



Ventilated Improved Latrine construction in the slum areas of Kampala, Uganda

U-ACT: The Urban Affordable Clean Toilets Project

The Urban Affordable Clean Toilets (U-ACT) project, headed by the Centre for Development and Cooperation (NADEL) of the Swiss Federal Institute of Technology (ETHZ), aims at overcoming the constraints to private sanitation investment in poor urban areas. Field research was conducted in 40 randomly selected low-income areas of Uganda's capital Kampala where people rely on on-site sanitation. The sanitation situation in these urban slum zones is characterised by a high number of users per toilet, and full or overflowing latrines that are not regularly emptied. The U-ACT project activities include the construction of ventilated improved pit (VIP) latrines. This factsheet provides information on the construction and cost details.

After an analysis of the sanitation conditions in 40 urban slum zones, U-ACT designed and empirically tested financial interventions with the aim to improve sustainable sanitation access.

About 1200 randomly selected households were offered a one or double-stance ventilated improved pit latrine at different subsidised rates and payment modalities to understand how sensitive sanitation demand is to price and financing mechanisms, and to analyse non-price-based constraints, such as space limitations or the lack of land rights. In total, 156 VIP latrines were built under the supervision of the project engineer. In 85% of the cases, double-stance facilities were desired by the households, which is why construction and cost details are given only for double-stance U-ACT toilets.



Fig 1 Construction of raised double-stance VIP latrines in Bwaise Division, Kampala in 2012. © Roman Grüter

Main features of the U-ACT toilet

U-ACT toilets feature one- or double-stance toilets with a lined pit and a brick superstructure. Pit lining prevents groundwater contamination and ensures that a facility can be emptied when it is full (ideally by a vacuum truck). To guarantee ease of access for the hose from the vacuum truck, the pit is equipped with a removable brick. The solid brick and cement structure makes the latrine very durable. All latrines are equipped with wooden doors and a sturdy lock. To reduce flies and odours, the U-ACT latrine is provided with a ventilation pipe. Furthermore, it is equipped with a handwashing facility that can be filled with rainwater or piped water. In locations where there is a risk of flooding and/or a high water table, the latrine is raised. The space required for a ground-level double stance U-ACT toilet is 4.5m². For a raised double-stance VIP with stairs it is 8m² (see Figure 3). During the construction period, a total area of around 15m² is required to store materials and tools.

Costs (capital expenditure CAPEX)

Establishing the generic costs of VIP latrines is difficult due to varying site conditions and individual design adaptations. Table 1 provides the average construction costs for the lined double-stance U-ACT toilets built in Kampala in 2011/2012 as pictured above.

Material costs constitute 78% of total costs, while labour costs are only 22%. Operation and maintenance (O&M) costs are not included. An interesting finding is that transport costs of construction materials (and of the soil from pit excavations) amounts to around 5 to 7% of overall construction costs. This is due to the fact that the construction sites are difficult to access. Building raised

VIP latrines for flood-prone areas adds around 9% to the cost of construction (see Table 1). Also, worth noting is that the construction of single-stance toilets is only 25% cheaper than the double-stance toilets.

Training of masons and construction time

The Kampala-based NGO SSWARS was responsible for organising and training local builders to build the VIP latrines. All of the builders were community-based masons who received a 2–3 day training, especially regarding the substructure and pit lining. Overall quality control was guaranteed by a SSWARS civil engineer who made sure that the construction met U-ACT standards.

Construction time, including pit digging, varies according to the soil conditions, size of the pit and the size of the working team. Table 2 provides an overview of the man-days needed for constructing the raised and non-raised VIP latrines.

Further reading:

- Günther, I., Horst, A., Lüthi, C., Mosler, H.-J., Niwagaba, C.B., Tumwebaze, K.I. (2011). Where do Kampala's poor "go"? An overview of urban sanitation conditions in Kampala's informal settlement areas. Research for Policy 1.
- Günther, I., Niwagaba, C.B., Lüthi, C., Horst, A., Mosler, H.-J., Tumwebaze, K.I. (2012). When is shared sanitation improved sanitation? The correlation between number of users and toilet hygiene. Research for Policy 2.



