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Accelerating Access
Technologies, Costs, Capacity Development

National sanitation plans as well as sanitation projects have to provide guidance regarding appropriate and cost efficient technical choices for public infrastructure on one hand and for household level solutions on the other hand. Thus, the choice of technology is a trade-off between objectives in different areas such as environment, urbanisation, costs, cultural setting etc. In order to achieve sustainability, the choice of the appropriate system has to be made based on the user perceptions and concerns. These have to be analysed thoroughly for each setting.

Selecting the appropriate system needs decision making on:

- Centralized, semi-centralized or on-site sanitation concepts
- Wet or dry systems
- Extent of treatment, disposal and reuse
- Separation of waste
- Level of health and environmental risks acceptance

Centralized, semi-centralized or on-site sanitation concepts

Basis for a functional infrastructure being operated in a sustainable way is the selection of an appropriate system adapted to local conditions (population density, water supply, topographical and (hydro-) geological situation, receiving body, existing facilities, cost, acceptability,…). A fundamental question is whether to design centralised, semi-centralised or decentralised sanitation options. This decision will depend on the feasibility and the relative cost of the solutions in relation to the advantages. Important influencing factors are the extent and state of already existing infrastructure, population density and the legal and physical condition of the settlement. Furthermore, the availability of water supply is decisive for the selection of a sanitation option. In Sub-Sahara Africa, centralised solutions are therefore not an obvious choice, notably for smaller towns and peri-urban areas.

This being said, when talking about decentralized systems, care must be taken not to limit the thinking to conventional pit latrines. These onsite facilities are generally placed outside the houses for convenience, are often shared by many users from several households (hygiene hazard), and bear the risk of residues contaminating ground water or wells (environment

hazards). This may be the reason why many decision makers, who may be unaware of numerous other on-site or semi-centralized options, seem at unease to accept decentralized solutions.

There are serious constraints to reach a high number of people according to the MDG and human rights criteria with centralized systems only. Centralised systems require substantial investments, and result in high cost for operation and replacement. Furthermore they require precious water as a carrier, which can be a severe constraint in water-scarce countries and when users have low water consumption. In order to invest in such expensive infrastructure, specific conditions must be fulfilled. The settlements need to be legal, the inhabitants need to hold a land title and be able to afford in-house plumbing and the recurrent cost of a central sewer service. In the settlements of the urban poor, even if these conditions are fulfilled, the unplanned character may still pose huge problems for the construction of a centralized sewerage system.

On the other hand, emptying full toilet pits in a hygienically sound manner is a difficult and costly task. Centralized systems may be more cost-efficient to ensure waste-water collection and reuse (especially if people already have water toilets). Decentralized systems are often difficult to implement and almost impossible to control. In addition, the implementation capacity and consequently the needed capacity development efforts may be much higher with decentralised systems and require a significant presence on-the-ground and knowledge of the served community.

An intermediate solution might be semi-centralised schemes. Before designing an appropriate sewerage scheme, a detailed assessment of the objectives is required. Many different technical solutions may be feasible, depending on the effluent quality of treated waters required (e.g. protection of downstream population, reuse in agriculture).

Decentralised sanitation: Wet or dry systems

In water-scarce areas, water may seem too precious to be used for flushing toilets. Dry systems may seem the obvious choice, especially if the reuse options are accepted such as production of biogas and use for agriculture. On the other hand, reuse of wastewater, for example in irrigation, can be a very interesting choice when wet systems are in use.

The choice between systems and technologies will to a large extent be guided by cost-benefit considerations, the level of convenience/ comfort required (dry systems may be smellier), the ease of implementation and the need for capacity development and behavioural changes to be required. In urban areas, households do often not have sufficient space for proper reuse on their plots. Therefore, urban decentralised sanitation (dry and wet systems) requires an organised service to remove residual products (sludge, compost, urine) safely for treatment and disposal or reuse. Where cities are growing, including these considerations into town-planning can be an advantage.

Many variants of wet or dry systems are in use. The collaboration with the users and the consideration of their preferences is very important for a sustainable solution. Therefore, it is not possible to have a one-fits-all standard model.

Separation of waste products

If reuse in agriculture or in energy production through biogas is considered an option, it is an advantage not only with decentralized systems but also with semi-centralized or even centralized from-scratch solutions to consider separation of faeces, urine, black and beige water. This usually comes at a cost and needs significant behavioural changes. The choice of adequate separation including implications for implementation should be clarified right at the start of each sanitation project. Motivation for separation should be the interest of the stakeholders in the products generated (there must be a market for reuse). If cost-reduction is

the motive, as e.g. in Durban, or the reduction of hygienical risks is the main driver, assuring a market for the respective products is still key for implementation.

Treatment, reuse and disposal

Problems arise where sanitation solutions do not have a specific reuse or disposal concept, simply taking human waste away from the dwellings and disposing them into the nearest lake, river or at the roadsides - whatever seems most convenient and less costly. Such uncontrolled disposal pollutes drinking water sources or is the source of other environmental health hazards when e.g. settlements are inundated with waste during rainfall. Not only surface water but also groundwater is increasingly contaminated by such practices.
Thus, proper treatment, reuse and disposal of wastewater are not an “environmental luxury” but also key for assuring safe water supply and the maintenance of a healthy environment in general.

Adequate solutions depend on the specific settings and available funds for development and operation.

Social aspects

Social, cultural and behavioural aspects are key for acceptance and therefore for sustainability. Thus, they are an important factor in the choice of technology: The adequate level of convenience, privacy and security (notably for women) needs to be ensured. The existing problem awareness and the degree of behavioural changes required are different for different technological solutions and have an impact on the ease with which a given solution will find acceptance and can be implemented.

Cost-benefit and Cost-efficiency Considerations

A key factor for successful up scaling of sanitation coverage to reach the poor are cost efficient solutions (value for money). Besides investment for construction, operation and maintenance costs have to be considered and must be affordable for the poor in order to achieve sustainability. Cost-benefit analysis needs to consider full cost of infrastructure, operation, awareness-raising measures, capacity development, health benefits, direct an indirect effects on income generation and benefits from the reuse of waste (energy, fertilizer). Cost-efficiency analysis relates the cost and benefits of sanitation to the number of inhabitants served over time.

The technological solutions together with the financial and process requirements for up-scaling are increasingly prominent in the sector discussion on sanitation. Experience indicates that multiplication of success stories does not take place automatically. The focus must be on affordable, applicable and up-scaleable solutions adapted to the East African realities. The impacts on health, environment, income generation and culture as well as specific costs and the ease of implementation are the measures against which each solution should be evaluated.