



Project no. 037099



NETSSAF

**- Network for the development of Sustainable approaches for large Scale
Implementation of Sanitation in Africa -**

Instrument: Coordination Action

Thematic Priority: Global Change and Ecosystems

Deliverable 33 & 36 & 39

Due date of deliverable: 01.12.2007

Actual submission date: 11.02.2008

Start date of project: 01.06.2006

Duration: 30 months

Organisation name of lead contractor for this deliverable:

SEI, ESCA, IEES

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	X

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ABBREVIATIONS

CBO	Community-Based Organization
DSS	Decision-Support System
HCES	Household-Centred Environmental Sanitation
LDP	Local Development Plan
MCDSS	Multi-Criteria Decision Support System
MoU	Memorandum of Understanding
NGO	Non-Governmental Organization
O&M	Operation and Maintenance
OPSS	Open Planning of Sanitation Systems
PACA	Participatory Analysis for Community Action
PHAST	Participatory Hygiene And Sanitation Transformation
PM&E	Participatory Monitoring and Evaluation
PRA	Participatory Rural Appraisal
PRSP	Poverty Reduction Strategy Paper
PSPT	Participatory Sanitation Planning Tools
RRA	Rapid Rural Appraisal
SARAR	Self-esteem, Associative strengths, resourcefulness, Action-planning, and Responsibility
SHG	Self-Help Group
SME	Small and Medium-Sized Enterprises
SWAp	Sector-Wide Approach
WP	Work Package

1 Introduction

1.1 Objectives of Work Package 4

The major objective in Work Package 4 is the development of a conceptual planning approach for supporting decisions in the field of sanitation on a large scale. It will also at the same time identify the technical and non-technical requirements for the large-scale implementation of sustainable sanitation systems in West Africa.

The specific objectives can be formulated as follows:

- To develop a conceptual approach for supporting decisions in the field of sanitation on a large scale.
- To apply this approach in typical cases, identifying suitable sanitation technologies for typical rural and peri-urban settlements, according to the characteristics and needs regarding technical, social, economical, environmental, institutional and legal aspects.
- To identify generally applicable technical requirements for the implementation of sustainable sanitation at large scale, mapping and contacting the existent regional suppliers of sourcing, logistics, installation, operation and maintenance, in order to prepare a West African database of Sanitation Supply.
- To identify generally applicable non-technical requirements (i.e. human and financial aspects) for the large-scale implementation of sustainable sanitation in West Africa.

1.2 Highlights of the Mid-Term Meeting and Ad-hoc Meeting

1.2.1 Mid-term Meeting Bamako, Mali

The methodology/procedure of WP4 given in the DoW had foreseen that once the socio-economical characteristics and existing needs of typical cases have been identified in WP2 and a thorough evaluation of the sanitation technologies available is performed in WP3, an assignment of the most appropriated technology for each case will be executed in task 4.1. As a result a set of suitable sanitation options should be obtained, for which the technical and non-technical requirements will have been identified in task 4.2 and task 4.3, respectively.

Revision of the above stated methodology/procedure of WP4 and its respective tasks (task 4.1, 4.2 and 4.3) were first discussed between the work package leader (SEI) and the respective task leaders (ESCA, IEES) prior to the kick-off workshop on WP4 that was held at the NETSSAF-Mid-Term-Meeting in Bamako, Mali (21–25 June 2007). The common understanding of work package and task leaders was that revision of the methodology/procedure given in the NETSSAF project proposal might enhance the outcome of the work package. The revised methodology/procedure for WP4, as presented to, discussed and approved by the consortium of NETSSAF-partners, is outlined in brief below.

It is concluded that, even if “positive lists” of sustainable sanitation concepts/systems that are deemed suitable for a typical setting are prepared in all conscience at present, site-specific constraints and

technologies and their respective costs may vary in future. Therefore it was decided that, instead of naming a few sanitation concepts/systems that are deemed suitable for a typical setting, a methodology on how to select appropriate sanitation concepts would be prepared in task 4.1. Task 4.2 & 4.3 will compile universally valid technical and non-technical requirements for the large-scale implementation of sustainable sanitation concepts in West Africa. Those requirements will give a feed back to task 4.1. for the selection of suitable sanitation concepts.

Applying the decision support (DSS) tool, which is developed in task 4.1 and which reflects on technical and non-technical requirements compiled in task 4.2 and 4.3, will help in the evaluation of appropriate sanitation solutions in future.

1.2.2 Ad-hoc Meeting Hamburg, Germany

An agreement was reached by the leaders of WP4 and WP6 at the Ad-Hoc meeting in Hamburg on t6 September 2007 to carry on with the revised methodology and structure of WP4 as defined at the Bamako meeting, except for one major change: to reduce the number of case studies of typical settings from six to two in order to show the steps involved in the process of decision making. These case studies are to be prepared based on the feedback from tasks 4.2 and 4.3. An agreement was reached by the leaders of WP4 and WP6 at the Ad-Hoc meeting in Hamburg on t6 September 2007 to carry on with the revised methodology and structure of WP4 as defined at the Bamako meeting, but with one major change: to reduce the number of case studies of typical settings from six to just two in order to show the steps involved in the process of decision making. These case studies are to be prepared based on the feedback from tasks 4.2 and 4.3.

1.3 Stakeholder groups and their respective roles, tasks and responsibilities

Involvement and participation of all involved stakeholder groups is needed to sustain a large-scale sanitation project:

- User/residents;
- Community representatives (e.g., traditional leaders, etc.);
- Planners, regulators, engineers, consultants (national, international);
- Political decision-makers (local, regional, national);
- Schools and commercial operations;
- Land owners;
- Contractors and/or service providers;
- User of recyclates/farmers;
- NGOs (Non-Governmental Organisations);
- CBOs (Community-based organizations) and SGH (self-help groups);

- Other stakeholders (e.g., people living downstream, etc.);
- Funding agencies;
- Research institutions;

There is a strong need for the input of all stakeholders into the planning process as the respective roles, tasks and responsibilities of the various stakeholder groups vary. The success of any large-scale sanitation project depends on the active participation of all stakeholders. This is to ensure that all issues and interest related to these stakeholders are properly addressed and proper considerations are made. Due to these different roles and responsibilities of the varying stakeholder groups, it is necessary to properly identify and define the roles and responsibilities of each group. These roles and responsibilities are outlined in the table below (Table 1):

Table 1: Descriptions of stakeholder groups and their potential roles, tasks and responsibilities.