Fig. 2 Raised VIP latrine



Fig. 3 Ground-level VIP latrine

Lined Double-Stance Ventilated Improved Pit (VIP) Latrine

Table 1: Costs of ground-level and raised U-ACT VIP latrines*

	Ground-level double-stance VIP		Raised double-stance VIP	
Substructure	1'742'00 UGX (=695 US\$)	63%	2'011'500 UGX (=803 US\$)	67%
Superstructure	1'003'467 UGX (=400 US\$)	37%	1'003'467 UGX (=400 US\$)	33%
Total	2'745'467 UGX (= 1095 US\$)	100%	3'014'967 UGX (= 1203 US\$)	100%

*The cost information is based on prices from November 2011 and the US\$ exchange rate used for conversion is: 1 US\$ = 2506.26 UGX (09.11.2012).

Construction details:

Construction time to build these pits varies according to the size of the pit and the size of the working team. With a team of 4 labourers you need 1 day for a 1-stance non-raised pit, and 2 days for the raised pit (without superstructure).

In addition to labour costs, additional features add to the overall costs:

- a handwashing facility adds US\$ 12
- installation costs of the handwashing facility adds US\$ 22
- water gutters for rainwater harvesting (material and installation) cost US\$ 28,6

Spatial footprint

A double-stance VIP latrine requires 4.5 m² space, whereas a raised latrine has a spatial footprint of almost 8 m², due to the required stairway. During the construction period, a total area of around 15m² is necessary (excavation, materials, tools).

Table 2: Average construction time for one double-stance VIP latrine

	Type of latrine	Pit volume	Avg. man labour days for pit digging	Man labour days for construction	Total construction time (man labour days)
Double-stance latrine	Raised VIP	5.5	12-16	32	44-48
	Ground-level VIP	4.7	4-8	28	32-36

Note: Man labour days include both man days of a skilled mason and of a casual labourer.

