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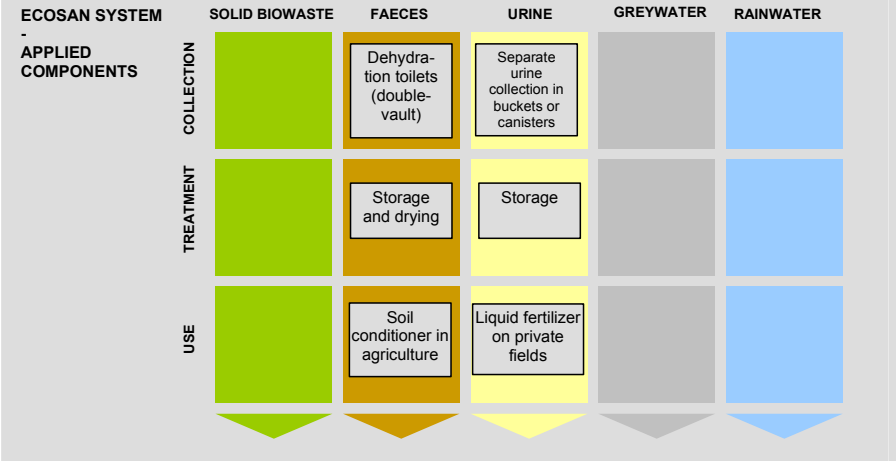
Urine diverting dry toilets dissemination programme

Guanxi province, China



1 General Data

Type of Project:
rural upgrading

Project Period:
start of planning: 1997
start of construction: 1998

Project Scale:
diverse villages, approx. 685.000 toilet units (by 2003)

Location:
by 2004 in total 17 provinces of China, focus on Guanxi province

Executing Institutions:
Jui San Society
Local Public Health Committee

Supporting Agencies:
UNICEF, SIDA, Red Cross

2 Objective of the project

To provide rural households in southern China with appropriate sanitation, as part of health improvement and poverty reduction activities.

To create several “eco-villages”, where the renovation of sanitary systems plays an integral role in the improvement of the overall conditions in the villages.

3 Location and general conditions

Around 47% of the rural population in China have access to improved sanitation – with around 200 million pit latrines throughout the country. Sludge from latrines and septic tanks, mostly poorly treated, contribute to the transmission of intestinal helminth infections. Remote rural areas suffer particularly from water shortage, mainly due to a lack of access to hygienically safe water resources.

This programme is being implemented in the rural areas of Guanxi province,

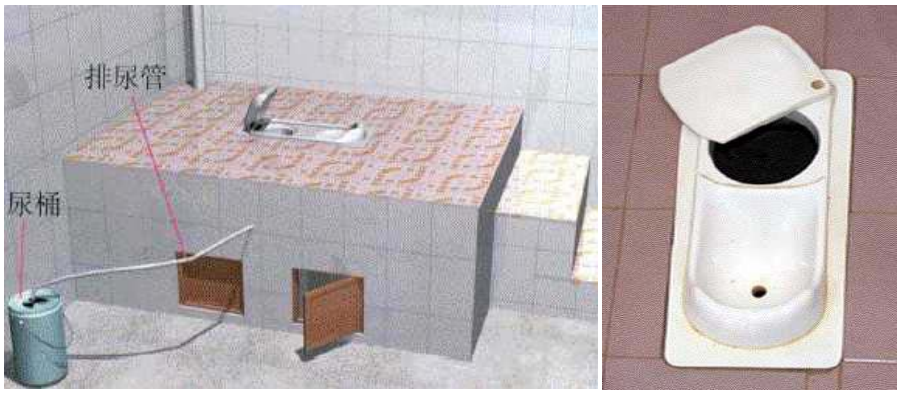


Figure 1: Ecosan toilet pedestal and squatting pan *(source: SIDA)*

which cover around 80% of the province area. It is one of the poorest provinces in China (income/person 2,400 RMB (220 €) annually). Households are most commonly involved in farming (rice) and small animal husbandry activities. Sanitation coverage in Guanxi is less than 30% - below the national sanitation targets. In addition frequently occurring floods are a severe problem, as they wash out the contents of pit latrines.

Since its start in 1997 in Guanxi province, the programme has been expanded to 17 provinces in 2003.

