sustainable sanitation alliance

Case study of sustainable sanitation projects

Up-scaling Basic Sanitation for the Urban Poor (UBSUP) in Kenya

Fig. 1: Programme location

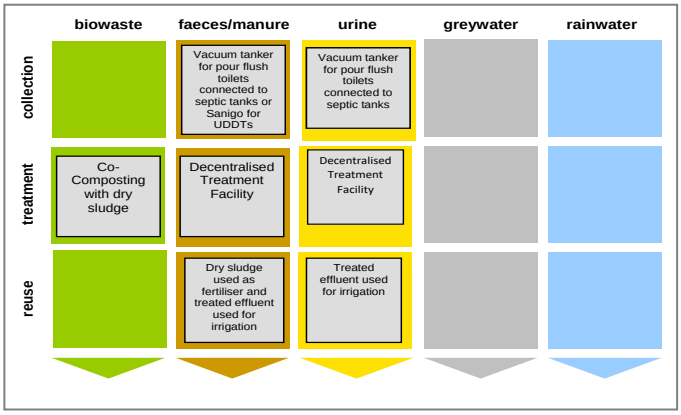

Fig. 2: Applied sanitation components in this programme

1 General data

Type of programme:
UBSUP is a country-wide up-scaling programme aimed at providing access to basic household sanitation across all Kenyan urban low income areas. The programme is implemented through licensed water utilities. The UBSUP concept covers the entire sanitation service chain: it incorporates a social marketing concept, technical concepts for infrastructure, emptying and transportation as well as business and financing models.

Programme period:
Start of the programme: 2011
End of the programme: 2018

Programme scale:
Target population: 400,000
Target number of toilets: XX
Target number of DTF: XX
Total investment: EUR 18.4 m (EUR 9.2 m German Federal Ministry for Economic Cooperation and Development (BMZ) and EUR 9.2 m Bill and Melinda Gates Foundation (BMGF))

Address of the programme office:
CIC Plaza, First floor, Mara Road
PO Box 49699 – 00100
Nairobi, Kenya

2 Objective of the programme

- Improve access to basic household sanitation in low income urban areas of Kenya.
- Create demand for on-site sanitation (household toilets)
- Cover the entire sanitation service chain from toilet to treatment.
- Provide sustainable sanitation to 400,000 people by end of 2018.
- Create business opportunities in terms of toilet construction, faecal sludge collection, transport, and treatment services.

Photo. 1: Social marketing in a low income area in Machakos © GIZ/Berea (2017)

3 Location and conditions

Kenya has a population of 46 million people out of which 25% live in urban areas. The urban growth rate is 4% per year. Around one third of the urban population lives below the poverty line. Most of them are residents of the approx. 2,000 urban low income areas or slums country wide.

Due to the fast urbanisation and low investments in sanitation infrastructure, the number of underserved urban residents increases steadily. In Kenya, on-site sanitation system predominates, but lack of sustainable faecal sludge management remains a key contributor to low access to sanitation services.

In 2011, the Government of Kenya, through the Water Sector Trust Fund (WSTF), commissioned a sanitation up-scaling concept called Up-scaling Basic Sanitation for the Urban Poor (UBSUP). The programme is active nationwide in Kenya and as of July 2017, it has been implemented in 23 towns.

4 Approach of the programme

The WSTF is a Kenyan State Corporation mandated to finance water and sanitation services for poor and underserved communities.

Up-scaling Basic Sanitation for the Urban Poor (UBSUP) in Kenya

UBSUP is anchored at the WSTF with technical support from GIZ and funding the Bill and Melinda Gates Foundation and the German Government through the German Development Bank (KfW). The programme is implemented by licensed Water Services Providers (WSP/utilities).

The UBSUP concept covers the entire sanitation service chain and is based on three pillars: (1) social marketing, (2) technology, and (3) business and financing models.

UBSUP is a demand driven programme. WSPs apply to the WSTF's calls for proposals to receive funds for investments. The WSP promotes and implements the project in the urban low-income areas through innovative social marketing techniques (door-to-door, community gatherings, road shows, etc.) aimed at increasing the demand for improved on-site household sanitation. Households are encouraged to build toilets with a permanent superstructure (concrete or masonry walls) and which comply to the building standards (quality, dimensions, etc.).

Photo. 2: Beneficiary of an UBSUP toilet in Chuka © GIZ/Berea (2017)

Once the construction of the toilet is complete, the water utility inspects the toilet. Upon approval of the structure, the household receives a post-construction incentive funded by UBSUP -$200 for a new toilet or $150 for a rehabilitated toilet. This- corresponds approximately to half of the construction costs.