Stakeholder Groups	Roles	Tasks	Responsibilities
Users, residents	Users and often owners of the planned sanitation system.	Determination of needs and priorities. Participation in the selection of the most appropriate sanitation scheme.	Day-to-day O&M of on-site sanitation systems. Often, reuse of hygienised recyclates. Reuse of treated water.
Planners, engineers, consultants	Experts in the designing, implementation and O&M of large-scale sustainable sanitation projects.	Provision of expert knowledge to the implementing organisation(s).	Planning of the sanitation concept.
Political decision makers	Policy makers that can influence as well as assist the practice of sustainable sanitation	Create policies that support the practice of sustainable sanitation	Political influencing of sanitation policies
Schools and commercial operations	Outscaling; improving human capacity in water and sanitation	Organise lectures and events where sustainable sanitation issues are dealt with	Support in the dissemination of knowledge in the field of sustainable sanitation
Land owners	Owners of the land where components of the sanitation/reuse system will be located	Provide input into planning	To be informed of the process
Contractors	May be involved in the construction and/or operation and maintenance of the system	Provide input into planning	To be informed of the process
Farmers/users of the recyclates	Users of the treated waste and, possibly, the reclaimed water	Provide input into planning	Reuse of hygienised recyclates and treated water. Marketing of agricultural produce.
NGOs	Representatives of	Speaking on behalf of	Representing and

	certain communities.	their community.	lobbying of interests of their community.
CBOs, SHGs	Representatives of certain communities.	Speaking on behalf of their community.	Representing and lobbying of interests of their community.
Other stakeholders	People not directly benefiting from the sanitation system, but been affected by the same.	Provide input into planning	To be informed of the process
Funding agencies	Providing financial support for the implementation of the sanitation scheme	Provide assistance for the planning and implementation stages.	Support in the area of providing finances for sustainable sanitation projects
Research institutions	Generate new knowledge in sustainable sanitation approaches; create international public goods on ecological sanitation	Provide input into planning	Creation and dissemination of the latest sustainable sanitation technologies.

1.4 Definitions and Terminology

1.4.1 Sanitation

Sanitation involves interventions to reduce people's exposure to diseases by providing a clean environment in which to live and with measures to break the cycle of disease. This usually includes disposing of or hygienic management of human and animal excreta, refuse and wastewater, the control of disease vectors and the provision of washing facilities for personal and domestic hygiene. It also involves both behaviours and facilities which work together to form a hygienic environment (World Bank, 2002)

A sanitation system encompasses the users of the system, the collection, transport, treatment and management of end-products of human excreta, greywater, solid waste, stormwater and industrial wastewater (Bracken et al, 2005).

1.4.2 Sustainability in the field of sanitation

Sustainable sanitation systems and services protect and promote human health, seek to minimize environmental degradation or depletion of the resource base, are technically and institutionally appropriate, economically viable and socially acceptable (Bracken et al., 2005). This definition expands the triple bottom line definition of sustainability (ecological, economical and social) with two categories that are specific and extremely important for sanitation systems: health and technical sustainability – health, since the prime

objective in the first place with a sanitation system is improved health; and technical, since the technical function of sanitation systems is crucial for its sustainability.

1.4.3 Peri-urban vs. Rural

Peri-urban areas can be described as the areas immediately adjoining urban areas i.e. between the suburbs and the countryside. Such areas are found outside formal urban boundaries and urban jurisdictions which are in a process of urbanisation and which therefore progressively assume many of the characteristics of urban areas. Inhabitants in these areas generally fall into the low-income group of the community and mostly live in slums. These peri-urban areas are also seen as an interface between the urban and rural areas. Rural areas on the other hand are settled places outside towns and cities. Such areas are distinct from more intensively settled urban and peri-urban areas. Inhabitants generally live in villages, hamlets, on farms and in other isolated houses.

Both peri-urban and rural areas have similar characteristics which include inadequate sanitation systems and infrastructures to meet basic needs, as well as a significant proportion of residents living in the lower income categories. These characteristics are to be taken into consideration when planning on sustainable sanitation projects as factors affecting the peri-urban locations vary from those affecting locations in the rural settings.

Technical requirements pertain to the technical aspects such as performance-related, reliability, and availability issues to be considered when planning projects. These requirements are often called quality of service requirements or service-level requirements and deal directly with the technology to be used for the project. Non-technical requirements on the other hand are requirements that give support to the project as a whole, but are not technologically oriented. These requirements are further highlighted below, with a checklist of activities designed to fulfil these requirements provided in the Annex to this report.

The technical requirements cover aspects such as sourcing, designing, management and logistics, installation, operation & maintenance (O&M), treatment processes and installations, as well as the logistics of distribution & application treated human waste in agriculture or aquaculture. These technical aspects include:

Sourcing: Identification of all types of sources of supply. This refers not only to sourcing of (building) materials (e.g. local, national or international suppliers of required sanitary wares), but also of human resources, etc.

Designing: Assessment of “good practice” examples and adaptation of existing technologies to local needs and habits, etc.

Management and logistics: Refers to the management and logistic aspects of collection, treatment and reuse/disposal concept processes, and also the collection and transport of flowstreams and/or sanitized end products, etc.

Installation: The hardware of the sanitation system used for collection, treatment, distribution and reuse/disposal concepts, etc.

Operation & maintenance: O&M aspects of the whole sanitation system, including collection, treatment and reuse/disposal concepts, etc.

Treatment: Transformation (processing) and sanitation of flow streams, etc.

Logistics: logistical aspects of distribution and application of sanitized flowstream(s) (applicable only if flowstreams are recovered for crop production or aqua cultural activities after sanitization), etc.

Monitoring & evaluation: control of the functioning of the “whole” system (project) and its assessment for corrective actions, etc.