4 Technologies applied

Double vault urine diverting dehydration toilets were developed as an improvement of the Vietnamese double-vault latrine to enhance the dehydration of faeces and allow the reuse of urine as fertiliser. The squatting pan has a hole towards the front for urine collection, which is transported in small PVC pipes to a bucket or canister. Faeces fall at the back in a double vault chamber below the toilet, which is ventilated by vertical pipe. For aesthetic reasons and to reduce fly breeding the pan is covered with a lid, which can simply be pushed aside before defecation. After each defecation one shovel of ash is thrown onto the faeces. When the first chamber is full, the squatting pan is turned round, and the other chamber can be used. The faeces remain in the chamber for about 1 year. This retention time combined with elevated pH caused by the addition of ash allows for almost complete die-off of pathogens.

In some households waterless urinals were also installed.

Usually the paper used for anal clean-

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Figure 2: Different sites with urine diverting toilets: in the house yard, in-house, or outside the house *(source: GTZ, Morel)*

sing is dropped into a bucket placed beside the pan. It is later burned and the ash is thrown into the hole after defecation. Additional ash is locally available from the household where wood is burnt as fuel.

5 Type of reuse

China has a traditional culture of plant cultivation with human excreta from latrines and septic tanks (called night-soil), which still exists today. Although hygienic concerns have increased in recent years, reuse is not questioned, as rural households still depend on fertiliser from human excreta for their fields.

The dried faeces from the vault are removed once or twice a year, depending on the chamber filling cycle. They are applied to the plant roots by digging them into the soil. However the amount of dry matter produced is relatively small for farming areas.

Urine is collected once or twice a week and directly applied to the fields in a 50% water dilution.

Figure 3: Urine outlet from toilet *(photo: GTZ)*

6 Further project components

Along with the construction of the toilets, hygiene and health education is carried out with the village inhabitants. Training courses at county and community levels are held.

In the framework of the eco-village concept rural villages are upgraded with a whole range of measures: water supply, sanitation, greywater and rainwater drainage, the installation of green areas, biogas units treating manure from small husbandries for biogas supply to kitchen stoves and lamps, electricity, telephone, health education, road construction, occasionally also pigsty relocation outside the village.

7 Project History

The Sida-funded SanRes programe in co-operation with UNICEF and the Chinese Ministry of Health started with the first activities in 1997-1999. A further national partner was the provincial Public Health Campaign Committee (PHCC), the Institute of Environmental Health and Engineering, and the Jui San Society (one of the 8 official democratic parties in PR china, who are particularly active in the fields of science, technology, culture, education and medicine).

The first village worked with in Guanxi province was Dalu, with 70 households. Wucun town in Tianyang county, Jilin and Shanxi provinces also implemented pilot sites between 1997 to 1999. Since 2000 the programme has been extended to Shandong, Gaungdong, Sichuan, Anhui, Guizhou, Qinhai provinces, as well to Inner Mongolia and Xinjiang Uygur autonomous regions. The total number of these toilets in whole China by 2003 is estimated to be 685.000 in 17 provinces (accounting for 0.54% of total sanitary facilities in China).

More than 100.000 families in Guanxi province benefited from ecological sanitation systems between 1998 and 2003. Yongning county has particularly promoted the ecological renovation of its rural villages.

The reason for the successful upscaling of the initial pilot projects has been the political support through subsidies and legislation on various levels (county, provincial and village level). The government, under pressure from rural improvement targets, have seen that ecological sanitation is a hygienic solution that performs well. Its cost effectiveness, particularly when compared to biogas and flush toilets has also played an important role. As top-down decision making processes prevail in China, implementation can proceed extremely quickly once decision makers are convinced. Additional support came from Jui San Society, that put “ecological sanitation” on its national action agenda.

The toilets are also promoted on TV and radio as well as by excursions to model villages. The International Conference on Ecological Sanitation in Nanning in 2001 further boosted activities and legislative support within the country.

Urine diverting dehydration latrines are now considered in the Chinese standard for rural latrine construction.

8 Costs

With the use of local materials and self construction the costs for the toilets are very low. The basic toilet room costs approximately 280 RMB (27 €) for the total construction.

If the toilet is built in the yard extra costs for the superstructure can increase the total costs, depending on size and location, to between 500-800 RMB (45-75 €).

The village and the households have to cover 2/3 of the costs, usually through manpower and the provision of locally available material. The additional funding comes from the national and local governments. This totals approximately 7 million RMB (670.000 €) per year. Additional financial support from the Chinese Red Cross (Echo programme) and some other donors (e.g. the Australian embassy) is possible.