Emptying and transport services for the sludge (from septic tanks) are either provided by private vacuum tankers registered with the WSPs or by the WSPs themselves. Emptying and transport of the dry sludge (from UDDTs) is offered by a group of entrepreneur equipped with a customized motorised tricycle (tuk-tuk) - the so-called Sanigo (provided by UBSUP). This group of manual emptiers referred to as Sanitation Team, are trained and supervised by the water utility. After collection of the dehydrated sludge from the vault of the UDDT they process it to produce compost.

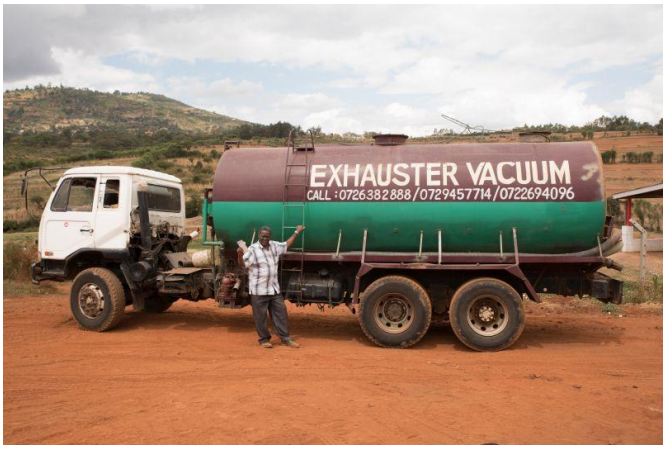

Photo. 3: Vacuum tanker in Machakos © GIZ/Berea (2017)

If the area has no treatment facility, UBSUP supports the construction of a Decentralised Treatment Facility (DTF). These small scale treatment plants are established conveniently in the vicinity of the town, that cater for faecal sludge from dry and wet toilets brought in by vacuum tankers or Sanigo.

Photo. 4: Aerial shot of the DTF in Chuka © GIZ/Berea (2017)

5 Technologies applied

These are the technologies applied (occurrence in %) within the UBSUP programme:

Containment

- *Pour flush toilets (98%)*
  - *70% connected to a septic tank*
  - *30% connected to a sewer network*
- *Urine diverting dry toilets – UDDT (2%)*

Collection and transport

- *Existing vacuum tankers (mostly from the private sector)*
- *Sanigo (as of 2017, 2 are operational)*

Treatment

- *Existing conventional wastewater treatment plant*
- *DTF (as of 2017, 7 are operational)*

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Photo. 5: Sanigo in Nakuru © GIZ/Berea (2017)

6 Design information

UBSUP supports the construction of low-cost sanitation infrastructure adapted to the context. Standardised technical drawings are provided to the Water Services Providers responsible for quality control and assurance on the ground.

Pour flush toilet and septic tank:
One pour flush toilet can serve a maximum of 10 people and the size of the septic tank must cater for the number of connected toilet units.

