# Survey on Environmental Sanitation
## Sideng, 2002

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## *Executive Summary*

The overall goal of this survey was to assess the present situation of Sideng village (Shaxi Commune, Jianchuan County, People's Republic of China) in the field of Environmental Sanitation, which comprises water supply, excreta and wastewater management, solid waste management, and storm water drainage. Goal of the survey was to identify the willingness of stakeholders on different levels to introduce a decentralised sanitation system. Perceptions on prefecture, county and commune government levels as well as on household level were considered and included in the analysis.

**Water supply**

The survey in Sideng village showed that in general the households having individual household taps (30 to 40% of the households) are satisfied with the supply. The high convenience of piped water motivates households to get their own tap. According to the households interviewed, the water quality seems to be acceptable, but unfortunately no data on the quality of the different water sources could be found.

It can be assumed that the groundwater is contaminated. The inappropriate drainage and toilet systems most probably affect the groundwater quality. The groundwater level is very high in the village and sometimes even reaches the surface. Assuming that several households will still use groundwater as drinking water source in the future, protection measures (construction as well as education measures) must be developed and implemented.

Main constrains of the present water supply network are the insufficient pressure and lacking storage capacity, leading to unavailable piped water supply during the dry season. Water pipes often lie directly on the ground or in the drainage channels. As water pressure is very low in most parts of the network, there is a danger that a temporary negative pressure may suck drainage water or dirt into the pipes. The future plans to replace the old pipes with bigger 4 to 6 inch pipes and to construct a larger reservoir next to the old one will not suffice to mitigate the problem of lacking pressure. The water shortages will be reduced, but water pressure will most probably not increase significantly.

Although many households have water meters they pay according to a fixed monthly fee. Discontent was observed on household level, because even in times of water shortages, households still have to pay for the service. In future, a consumption based tariff system should be introduced. Such a system makes sure that water is perceived as an economic good. Thus, people only use the required amounts. This is very important in order to make sure that both the supply capacity suffices and the wastewater production does not increase too significantly.

## Sanitation

Sanitation problems are very important in Sideng village, but underestimated by the communal government. The approach people have towards sanitation is very ambiguous; the product of sanitation – faecal sludge – is perceived as something very precious for agricultural purposes, but the facility where this precious good is produced – the toilet – is strongly neglected. Up to now no strategies have been developed to manage sanitation effectively. The local government explained that they were waiting for solutions from external experts.

Approximately 55% of the households have a private toilet next to their house. The survey showed that people are not satisfied with their private toilets. People do not clean their toilets, which leads to very malodorous, unhygienic and harmful conditions. People with upgraded sanitation systems complained about the ineffectiveness of their system to achieve a clean environment. Some households wish to have a flush toilet, but most of them would regret to loose the precious resource of faecal sludge. People who do not have a private toilet generally wish to construct one. However, they would not build it inside the yard or inside the house.

Interviewed households were very interested in the dry toilet with urine diversion, but they expressed their wish to see an example, a pilot toilet, that they could test. The more demanding operation and maintenance tasks of the urine diverting system (separate paper collection, addition of ash, sitting when urinating etc.) are not perceived as problematic by potential users. The costs of about 200 RMB or 25 USD per toilet seem to be affordable.

Totally 15 public toilets were identified in the village, most of them in a very bad state due to lack of clear assignment of responsibilities. With exception of the two well functioning public toilets with user fees, nobody is really in charge of the maintenance of the toilets. The good examples of the public toilets with user fees and the readiness of the population to pay for it supports the idea of the extension of this approach to all other public toilets. *Mr. Duan Zhongyue*, Director of Jianchuan County Bureau of Construction and Environmental Protection, believes that in future public toilets must foresee user fees, although it will certainly take some time until the users accept the system.

Looking at the material flows it must be assumed that 50% of the effluents from latrines infiltrate into the soil, corresponding to 500-1000 tons per year. The horizontal distance between the latrines and the groundwater wells is often lower than 20m. Due to the very high groundwater level it must be assumed that the capacity of the soil to filter and treat the effluent is not sufficient to avoid groundwater contamination. Unfortunately, groundwater quality is not monitored and nobody is able to confirm this presumption. Quality analysis of the groundwater must be undertaken in order to determine the extent of contamination.

Toilet owners and farmers tend to empty the chambers of the latrines whenever they need fertiliser, regardless of the retention time in the chamber. 300 to 600 tons of fresh faeces are spread on the fields every year unto crops such as rice, wheat, maize or beans, thus considerably increasing the risk of infectious disease transmission. There is definitely a need to explore new ways how to effectively sanitise human waste and to increase hygiene awareness. Ways to sanitise human excreta together with farmyard manure by means of biogas digesters have to be investigated as many households and representatives of the government appreciate this system. The final choice of technological options strongly depends on costs for construction, operation and maintenance. The decision should be taken by both the government (responsible for the public toilets) and the households (responsible for their private facilities).

