Title	**Sanitation for a rural school in Uganda – a successful implementation process**
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INTRODUCTION AND BACKGROUND

"Kalungu Girls Secondary School", a boarding school hosting about 350 girls is embedded in the hilly landscape of Southern Uganda (in Masaka District) surrounded by small villages. As usual in this region the quantity of water is not a major problem but rather the insufficient quality. Problems with the water quality and the unsatisfying conditions of toilet facilities caused the administration of the school to ask for support to improve the situation.

SITUATION BEFORE THE PROJECT

Wastewater which was produced in low quantities from the staff quarters and sisters house (flush toilets and grey water from kitchen and showers) was drained away in soak pits. Grey water produced at the school from showers and kitchen was discharged untreated into a ditch outside the school's compound and drained. Human waste from the pupils was disposed of via app. 35 pit latrines which were badly smelling, full of flies and in unhygienic conditions. A further major problem was the limited space of the school's compound, where the construction of new pit latrines every few years became a urgent issue (also in money terms).

Due to the shallow ground water level and the location of the soak pits and pit latrines directly upstream of the school's and the nearby villages' water source the situation was clearly unsatisfying and potentially dangerous. Wastewater treatment was not available at all.

Picture 1: Pit latrine on the schools compound.

In addition also the water sources were not constructed properly, minimizing the risk of secondary pollution. Therefore, to reduce the groundwater (drinking water) pollution, it was planned to replace the pit latrines by dry toilets and treat the remaining wastewater – grey water with a small share of black water – in a horizontal subsurface flow constructed wetland. The basic scheme is shown in Figure 1 below.

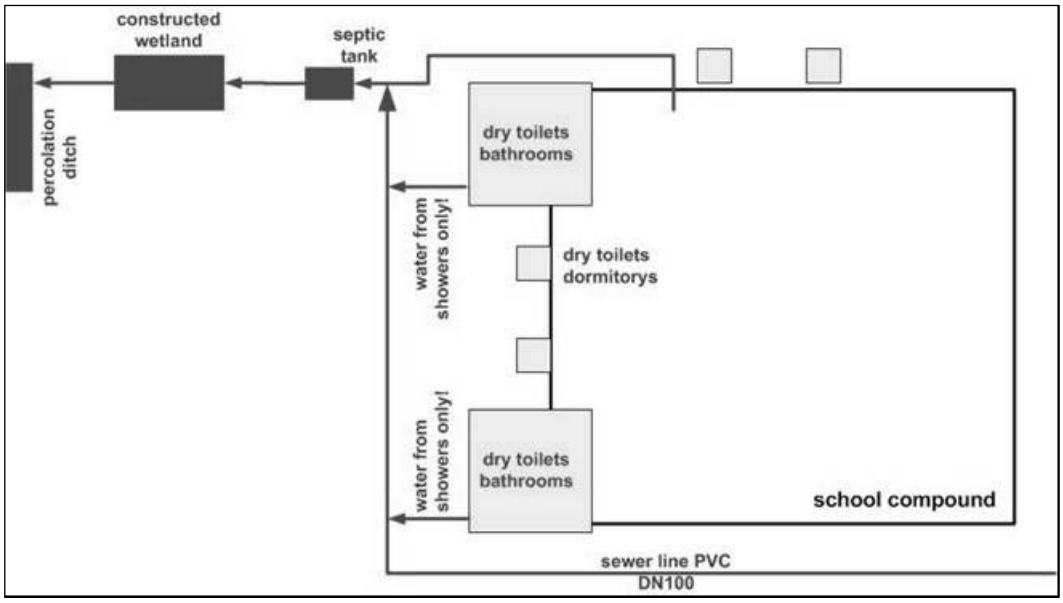

Figure 1: Sketch of the sanitation system

PROJECT IMPLEMENTATION

1. THE HARDWARE

After a first site visit to gain an overview of the situation a first meeting with the administration was organised to discuss the major points of the water supply and sanitation improvements. A way forward was decided and a local company started with construction works: (i) dry toilets with urine diversion for the pupils, the end-products being used in the schools agricultural activities, (ii) a constructed wetland system for biological treatment of remaining greywater and a (iii) dry toilet demonstration unit for teachers and visitors to enhance their prestige and image.

(i) Dry Toilets

In line with the National Strategy to promote Ecological Sanitation in Uganda 45 dry toilets for the pupils were constructed (mainly outdoor but additionally 2 indoor dry toilets for each dormitory to avoid the girls going out during the night).