1.4.4 Non-technical requirements

Non-technical requirements cover stakeholder aspects, financial aspects, economic aspects, environmental aspects, legal & institutional aspects and training, education & dissemination.

Brief description of different non-technical aspects:

Stakeholder aspects: focus is on all involved stakeholder groups and their awareness, needs and priorities in terms of sanitation

Financial aspects: requirements referring to the financing of large-scale implementation of sustainable sanitation systems/projects

Economic aspects: focusing on the collection, treatment, distribution and application of all relevant flow streams, including reuse aspects for energy and food production

Environmental and health aspects: refer to environmental and health issues of the sustainable sanitation project

Legal & institutional aspects: aspects that help in establishing an enabling legal and institutional environment

Training, education & dissemination: requirements relating to training, educational and dissemination aspects of sustainable sanitation projects

2 Review of existing Participatory Sanitation Planning Tools (PSPTs) and adaptation for the rural and peri-urban context in Africa

2.1 Principles of Sanitation Planning

The latest trends in international development ideology reflect a shift away from traditional, top-down planning to strategic, bottom-up processes. The traditional method of planning for sanitation was highly structured process of written rules and procedures, with a top-down planning flow with narrow participation profiles and budgetary focuses (Pyburn, 1983). The priority needs and necessary service levels were determined by well-meaning officials based on their own perceptions of what was needed for the “target beneficiaries”. The beneficiaries themselves often had little say in the matter (Eawag, 2005).

In contrast, the strategic planning frameworks that have emerged out of the past fifty years of international development work focus on more participatory, bottom-up methodologies. Planners solicit the participation of a variety of stakeholders in a democratic planning process. A number of strategic planning principles can be synthesized from the international development literature concerning the approach necessary for achieving sustainable sanitation projects. These principles are not logical steps to be completed, but guidelines that will influence the format of the steps and the decision-making process itself. The five key principles behind successful planning are (1) participation, (2) capacity building, (3) economic efficiency, (4) technical flexibility and (5) feedback.

2.1.1 Participation

The need for participatory development approaches is widely recognized. Community participation is championed as a way to develop ownership, community empowerment, and promote demand-driven economic models for sanitation promotion. The participatory approach is often tied to a decentralized democratic process which seeks to manage problems close to their source. Participatory planning requires recognition of different groups of stakeholder, each with their unique set of priorities and drivers for sanitation improvements (Sharp, 1998; IWA, 2006). Both the formal and informal sectors of society should be recognized (Choguill, 1996) and involved to an appropriate degree (GHK, 2002).

2.1.2 Capacity Development

Two of the main impediments to sustainable sanitation are low prioritization of need and lack of maintenance on existing systems. Capacity building can address both of these problems through educational measures for awareness raising, social marketing and capacity development. Health education, social marketing and sanitation promotion efforts will increase awareness of the need for improve sanitation as well as the demand for it. However, it is also necessary to develop the technical and organizational capacity of communities to participate in planning, management and maintenance of sanitation systems once they are in place. This type of capacity development includes the training of politicians, architects, real estate agencies, managers, technicians, masons, and entrepreneurs in the formal and informal sector who will stimulate the

market. Sustainable capacity building requires effective communication and information sharing both during and after the planning process. Education and training initiatives should be linking into local and regional learning alliances so that the learning processes will continue after the initial project stimulus is gone (Moriarty et al, 2005). By working closely with institutions and local communities during capacity building exercises planners will also be supporting participatory processes.

2.1.3 Economic Efficiency

Increasing economic efficiency requires a more holistic approach than the traditional one that is based on demand projections from demographic and income analyses. Marketing of sanitation services needs to respond to realistic assessments of demand, but should also be affordable for all levels of users (Wright, 1997). This will require the unbundling of investments, both geographically and by hardware components, so that services can more easily be adapted to meet demand. The demand-based economic models are therefore closely linked with both participatory approaches and capacity building since they rely on consumer input and social marketing strategies. The process of creating an informed public demand and listening to that demand at the planning level greatly increases the chances that the services offered will be appropriately matched with affordability (GHK, 2002). However, offering affordable technology will still need to be backed by equitable credit and financial arrangements that encourage investment through reduced up-front costs and cost recovery.

2.1.4 Technical Flexibility

The key to responding to consumer needs and making sanitation affordable for all is to consider a wider range of technical options. This often requires taking a wider view of sanitation itself, by considering the linkages with water supply and solid waste systems (GHK, 2002). Sanitation technology can either integrate these systems (i.e. waterborne sewerage and land filling of faecal sludge) or separate them (i.e. on-site dry toilets and direct recycling of nutrients). Planning for the configuration of the systems should also consider the most appropriate level of service provision, i.e. large centralized networks, neighbourhood systems, or household level. The advantages and disadvantages to each type of technology and system structure must be evaluated for the local conditions and matched with existing demand, managerial capacity, and user needs (IWA, 2006). In general, the prevailing attitude is to look at the functionality of the sanitation system rather than the technology itself.

2.1.5 Feedback

A critical component to all of the planning principles is the process of soliciting and responding to feedback. Although responding to both consumer and technical feedback are intrinsic functions of the other principles, without specific reference to the feedback loop itself, it risks being lost behind the more visible, core actions of the other processes. The entire planning process should be linked in an iterative and participatory way, so that technical and socio-economic issues are assessed together throughout the process (Norström, 2007). Both the planning and implementation processes should take manageable steps towards intermediate objectives (GHK, 2002). Using such an incremental approach with feedback loops in between steps

increases incentives to reach immediate goals, and keeps the project on track through consistent evaluation of progress.

2.2 Existing Participatory Sanitation Planning Tools (PSPTs)

The following section gives an overview of some existing participatory sanitation planning tools (PSPTs). The overview will illustrate the scope of the steps and some of the common methodologies employed in the various frameworks. A table comparing the frameworks can be found in Table 3.