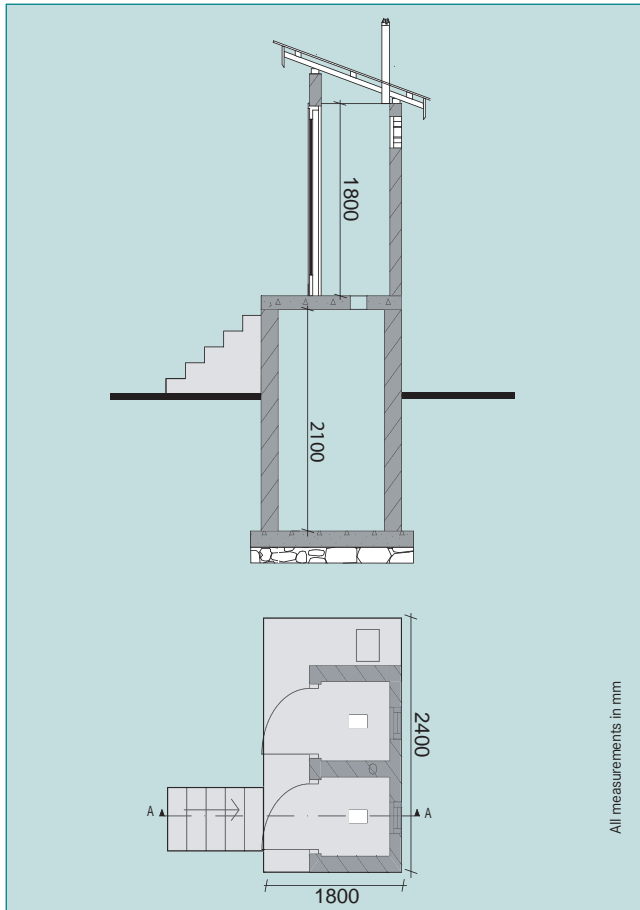


Fig. 5 Section and floor plan of raised U-ACT VIP latrine

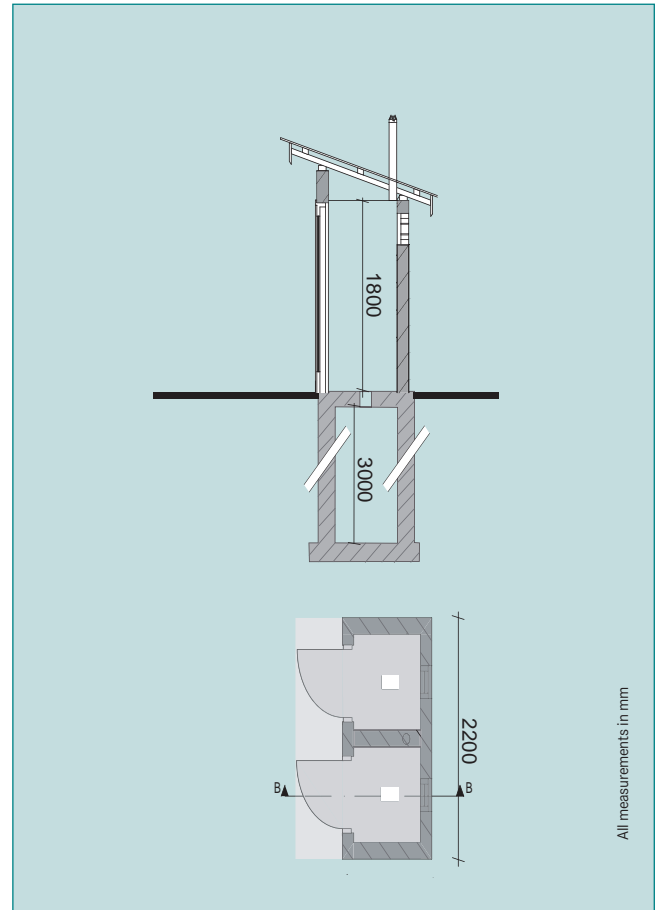


Fig. 6 Section and floor plan of ground-level U-ACT VIP latrine

Research Team

Lüthi, Christoph

Senior Scientist, PhD
 Department of Water and Sanitation in Developing Countries (SANDEC)
 Swiss Federal Institute of Aquatic Science and Technology (EAWAG)
 christoph.luthi@eawag.ch

Niwagaba, B. Charles

Senior Lecturer, PhD
 Department of Civil and Environmental Engineering
 College of Engineering, Design, Art and Technology (CEDAT)
 Makerere University (MAK)
 cniwagaba@tech.mak.ac.ug

Günther, Isabel

Assistant Prof. Development Economics, PhD
 Centre for Development and Cooperation (NADEL)
 Swiss Federal Institute of Technology Zurich (ETHZ)
 isabel.guenther@nadel.ethz.ch

Horst, Alexandra

PhD Student Development Economics
 Centre for Development and Cooperation (NADEL)
 Swiss Federal Institute of Technology Zurich (ETHZ)
 alexandra.horst@nadel.ethz.ch

Mulongo, Phenekus

Graduate Engineer
 Sustainable Sanitation and Water Renewal Systems (SSWARS)
 P. O. Box 21302, Kampala, Uganda

Grüter, Roman

Department of Environmental Sciences
 Swiss Federal Institute of Technology Zurich (ETHZ)
 gruetero@student.ethz.ch

Research Partners

- Swiss Federal Institute of Technology (ETHZ), Centre for Development and Cooperation (NADEL), Zurich, Switzerland
- Swiss Federal Institute of Aquatic Science and Technology (Eawag); Department of Water and Sanitation in Developing Countries (Sandec), Dübendorf, Switzerland
- Makerere University, College of Humanities and Social Sciences (CHUSS), Kampala, Uganda
- Sustainable Sanitation and Water Renewal Systems (SSWARS), NGO, Kampala, Uganda

ETH

Eidgenössische Technische Hochschule Zürich
 Swiss Federal Institute of Technology Zurich

nadel

Nachdiplomstudium für Entwicklungsländer
 Centre for Development and Cooperation

eawag
 aquatic research

SSWARS
 ENVIRONMENTAL SYSTEMS FOR LIFE

MAKERERE UNIVERSITY

Funding

The U-ACT Project is funded by a EU SPLASH grant.

SPLASH

U-ACT
 Urban Affordable Clean Toilets
www.nadel.ethz.ch/forschung/u-act