspects refer to the socio-cultural acceptance and appropriateness of the system, perceptions, gender issues and compliance with legal and institutional frameworks.

For details on these criteria, please see the SuSanA Vision document "Towards more sustainable solutions" (www.susana.org).

13 Available documents and references

LEDeG Website:
http://www.ledeg.org/

ISEC Website
The Ladakhi project
www.isec.org.uk/pages/ladakh.html

Eco-solutions Website
http://www.eco-solutions.org/ladakh.html

14 Institutions, organisations and contact persons

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