2.2.1 Participatory Hygiene and Sanitation Transformation (PHAST)

Participatory hygiene and sanitation transformation (PHAST) is an adaptation of the SARAR (Self-esteem, Associative strengths, resourcefulness, Action-planning, and Responsibility) methodology of participatory learning to the specific context of sanitation issues (Wood, 1998). It seeks to empower communities to improve hygiene behaviours, prevent diarrhoeal disease, and encourage community management of water and sanitation facilities. It uses a participatory approach to community learning and planning that follows a seven step framework: (i) problem identification, (ii) problem analysis, (iii) planning for solutions, (iv) selecting options, (v) planning for new facilities and behaviour change, (vi) planning for monitoring and evaluation, and (vii) participatory evaluation. The community is involved at each step in the process and there is recommended participatory tools to assist in implementing each step.

2.2.2 Open Planning of Sanitation Systems

The framework recommended by the EcoSanRes Programme (Kvarnström and af Petersens, 2004) is based on the Open Comparative Consequence Analysis (OCCA) methodology (Ridderstolpe, 2000). This planning process is performed in five steps: (i) problem identification, (ii) identification of boundary conditions, (iii) terms of requirement, (iv) analysis of possible solutions, and (v) choice of the most appropriate solution. The first step requires identification of the stakeholder groups and their roles. The problem identification process can then be performed using participatory methods such as the logical framework approach (Örtengren, 2004) or PHAST. Identification of the boundary conditions should define the technical limits of the sanitation system (community served, water supply, agriculture), but also potentially limiting socio-economic patterns, natural environments, and political conditions. After the first two steps, planners should be able to define the Terms of Requirement (ToR) for the sanitation system. The ToR should be comprehensive and include factors on health, water and natural resource protection, costs, technical reliability, user satisfaction, and management issues. The analysis of possible solutions is then based on how well potential technologies meet the ToR. At least three options should be selected and presented to the stakeholders for evaluation and selection of the most appropriate solution.

2.2.3 Sanitation 21

The framework proposed by the International Water Association task force for the analysis and selection of appropriate sanitation systems is called Sanitation 21, (IWA, 2006). This framework defines three parts to effective sanitation planning: (i) defining the context, (ii) identifying technical options, and (iii) determining the

feasibility of the options. These three phases are broken into nine action steps (Table 2). Analysis of the context recognizes that different domains exist within a city and that the stakeholders in each of these domains will have different objectives with regards to sanitation. The domains can be broken down as household, neighbourhood, district, city, and beyond city. The context within each domain will include a set of interests, external drivers, and management capacity that are identified through a participatory process with the stakeholders. During the second step, a range of technical options is identified and listed according to their treatment capacity and level of management required. At this stage a generic list of sanitation system types can be used that include both on-site and centralized systems. The purpose here is more to look at the functionality, operation, maintenance, and basic management requirement of the systems than to outline specific costs and design requirements. The key step in the framework is finally to select a technology based on its ability to meet the objectives defined by the stakeholders. At this stage the important questions are to determine if the management requirements match the community capacity, basically will the system work? It is important to realize that it is possible to apply different technical options at different domains within the city in order to adequately meet the needs and institutional realities of everyone.

Table 2: Sanitation 21 Framework

	Assessment	Step	
Context	Institutional Mapping	1	Identify the Key Actors in each Domain
	Interests/Objectives	2	Identify the interests of the key groups
	External Factors	3	Understand the external factors driving decisions on sanitation
	Capacity	4	Identify the capacities which exist for implementation and long-term management of any system
Sanitation System/Options	Sanitation Elements	5	Analysis of existing systems and potential new systems
	Management	6	Identify in detail the management requirements for the systems
Fit for Purpose?	Does it meet Objectives?	7	Assess whether the proposed/existing system meets the objectives in each domain
	Do Management requirements match?	8	Assess whether the system can be managed based on the capacities of each domain
	Will it work?	9	Taking into account all the previous steps and technical considerations, ask the question 'will it work?'

2.2.4 Household-Centred Environmental Sanitation Planning Approach (HCES)

Household-Centred Environmental Sanitation (HCES) was developed by the Swiss Federal Institute of Aquatic Science and Technology (EAWAG, 2005) in response to the Bellagio Principles (see Annex 7.4). Like many other frameworks, HCES recognizes the importance of management zones within the urban environment. The ten-step HCES process follows a project cycle framework (Figure 1), from project identification, pre-planning and preparation, to implementation and monitoring. The process is built on identification and assessment of sanitation needs by the local stakeholders. Steps 1–4 establish the participatory communication channels and define local sanitation priorities based on an understanding of the current situation and system boundaries. Steps 5-6 identify and assess the feasibility of a wide range of technologies, as well as, the institutions and financial arrangements for providing these technologies. The final steps of the HCES process involve the stakeholder in the selection of appropriate solutions and the development of an implementation program, complete with methods for monitoring and evaluation. EAWAG also emphasizes that the successful application of this planning approach is dependent on the preconditions of an enabling environment (see chapter 3).