Presently diverted urine is drained in soak pits, reuse as a nitrogen rich fertilizer is optional. Faeces (incl. anal cleansing material and ash) are collected in locally produced wooden containers which are changed regularly and brought to a covered composting area for drying before reuse in the surrounding banana and matoke plantation.

One employee attending the garden behind the schools compound was trained in operation and maintenance as well as the possibilities of reusing the dried faeces and the urine as fertiliser. In addition both students and teachers received information and training on the use of this type of toilets.

Picture 2, 3 and 4: Dry toilet in detail; Backside with door and basket for faeces; composting area behind the school.

(ii) Wastewater Treatment

For treatment of the remaining wastewater a horizontal subsurface flow constructed wetland system was built. Wastewater is pre-treated in a septic tank to remove solids (by sedimentation and flotation) before it flows by gravity to the inlet area of the constructed wetland system. The treated wastewater is infiltrated into the ground through a percolation trench.

(iii) Demonstration dry toilet

Additionally to the students' toilets, a dry toilet unit was constructed for the staff and in serving as a demonstration unit for guests. It is located near the main entrance to the school. Urine is collected in jerry cans and reused as fertiliser. The collection of the faecal material is the same like for the pupils' toilets. The demonstration unit is equipped additionally with an urinal to avoid misuse by male users.


Picture 5 and 6: Demonstration Unit; Collection of urine in jerry cans

2. THE SOFTWARE

(i) Participatory planning

The idea of the demonstration unit for the teachers and visitors came during many discussion how to commit the users of the advantages of dry toilets. Constructing for pupils and the teaching personal the same type of toilets seemed to be the most suitable way that the units will work properly. Based on that particularly the design of the demonstration unite was carried out in a participatory way: together with the teachers the details of the unit were developed to create the feeling of ownership and responsibility. A series of possible designs were presented to the teachers and any decisions (like location of the toilet; sitting or squatting type; urinal for men,…) were discuses among them.

(ii) Training

A special focus was laid on training of students, teachers and the O&M personal, fearing that without any training the newly constructed toilets would soon look like the old latrines. A main concern was the involvement of the teaching personal, especially the ones responsible for health issues. For educating the students and O&M personal the constructors on site were responsible, with a special focus to involve the local technicians from the beginning of any planning/construction processes.

Picture 7 and 8: Training of students

COMPARISON OF COSTS

Following an analysis of the situation before the project, a detailed comparison of costs was carried out for two alternative sanitation solutions. This cost comparison was meant to serve as one information among others for the client in the decision making process.

The options which were compared were a “conventional” sanitation concept, comprising collection of wastewater in a sewer line and treatment according to Ugandan standards and

an “EcoSan” solution, relying on prevention and split flow treatment as much as possible. The main components of the concepts are:

- Option 1 - EcoSan concept: dry urine diversion toilets (45 units), sewer line for greywater and a horizontal subsurface flow constructed wetland (area app. 100m²)
- Option 2 - conventional sanitation concept: flush toilets for the students (30 units), separate sewer system for black water, mechanical pre-treatment, pumping station and a vertical subsurface flow constructed wetland (area app. 500m²)

Option 1	**no.**	**unit**	**unit cost**	**total cost**
piping	250	m	15.750,00 UGX	3.937.500,00 UGX
manholes incl. covers	5		100.000,00 UGX	500.000,00 UGX
fittings	1	lump sum	1.750.000,00 UGX	1.750.000,00 UGX
filter unit	1	lump sum	7.875.000,00 UGX	7.875.000,00 UGX
wastewater treatment system	100	m²	61.250,00 UGX	6.125.000,00 UGX
dry toilets	45	units	400.000,00 UGX	18.000.000,00 UGX
				38.187.500,00 UGX

Option 2	**no.**	**unit**	**unit cost**	**total cost**
piping	250	m	15.750,00 UGX	3.937.500,00 UGX
manholes incl. covers	5		100.000,00 UGX	500.000,00 UGX
fittings	1	lump sum	1.750.000,00 UGX	1.750.000,00 UGX
filter unit	1	lump sum	7.875.000,00 UGX	7.875.000,00 UGX
pumping station	1	lump sum	2.000.000,00 UGX	2.000.000,00 UGX
wastewater treatment system	500	m²	61.250,00 UGX	30.625.000,00 UGX
flush toilets incl. plumbing	30	units	600.000,00 UGX	18.000.000,00 UGX
				64.687.500,00 UGX

Figure 2: Detailed comparison of costs for an “EcoSanitation” concept (option 1) and a conventional sanitation concept (option 2). Figures are in Ugandan Shillings (exchange rate by 22.09.2004: 1€ = 2060 UGX).