When a village decides to implement an ecological sanitation system or even a whole eco-village renovation, its leader has to submit a proposal to the county government including a financial plan. In Yongning county about 30,000 RMB (2900 E) are given to each village (1,500 RMB (140 €) to each family). However as the demand for sanitation and eco-village upgrading has outstripped the funds available from government, a selection of the villages to receive support had to be made.

Material	Amount	Costs
Squatting pan	1	85 RMB
Cement	100 kg	25 RMB
Bricks	100	25 RMB
Sand	150 kg	10 RMB
Vent-pipe	4 m	17 RMB
Urine pipe	2 m	2 RMB
Tiles*	4 m²	50 RMB
Plastic door	1	50 RMB
Buckets for paper and ash	2	10 RMB
total		**284 RMB (27 €)**

* can be replaced by local material

Figure 4: Prices of the ecosan toilet components *(sourceJui San Society)*

9 Operation and Maintenance

Operation of the toilets is very simple, and maintenance effort is very low.

To assure good operation, the addition of sufficient ash after defecation is necessary. This reduces the moisture content and pH level, while hindering insect breeding and destroying pathogens, ensuring hygienisation within the storage period. Evaluation results of different drying materials (see table) confirmed that plant ash achieves the best pathogen reduction. The toilets themselves are almost maintenance free apart from normal cleaning and the removal of liquid and dry matter.

10 Design information and technical specifications

Normally the toilet is built by the households themselves with backup by the county "ecosan offices" (see 11.5). If necessary their skilled technicians can be requested for assistance.

Almost all toilets follow a standard construction plan:

2 chambers, with a volume of at least 0,4 m³ each, correspond to a filling time of 6 months for one household (of 4-5 persons). The compact design locates the pedestal on top of the chambers, accessed by small stairs. The chamber is generally built from local materials. Access to the urine bucket and the chambers is usually from outside the toilet / house. In the bathroom normally tiles are used. In a minority of houses the toilet room can also be constructed with local material such as wood, bamboo and a PVC foil.

If the toilet is built on the 1st floor, the faeces drop through a PVC pipe (150-200 mm diameter) to the chamber at ground level.

The first toilets built in Yongning had self made ceramic pans. Now prefabricated plastic (fibreglass) is used, which is both cheap and break-resistant. They are produced in a local plastic factory. The front is improved by a higher board to prevent urine sprinkles on the floor. Ventilation pipes are standard 100 mm PVC pipes, rising at least 30cm above the roof. Lighting of the toilet is another important component, which increases user friendliness and acceptance.

11 Practical experience and lessons learned, comments

1. The basis of the success and acceptance by the toilet users is the traditional utilisation of urine and excreta in agriculture and therefore the absence of prejudices and questioning of the fertilising value.

2. Furthermore there are various advantages of the toilet itself:

- no water consumption
- simple and easy to construct
- cleanliness, no smell, no flies when operated correctly
- design adaptability to local situation
- affordability

Additional advantages can be achieved by installing the toilet inside the house, including:

- weather protection

Figure 5: Urinal with canister *(photo: GTZ)*

Figure 6: 1st floor toilet in a wooden house *(photo: GTZ)*

- safety, especially for women and children
- convenience
- cost saving
- maintenance takes place within the household, which increases responsibility and therefore lifetime and cleanliness of the installation.

3. Diarrhoea was dramatically reduced in the villages after introduction of the toilets

4. Very important for convincing the village inhabitants was the selection of a model household to build a first demonstration toilet, or a public model. It is important to build the model unit inside the house, otherwise it will be understood and copied as an exterior solution. Acceptance of the first model toilet can induce an application for toilet renovation or eco-village upgrading by the village committee.

5. To include all stakeholders in the up-scaling process, county decision makers are invited to attend training courses organised by the JuiSan Society together with the provincial Health committee. During 2 days films and posters are shown and site visits are organised. Then "ecosan offices" are set up at county level and sometimes also township level. They consist of members of the county's development departments such as the department of sanitation and health, construction and education. The county authorities provide local funding and select suitable village applications. They also conduct smaller local training courses for township and village leaders. Furthermore the ecosan office gives training to the construction teams and controls the construction process.

12 Available documents and references

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further relevant abstracts from the conference in Nanning 2001: http://www.ias.unu.edu/proceedings/icibs/ecosan/abstracts.html

Brochure: Ecosan villages in Yogning
VCD for training on ecosan.
Available via the Jui San Society Guanxi committee (address see contact)

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