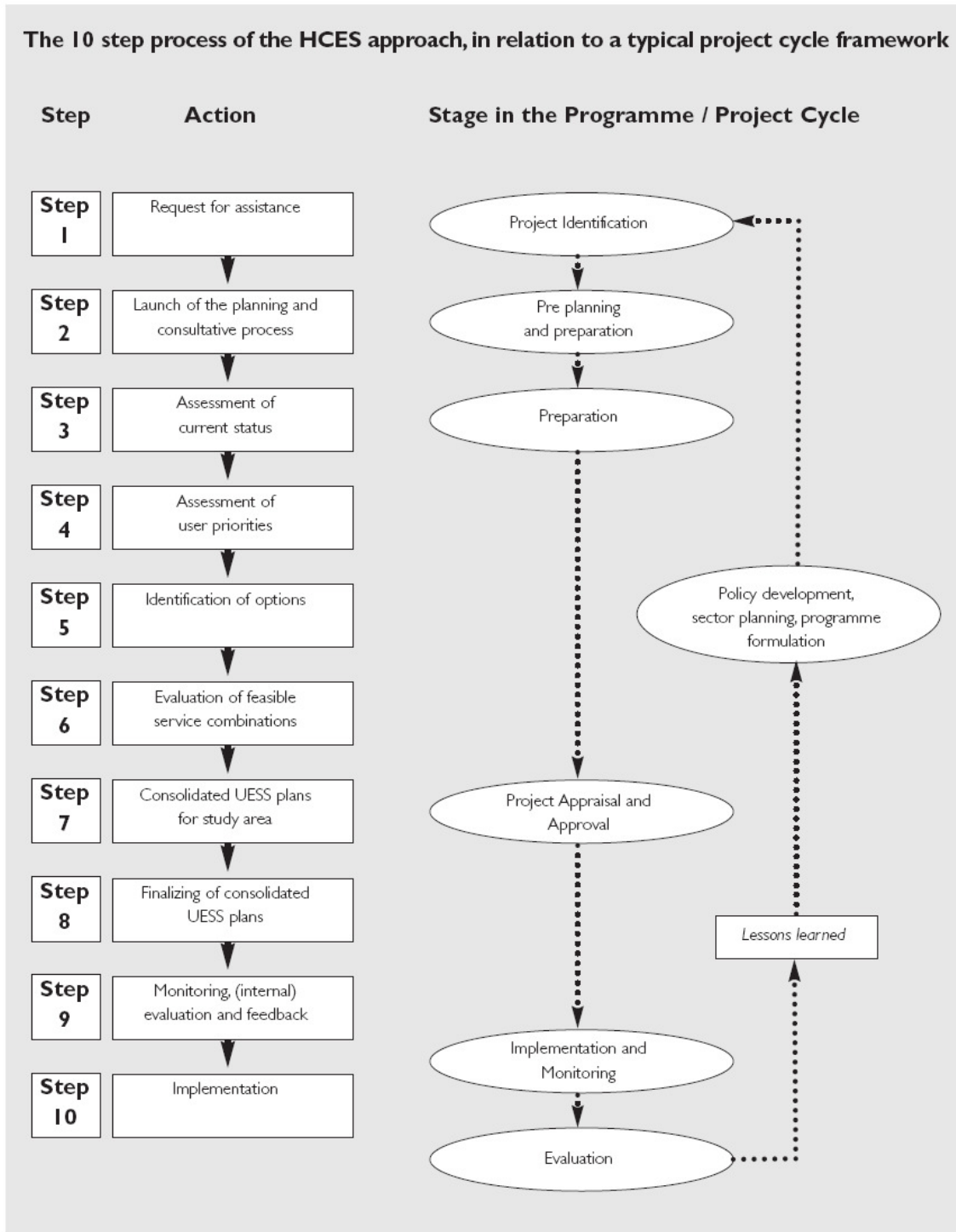


Figure 1: Schematic of the HCES planning approach (Eawag, 2005)

2.2.5 Multi-Criteria Decision Support Systems (MCDSS)

Decision Support Systems (DSS) are derived from the theory of decision analysis and designed to help decision makers resolve issues of trade-offs through the synthesis of a variety of information (refer to Annex 7.5 for further details). Multi-Criteria Decision Support Systems (MCDSS) are used when there is a need to identify trade-offs between of a variety of information, often including both quantitative and qualitative data,

as is the case with sanitation. The advantages of using MCDSS in decision-making are that it can increase transparency, stakeholder participation, and optimisation by application of several criteria in the decision process. It is also easily adapted to consider the local conditions. Although the components of each MCDSS will vary depending on the situation, the framework used for developing it is derived from a structured approach to problem solving. In a planning situation, it is useful to apply the same guidelines as those used in the MCDSS process. Since each step in the process requires defining the situation, criteria or ground rules for making trade-offs, it is highly compatible with other participatory tools (Wiwe, 2005).

The decision making process of a MCDSS planning approach can be highlighted in six steps:

1. Definition of the Problem, Goals and Objectives

Identify the problem with current situation and develop a vision for an improved future condition (the goal).

2. Definition of Criteria

Defines the criteria and boundary conditions that must be met in order to achieve the goal, these can be quantitative or qualitative criteria, but they must be measurable.

3. Definition of Alternatives

Design technically feasible options and measure their predicted performance against the criteria (generally done by use of a decision matrix).

4. Definition of Preferences

Assign weights to the criteria based on stakeholder preferences.

5. Decision Making

Decision maker(s) must balance trade-offs and make the final decision.

2.3 Adaptation of existing PSPTs for the Rural and Peri-Urban Context in Africa

The existing PSPTs covered in the previous section were designed to work well in the urban environment (HCES, Sanitation 21) or traditional rural settlements (PHAST). However, considered individually they are less able to tackle the key problems arising in rural and peri-urban settlements today. Urban-oriented PSPTs are often weak in creating sanitation demand and stimulating the necessary behaviour change, which is key when planning for sanitation in areas where open defecation is highly prevalent. On the other hand, participatory, rural development tools (such as PHAST) are designed to work in areas without centralized regulations on health and the environment, which makes them inappropriate in peri-urban areas and increasing so in rural areas affected by the process of decentralization. Decentralisation is gaining popularity in West Africa and is expected to enhance opportunities for participation by placing powers and resources at a more familiar and more influential level of local government. However, as this movement is still in its infancy, many of the local municipalities still lack the capacity to effectively execute the mandates which are given to them. Within this context, an efficient and appropriate sanitation plan needs to be compatible with the decentralised planning process and accessible to local municipal leaders. Therefore this work package proposes a combination of PSPTs for municipal and rural settings which we believe is appropriate for the

West African setting. The proposed methodology highlights demand creation for sanitation, participation, and capacity building to enable stakeholders to make an informed choice.

The methodology presented here is based primarily on the following existing methodologies/tools:

- Household-centred environmental sanitation (HCES)
- Multi-criteria decision support systems (MCDSS)
- Sanitation awareness raising tools such as PHAST

The order of the proposed steps most closely follows the process laid out in HCES (Table 3). However, more emphasis is placed on participatory techniques for demand creation, monitoring and evaluation, such as those used in PHAST; and the stakeholder process of defining criteria and preferences that is central to the MCDSS method. This method also proposes the addition of two key steps in the process: demand creation and the construction of demonstration units. These steps are designed to overcome problems of low levels of knowledge about the benefits and potential options for improved sanitation. The process is designed to be as participatory as possible and is focused on identifying the user criteria and preferences that will allow decision makers to select appropriate and sustainable sanitation solutions.