For the cost comparison the following costs were considered:

- investment costs,
- cost for reinvestment and
- operating costs.

The calculation is based on the following assumptions:

- timeframe for cost comparison: 50 years
- reinvestments depend on life-span of individual parts of the system
- interest rate 8% (UCB 2002)

The following results show the calculated actual cash value of each option for the period under consideration based on average costs in Uganda.
The comparison of costs between an EcoSan concept (option 1) and a conventional (option 2) shows clearly that not only ecological but also economic reasons support the decision to invest in Ecological Sanitation. The main difference is caused by the significantly smaller wastewater treatment system for option 1 and the pumping station additionally required for option 2.
Urine diversion significantly reduces the load of nitrogen which results in a reduction of the required expenditure for the biological wastewater treatment system (NH_4-N discharge limit in Uganda is 10mg/l).

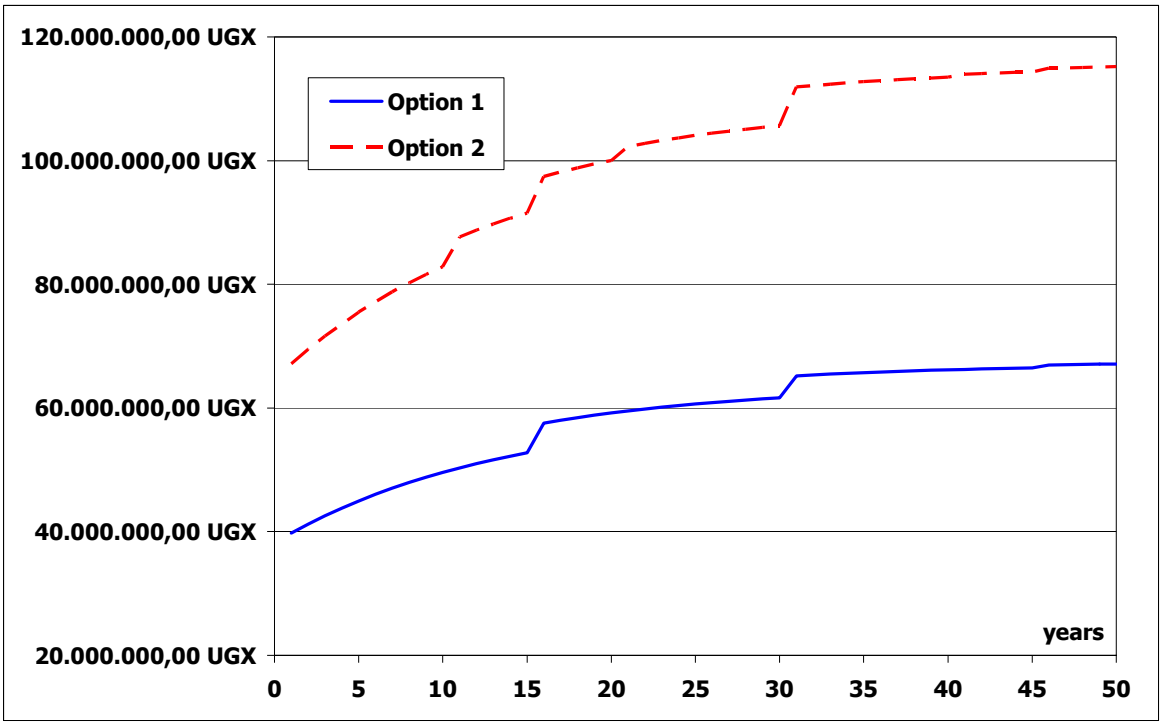

Figure 3: Comparison of costs for a conventional sanitation concept (option 2) and an EcoSanitation concept (option 1). Figures are in Ugandan Shillings (exchange rate by 22.09.2004: 1€ = 2060 UGX).

CONCLUSIONS & RECOMMENDATIONS

The toilets are a great success and delegations from all over the country and from abroad come to visit the school toilets. The pupils and the teachers are proud of their well working toilets which are kept clean and well maintained. Since this was such a successful project, visits or families are picking the idea and requests are increasing.

The success is based on a variety of reasons: (a) teachers and pupils are using the same type of toilets and the teaching personal is committed to this new technology; (b) all stakeholders were involved from the beginning of the project, any design decisions was met by the users, (c) the presence of the constructors was utilised to sensitise and train teachers and pupils.