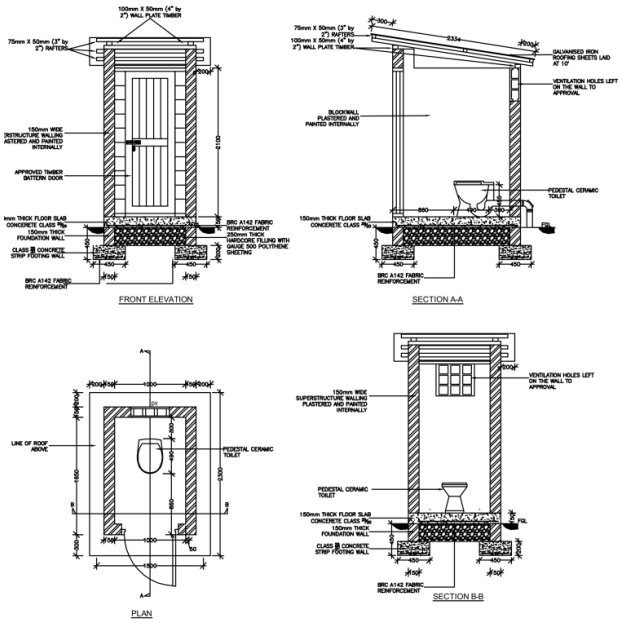

Fig. 3: Technical drawings of a pour flush toilet

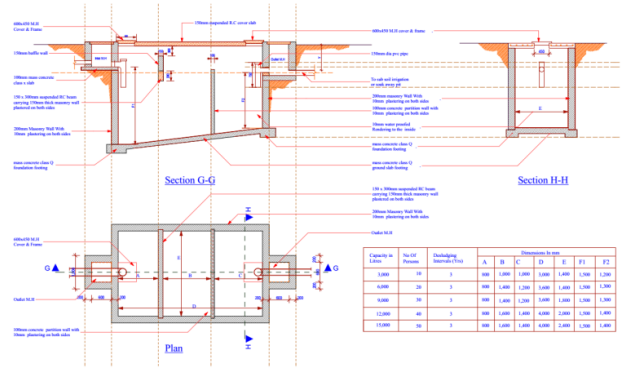

Fig. 4: Technical drawings of a septic tank

Urine diverting dehydration toilet:
In areas where water is scarce, soil is very rocky, or in areas with high water tables, households might opt for the Urine Diverting Dry Toilet (UDDT). This toilet does not require water for flushing and separates the urine from the faeces. Once dehydrated, the faeces can be used as fertiliser in crop production. The UDDT has two separated vaults for alternating use and a single cabin with two squatting pans. One toilet can serve a maximum of 10 people.

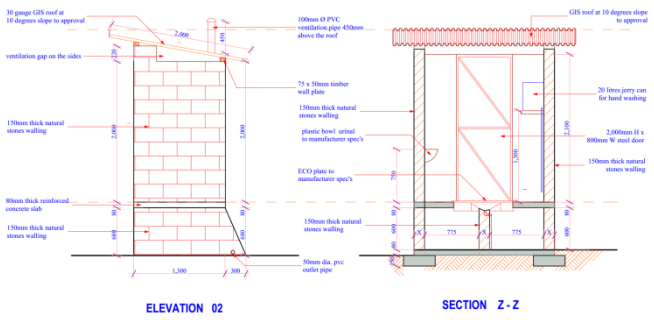

Fig. 5: Technical drawings of a UDDT

Sanigo:
The Sanigo is a motorised tricycle pulling a customised carrier, which has two compartments to transport the content of two UDDT vaults. The carrier can be tilted with an hydraulic jack to facilitate the emptying.

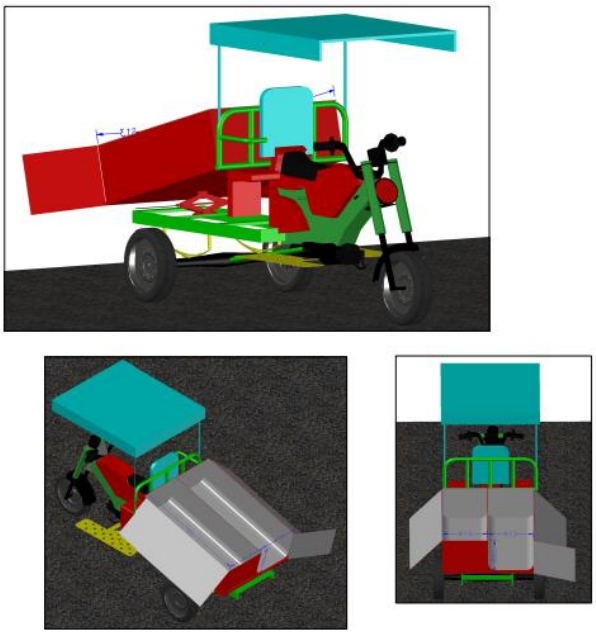

Fig. 6: 3D drawings of a Sanigo

Decentralised Treatment Facility:
If no treatment facility is available in the area, UBSUP supports the construction of a Decentralised Treatment Facility (DTF). It is a small scale treatment plant which is located in convenient distance from the service area and caters for dry or wet faecal sludge brought in by Sanigos or vacuum tankers. The DTF has a standard design, which allows for a daily discharge of 22m³ of wet faecal sludge. It comprises six sequenced modules providing physical and biological treatment (no electricity or chemical additive). The DTF is also equipped with an office for the operator and a solid waste incinerator.

1. *Receiving bay / balancing tank*

2. *Settler*
3. *Anaerobic baffled reactor*
4. *Vertical flow constructed wetland*
5. *Sludge drying bed*
6. *Co-composting area*
7. *Solid waste incineration unit*
8. *Operator's office*