Table 3: Summary table comparing the existing PSPTs outlined in this chapter

	PHAST	OPSS	HCES	Sanitation 21	MCDSS	NETSSAF
Context Assessment	Problem Identification	Problem Identification	Request for Assistance	Stakeholder Identification	Definition of Problem, Goals and Objectives	Project start-up and launch of the planning process
			Launch of Planning Process	Identify Stakeholders Objectives		Creation of a demand for improved sanitation
	Problem Analysis	Identification of Boundary Conditions	Assessment of Current Status	Assess External Factors	Definition of Criteria	Assessment of existing sanitary situation and user priorities
		Terms of Requirement	Assessment of User Priorities	Identify Management Capacities		
Technical Options	Planning for Solutions	Analysis of Possible Solutions	Identification of Options	Technical Analysis of Existing and Potential Systems	Definition of Alternatives	Construction of demonstration units
				Assess Management Requirements for the Systems		

Feasibility	Selecting Options	Choice of the most Appropriate Solution	Evaluation of Feasible Service Combinations	Evaluation of Technical Systems against Objectives	Definition of Preferences	Identification of Feasible Sanitation Concepts and Service Systems
	Planning for New Facilities and Behaviour Change		Consolidate Plans	Compare Management Requirements to Existing Capacity		Consolidation and Finalization of Sustainable Sanitation Plans
	Planning for Monitoring and Evaluation		Finalize Plans	Critical Evaluation of System Feasibility	Decision Making	
Implement	Participatory Evaluation		Monitoring, Evaluation and Feedback			Implementation
			Implementation			Participatory Monitoring and Evaluation

2.4 Planning Steps for the Large-Scale Implementation of Sustainable Sanitation – the NETSSAF Model

In order to meet the needs of participatory planning tools for the large-scale implementation of sustainable sanitation NETSSAF proposes a framework that is designed to be generally applicable in rural and peri-urban settlements across West Africa. It is derived from the existing methodologies outlined in this chapter and follows the eight step approach described below:

1. Project start-up and launch of the planning process

This phase will define the general problem and formulate the overall goal of the project. A consensus regarding the project goals and boundary conditions should be reached through a series of discussions with key stakeholders (municipal officials, health practitioners, engineers, planners, etc.) and drafted into official documents.

2. Creation of a demand for improved sanitation

Sanitation requires intervention at both household and community levels, therefore raising the demand for such services from individuals becomes of paramount importance for the project success.

Awareness raising activities must reach out to all members of the community, including diverse gender, ethnic and class groups, and be structured so as to provide a relevant message to each group. This is an on-going activity and will continue throughout the subsequent planning steps and beyond.

3. Assessment of existing sanitary situation and user priorities:

This step will collect the background information necessary to determine the terms of requirement for a sanitation system from both technical and user perspectives. This step is performed through a

comprehensive, participatory assessment of the current level of services and user attitudes towards sanitation across the domains of the project area.

4. Construction of demonstration units

Demonstration units shall introduce sustainable sanitation schemes before the final planning stages for large-scale intervention in order to give potential users and political authorities valid reference points that will assist in their decision making.

5. Identification of Feasible Sanitation Concepts and Service Systems:

The objective of this step is to reach a decision about the most suitable sanitation system based on the baseline information gathered in step 3, an assessment of the enabling environment, information on users priorities (from steps 3-4), and any additional knowledge that was gained from the demonstration units.

6. Consolidation and Finalization of Implementation Plans for Sustainable Sanitation

This step will develop an action plan for the implementation of the sanitation structures, as well as the corresponding management system. It will clarify financing methods, and roles and responsibilities in construction, operation, and maintenance of the chosen system.

7. Implementation

Implementation is a process within itself, and requires an adaptive and flexible project management approach with continuous feed-back via monitoring and evaluation systems. This step is designed to govern the process and key conditions necessary for successful implementation and service delivery.

8. Participatory Monitoring and Evaluation

Participatory monitoring and evaluation (PM&E) methods are used throughout the project as a feedback system to increase the consensus on appropriateness of goals, objectives and activities. It provides timely, reliable, and valid information for coordinating and managing the other planning and decision making steps.

The sequencing of the process is illustrated in Figure 2. The red squares indicate milestones, or significant events, in the project which are usually the completion of a major deliverable. In this case, the milestones may be significant stakeholder workshops, decision points, or checkpoints to validate how the project is progressing and potentially reassess the situation. The arrows originating at a milestone indicate to which project steps it is linked. This figure also highlights the continuous and on-going nature of demand creation (step 2) and participatory monitoring & evaluation (step 8). On paper it is easier to explain the planning process in a linear fashion, but in reality some steps will overlap and others will be iterated as new information is revealed during feedback sessions. It is also important to notice the time lag between implementing the demonstration projects in step 4 and assessing the feasibility of the options in step 5. This is to give the users of the new infrastructures time to get to know the facilities, integrate them into their daily lives, and decide on their opinions of the utilities. It also provides the planning team with feedback for the following steps.