## Greywater management and drainage

The greywater and drainage situation in Sideng village is neither satisfying nor particularly alarming. Nobody is complaining about it and the flood problems that periodically occur are perceived as natural.

Only the main streets in the village are drained. Drainage on household level is strongly neglected. Another important issue is the inadequate use of the drainage network. Many people use drainage channels as dumping place for their solid waste. This solid waste often blocks the channels, which leads to local overflows. Thus, improving solid waste management may mitigate problems of flood due to blockage. The drainage problem cannot be solved without solving the solid waste problem.

Greywater is not perceived as something hazardous in Sideng village, although it is both contaminated with micro-organisms and polluted with chemicals and particulates. This wastewater is disposed in the yards where it infiltrates into the soil or flows into nearby drainage channels. The daily greywater amount averages 150 to 190$m^3$.

Two different approaches for greywater management can be considered. The centralised approach is characterised by an open channel system leading the greywater together with rainfall runoff out of the yard to bigger drainage channels and finally to a safe treatment and disposal site. Centralised treatment is complicated and expensive. Local skills have to be created in order to operate and maintain the treatment plant.

In a decentralised approach, each household (or a group of household) treats, reuses or eliminates its greywater on household level. In contrary to the centralised treatment decentralised systems have to be financed by the households. The fact that no regulations exist to enforce on-site treatment, people have to be convinced of the necessity of appropriate greywater treatment.

A further controlling mechanism could be the combination of water supply and greywater management. Households who wish to have an own water tap must develop and implement a greywater management concept, too.

## Solid waste

Sideng village produces between 400 and 900 tons of solid waste every year. 60 to 80% of the waste is organic, 20 to 40% inorganic. Almost half of it is collected and dumped on landfills. Easily biodegradable waste is fed to animals. The rest is either burned or dumped into drainage channels or into the river. The solid waste of shops and restaurants is collected and disposed on dumps at the outer-zone of the village. The fees for waste collection range from 1 to 5 RMB depending on the stakeholder and the amount of waste generated. Three family enterprises recycle plastic-/beer bottles, paper and hard paper and some metal.

The present waste management system is inadequate. The steady rise of solid waste amounts generated demands for an improved waste management concept. The waste collection system based on a polluter-pays-principle is a promising attempt in this direction, but needs further development. A future solid waste management concept has to focus on the waste generation, separation and recycling, collection, and disposal. The growth of the population, transitory people, their behaviour and customs must be considered in planning and implementation. Awareness building, education and training plays in significant role as an integral part of a new concept.

## Conclusion and Recommendations

Discussions with the authority members showed that there is a will to improve the situation in the field of environmental sanitation. The reactions to the presented decentralised, household centred environmental sanitation approach were very positive.

Centralised sewerage systems are very expensive and need huge investments. It requires expertise and specialised personnel. The operation and maintenance of a centralised system is complex and expensive, and additionally burdens the water supply network due to water consuming flushing toilets.

The decentralised, household centred approach is the adequate approach for a new sanitation concept in Sideng and surrounding villages. The approach allows a step by step implementation and does not burden the small financial budget of the local government, issues often mentioned by the local government. Private households showed readiness to pay for the new facilities. The household centred approach allows nutrient recovery and reuse of human excreta in agriculture and is in line with the traditional Chinese system.

In order to convince people to invest into new toilet and greywater treatment systems, pilot units have to be constructed, which act as demonstration facilities and can be tested by the citizens. Long-term training and comprehensive education programs will have to be established to guarantee the operation and maintenance of the sanitary facilities. The decentralised approach only makes sense when households can choose one technical option out of a multitude of options. The suggestion of one option is not compatible with the basic idea of the household centred sanitation approach. Therefore, the urine diverting toilet (Nanning toilet) is only one out of several options. Technological solutions as the combined biogas digester for faecal sludge, animal manure and organic solid waste digestion, pour flush toilets and septic tanks or composting toilets should also be considered as alternatives. The final decision must be based on economical aspects (costs for construction, operation and maintenance) as well as on socio-cultural aspects. The decision must be taken by the beneficiaries.

The valuable experiences made during the EcoSan projects in Nanning have to be considered. *Mr. Lin Jiang*, Associate Professor of the Guangxi Committee of the Jiu San Society Department of Science and Technology and co-ordinator of the EcoSan village project in Nanning showed his interest to collaborate in the development of a decentralised household centred sanitation concept for Sideng.

*Mr. Heinz-Peter Mang*, engineer from GTZ (*Deutsche Gesellschaft für technische Zusammenarbeit GmbH*), expressed his cooperativeness in this project, too. *Mr Mang* is greatly experienced in the field of ecological sanitation and is advising several projects in China.