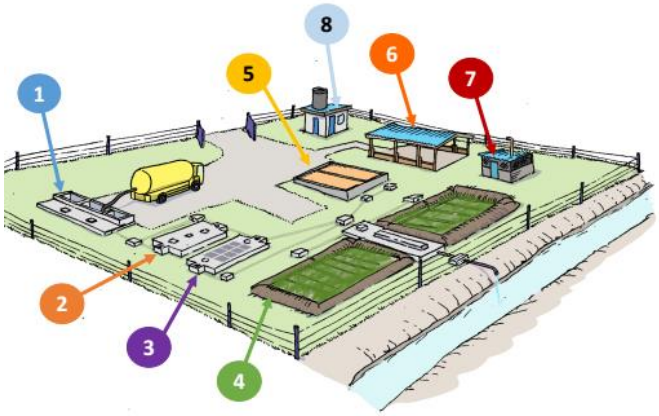

Fig. 7: Scheme of a standard DTF

In cases where the area doesn't have the slope required to build a DTF which runs by gravity, the WSPs are given the option to construct the EMPURA-DTF hybrid model which is an aerobic treatment facility that operates with electricity (pumping system and aeration). The EMPURA-DTF hybrid can receive and treat up to 75m^3 per day and combines the following modules:

1. Inlet screen: to remove coarse solids for separate disposal
2. Aerobic Sludge Digester: to stabilize the sludge.
3. Bioreactors (Fixed Film Media): to treat the wastewater to high standards fit to discharge to the environment.
4. Sludge Drying Bed: to receive the excess stabilized sludge from the Aerobic Sludge Digester and dewater the sludge for separate disposal or reuse

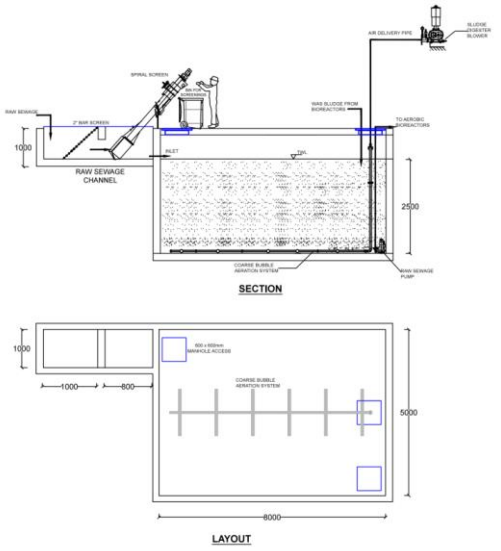

Fig. 8: Technical drawings of the EMPURA-DTF hybrid model

7 Type and level of reuse

According to the local context, the UBSUP concept offers reuse options through the treatment of the faecal sludge in the DTF. When economically and socially relevant, stakeholders such as the WSPs or entrepreneur group can choose to produce the following by-products:

Soil conditioner: the settled sludge collected from the bottom of the anaerobic treatment modules (settler and ABR) is spread onto sludge drying beds. After dehydration and filtration of the water-bound section of the sludge, the dry sludge can be used as soil conditioner for non-edible crops.

Co-compost: the dry sludge from the UDDTs or the sludge drying beds is mixed and processed with organic waste to produce co-compost to replace wholly or partly chemical fertilisers.

Irrigation water: the treated effluent from the DTF is collected and used as irrigation water for non-edible crops. This effluent contains high nutrients levels, which help the growth of plants.

8 Further project components

Apart from the financial and technical support for the establishment of sustainable sanitation service, UBSUP also provides the following types of support:

Preparatory studies to analyse the local situation and assess the demand

Information system tools to obtain accurate and detailed information on sanitation access on a real time basis and allow investment planners, operators and regulatory authorities to prioritise, implement and monitor their interventions:

- Maji Data: online database of general information for the Kenyan water sector
- SafisApp: online data collection tool for monitoring household sanitation in the low income areas
- UPC-IS: management tool storing project information such as proposals, appraisal data, funding requirements and the number of beneficiaries

Capacity building to ensure service provision and proper implementation of the UBSUP activities. UBSUP focuses its capacity building efforts on the WSP level. Specific trainings are provided to the WSP technical and social staff along the service chain. A training of trainers approach is used to ensure sustainability and to reach the different actors on the ground: toilet users, social animators, artisans, contractors, truck drivers, sanitation teams, DTF operators.

9 Costs and economics

Toilets:

- A pour flush toilets connected to a septic tank costs approximately EUR 400 (based on 2 toilet units sharing one septic tank), which brings the per capita investment cost to EUR 40 per person.
- A UDDT (double vault single cabin) costs approximately EUR 500 which brings the per capita investment cost to EUR 50 per person.

Emptying and Transport:

- Emptying tariffs applied by vacuum trucks (for pit latrines and septic tanks) vary from EUR 45 (8m^3 truck) to EUR 100 (18m^3 truck).
- Sanitation teams use the Sanigo (investment cost EUR 3,700) to empty and transport the dry sludge from UDDTs. They charge the toilet owner an average of EUR 15 to empty one vault. A UDDT requires emptying services twice a year.