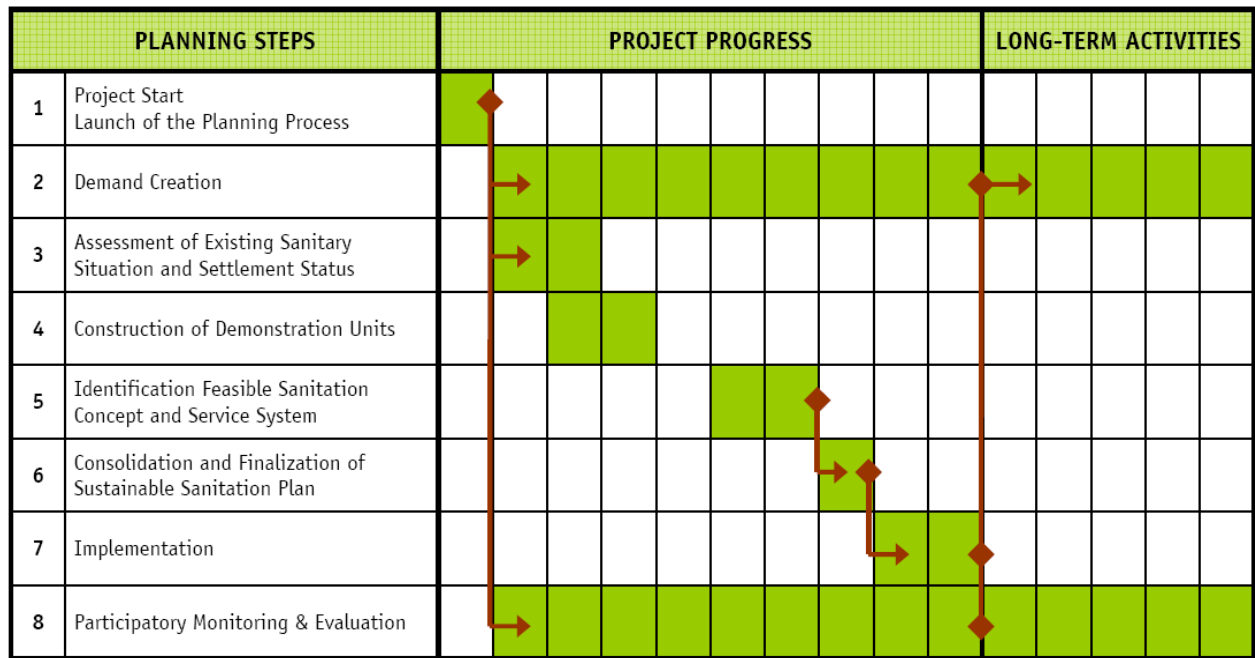


Figure 2: Sequence of planning steps in the course of a large-scale sanitation project.

3 Understanding the enabling environment for the large-scale implementation of sustainable sanitation in Africa

3.1 The enabling environment

An “enabling environment” can be seen as the set of interrelated conditions that impact on the potential to bring about sustained and effective change (in EAWAG, 2005; adopted from World Bank Social Development Note, 2003). This includes the political, legal, institutional, financial and economic and educational conditions that are created to encourage and support certain activities. Because most of these conditions are vested in law, the ability to modify them through project design may be limited. Understanding the conditions, through analysis and reflection of the environment locally – how they function and the factors that influence them in a given context – is a necessary requirement for a successful implementation of sanitation systems on a large scale. The following key issues need to be examined:

- Government support, such as positive political alliances on issues and favourable national policies and strategies
- The legal framework of operation, covering terms of contracting, appropriate standards and codes at national and municipal levels
- Institutional arrangements that suit the nature of the local environment and articulate roles and responsibilities of all stakeholders
- Access to credit and financial arrangements that allow householders to invest resources in sanitation and develop ownership of projects / programmes
- Effective training and communications, ensuring that all participants understand and accept the concepts through possessing the required skills. Connected to this issues is the need for improved information and knowledge management; providing access to relevant information, sharing of experiences, training and resource materials, the development of new approaches and the dissemination of findings.

3.2 Governmental support

In most of the West Africa countries, water and sanitation services are decentralized to an increased extent (i.e.: local or municipal administrations are in charge of providing water and sanitation services). However, any initiative at national or local levels planned to be carried out in urban, peri-urban or rural areas, should be founded on the national sector policy and consequently have the necessary support of governmental and/or local authorities for the implementation of the planned. Large scale implementation projects in sustainable sanitation also have to have this policy and government support.

The composition of the project team and/or the choice of the organisation hosting the project are some of the key points which may impact the willingness of governmental/authorities support to the project.

In the case of large scale implementation of sustainable sanitation projects (national level), it is necessary to constitute a national steering committee of the project in which the ministry in charge of sanitation is

involved. In this case, the minister or his representative should be member of the steering committee once the project initiative is laid in the framework of the national sector policy.

In a project at a communal level, it is judicious that the communal administration can host the project team and the mayor being member of the project steering committee. It is significant that the initiative of the project falls under the Local Development Plan goals (LDP).

3.3 Legal framework

In most countries or regions, the existing national laws, local by-laws and policies can provide an environment that facilitates, or at least does not impede, planning for large scale implementation. To ensure effective planning and subsequent implementation, designers and implementers need to examine the legal framework within which potential beneficiaries and communities operate to identify and address any constraints posed by the law. Typically, discussions around the legal framework need to include an overview of the following components:

- Forms of contracting
- Standards [technical and other] and their upgrading
- National and municipal codes.

3.3.1 Right to organise and enter into contractual agreements

This issue relates to the legal status of communities and their internal organization.

Here, the objectives for designers or planners are to *(a)* ensure that legal standing of these communities is appropriate and enables them to interact effectively with external parties as required, and *(b)* ensure equitable relationships among community members and transparent processes for internal decision-making (World Bank, 1996). Important questions include the following:

- What are the available processes for formalizing communities or groups so that they can participate in project-related activities?
- Is such formalization necessary to receive public funds or enter into valid contracts?
- If there is not formal legislation or regulation, can project-specific arrangements be developed to achieve the same objectives? (World Bank, 1996).

The designers must also understand that some issues of legal literacy are connected to the right to information. According to the World Bank (1996) they will need to find clarifications to the following questions:

- Are communities legally literate and aware of their rights?
- Is there a need to educate them?
- What institutional arrangements are necessary?

3.3.2 Standards [technical and other] and their upgrading

Standards are potentially one of the greatest immediate priorities when looking to understand and develop an environment for large scale sanitation implementation. In many low income and emerging countries,

standards for service delivery are based on decades-old norms that were developed in industrialized countries and adopted without consideration to the local context. A further complicating factor is that these standards, when appropriate, are difficult or expensive to enforce and therefore become quickly redundant in practice. Technical standards, which emphasise minimum pressures, pipe sizes or equipment, can impact on the flexibility in option design and implementation. The challenge for the sector professional involved in large scale implementation is to be able to review the standards that exist, identify those which require amendment and work with others to lobby for upgrading or amendment of the same.