Treatment:

- Investment costs for a DTF are around EUR 70,000. A DTF serves 10,000 beneficiaries bringing the per capita investment cost to EUR 7 per person. Operation and maintenance costs have been estimated to be around EUR 5,600 per year.
- Approximate investment cost for an EMPURA-DTF is EUR 157,000. An EMPURA-DTF serves 30,000 beneficiaries bringing the per capita investment cost to EUR 5.2 per person. Operation and maintenance costs have been estimated to be around EUR 11,000 per year.

Photo. 5: Exhauster tanker discharging at the DTF in Nakuru © GIZ/Berea (2017)

10 Operation and maintenance

Toilets:
WSPs train the households on correct usage and maintenance of their toilet. The full responsibility for operation and maintenance (O&M) of the household toilets remains with the toilet owners and users.

Emptying and Transport:

- Public sector: The WSP owns and operates one or several vacuum tanker(s) offering the service of emptying and transport to their customers.
- Public-Private partnership: WSP owns a Sanigo (taking care of its maintenance) and outsource the operation to a group of private entrepreneur
- Private sector: emptying and transport services is provided by private vacuum tankers (most common scenario)

Treatment:
The DTF is an asset of the WSPs who own, operate and maintain the facility. They allocate one or two trained staff to undertake all O&M activities which includes: receiving the vacuum tankers and Sanigos, removing the solid waste, the grit and the floating material, controlling the flow rate, collecting the dry sludge, monitoring the effluent quality, weeding, cleaning and other general repair and maintenance tasks.

Photo. 6: Operators collecting the sludge in the drying beds at the DTF in Machakos © GIZ/Berea (2017)

11 Lessons learnt and recommendations

National up-scaling works best within sector institutions. Established sector structures are designed to reach every corner of the country, which provides ideal ground for proven concepts to be simultaneously replicated in different areas. UBSUP uses the financing mechanisms of WSTF, complies to policies and regulations defined at a national level and implements through the WSPs at a county level.

Tried and tested concepts influence policy. Based on empirical evidence and lessons-learned, UBSUP made a significant contribution to the Kenya's Environmental Sanitation and Hygiene Policy (KESH) including shaping the chapters on urban sanitation, sludge management, sanitation types and financing.

A range of technology options is needed to cater for different socio-cultural and economic contexts in different area of implementation. Alternatives to UDDTs must be provided to the residents of areas where this technology is culturally not accepted. The same way, an alternative technology must be offered to the DTF where the terrain does not permit operation without pumping. Finally, reuse options only be considered when socially accepted and economically relevant.

There is a willingness to pay for sanitation services. Contrary to the common belief that the poor are not willing to pay for sanitation services, UBSUP has shown that, with enforcement of the Public Health Act by the Public Health department and appropriate sanitation options and systems in place, residents of urban low income areas are willing to pay for quality services.

Developing sustainable demand for sanitation services takes time. At the beginning of the programme, demand for sanitation was not evident. After vigorous marketing and the first positive results visible, demand picked-up dramatically. This suggests that the provision of affordable technologies and sanitation incentives is effective in triggering demand for improved household sanitation amongst poor households.

Awareness creation is necessary for up-scaling. UBSUP has raised awareness about the importance of improved sanitation services countrywide. This awareness creation has proven its worth by leading local governments to plan the financing of improvement of sanitation services in various towns based on the up-scaling model.

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 have not been emphasised (weaknesses).

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, such as from fertiliser 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 www.susana.org: the SuSanA Vision document "Towards more sustainable solutions" (www.susana.org).

According to the Water Act 2016, WSTF has the legal mandate to finance water and sanitation services in marginalised and underserved areas through the sector institutions.

In terms of accountability and transparency, rigorous monitoring and evaluation enables WSTF to report on actual numbers of beneficiaries reached with the funding. In addition, WSTF reports to the public on an annual basis and WSTF funded investments can be tracked down on the MajiData website.

UBSUP revolves around a solid business model to achieve long-term viability. Commercial opportunities are created in terms of faecal sludge collection, transport and treatment services, but also sale of by-products (fertilizer and soil conditioner) and construction of sanitation infrastructures.

13 Available documents and references

The work of UBSUP is open source. All key documents can be downloaded from the Safisan toolkit www.waterfund.go.ke/safisan/, including application forms for call for proposals, monitoring tools, social marketing material, technical documents, trainings, etc.

Information on WSTF funded investments and general data on low income area of Kenya can be found on the MajiData website www.majidata.go.ke

14 Institutions, organisations and contact persons

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SuSanA 2017

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