3.3.3 National and municipal codes

In addition to standards, the legal framework relates to codes of practice. Typical examples that are inappropriate include building codes which specify norms for plot sizes [and which indirectly mitigate against certain technology types], or distances between kitchens and toilet areas. Furthermore, health codes can be highly prescriptive and specify particular forms of sanitation as a condition of occupancy in some buildings. Codes that are technology-prescriptive are conservative in their nature since innovative technologies/systems that might be more apt to solve the problem might be illegal to implement unless they are mentioned in the code/by-laws. Functions-oriented standards/codes/by-laws/regulation is to prefer from a systems development perspective.

3.4 Institutional and financial arrangements

Paramount to a programme of implementation of sustainable sanitation systems on a large-scale is the putting in place of the necessary institutional arrangements at the inception phase.

3.5 Why here? - Increasing the impact of the project

- A conducive policy environment where the results of the project have a high chance of being embedded into the development of WASH sector.
- Sufficient diversity of WASH services in terms of technologies, geological/hydrological, models for service delivery, population sizes and distribution, private sector involvement
- A track of adopting and up scaling innovative approaches to pro-poor WASH service delivery
- Senior staff in relevant government departments who are supportive to the project and willing and able to access and share relevant official statistics and government reports

3.6 Who and how? - Implementing the project - general

- There is a partner organisation/combination of organisations which should be involved in the project
- There is a partner organisation/combination of organisations which have the skills, experience and capacity to conduct the project at any of its steps.
- There is a partner organisation/combination of organisations with influence and is recognised at both intermediate and national or local levels to booster the involvement of stakeholders and authorities.

3.7 Who and how? - Implementing the project - details

- Institutional hosting of the project: who (institutionally) will be the official host of the team; who will pay their salaries? Sometimes, the fund donor of the project does not have any sort of legal existence in countries; this could of course have to be done through local partners. Is that legally possible? What is the process and how long might it take?
- Institutional membership: Which group of organisations can be either part of the project team? Identifying potential team members: in addition to institutional membership, there is also the need of identifying the right people. This is particularly critical for team leader.
- Physical location of the project team: Does the project need to have access to national/local level actors. Does the project be hosted by another organisation at national level? In the case the project is taking on in a commune, it is preferably to the project team be hosted by the communal administration.
- In any case an inception phase of one to three months is necessary in which logistics and some more precise budgeting.
- Capacity development requirements of the possible team (management, financial, facilitation, etc).

3.8 Education, information and knowledge management

The objective of education is to provide training and increase awareness, while information sharing and knowledge management ensure that potential beneficiaries or communities receive adequate knowledge and information in a timely and meaningful way.

According to the World Bank (1996), to achieve this, information must flow from governments and external supporters in ways that genuinely support people's informed participation. They identified the following relevant questions for which the designers and implementers must seek clarifications:

- Is there an obligation on the part of the implementing unit to ensure that stakeholders are provided with adequate and relevant information and education?
- Is such information and education to be provided in a meaningful manner, that is, in a form that can be readily understood by relevant stakeholder groups?
- Is the mechanism for providing or requesting information accessible to all stakeholders? Is it a simple mechanism that can be used by all? For example, are stakeholders required to fill in complicated forms?
- Are there time and financial constraints that may discourage people from seeking information? Is there a significant delay between the request for information and the provision of information?
- Are there any cultural or social constraints for accessing this information? Do barriers exist that may inhibit women or other vulnerable segments of society? Are special measures required to reach potential participants who are poorly educated or illiterate? Is the information available in local languages and dialects? Do stakeholders have any legal remedy when their right to information is infringed?

According to the World Bank; experience in West Africa, specifically The Gambia, reveals that taking into account literacy, language, scope, timing, and selection of themes sensitive to gender, age, and ethnicity is critical to education and channelling information flows to target audiences. In West Africa, there are several channels of communication by which information can be successfully disseminated to stakeholders. The designers and implementers must identify these channels and understand them. In the case of The Gambia for example, the World Bank found that newspapers, radio, talk shows, leaflets, posters, and stickers were effective for education and information sharing. Other methods by which information can be vigorously disseminated in West Africa include traditional entertainment such as song, dance, and community theatres. The Gambia case further revealed that education and exchange of information can also be facilitated at traditional gathering places, such as village markets, religious meeting places, police stations, or marriage celebrations.

To achieve the objective of education, information and knowledge management, it is recommended, drawing from World Bank's experience in other parts of sub-Saharan Africa, that a number of NGOs and community facilitators who are respected by target communities should be appointed and trained to disseminate information among communities.

4 NETSSAF Planning Steps for the Large-Scale Implementation of Sustainable Sanitation Systems

As a basic principle, it is intended that this planning and implementation process takes place within the structure having a mandate for sanitation planning and implementation. This structure is usually the local authority/municipality or equivalent local decision-makers. These authorities should thus be the structure leading the planning and implementation process and the below steps are described from that perspective. The following steps presume that there is a genuine interest within the responsible structure to carry out a sanitation improvement (that there is demand for change) and they are not taking into account how to generate that genuine interest, if it is missing.

This chapter describes the components of the planning steps by giving the purpose of each step and the expected outcomes. This chapter is supported by three annexes. The first provides details of activities that may be associated with each planning step (Annex 7.6). The other two annexes are indicative and non-exhaustive checklists of technical and non-technical requirements that should be fulfilled during the planning process (Annexes 7.2 and 7.3).

STEP 1: Project Start & Launch of the Planning Process

The first step of the planning process is the project start-up. A planning process is unlikely to succeed, if those who will be responsible for its implementation are not convinced of the need to plan (GHK, 2000). Therefore, the main purpose of this step is to bring together the various stakeholders and unite them over a common goal. The initiator of the project (generally the local municipality) will open a dialogue with and persuade key partners and stakeholders of the need to plan and take action.

This phase will define the general problem and formulate the overall goal of the project. It shall also define the project boundaries by identifying the affected stakeholder groups and clarifying the size and location of the project area. A consensus regarding the project goals and boundary conditions should be reached through a series of discussions with key stakeholders and drafted into official documents. The participants in these initial meetings should agree on the planning framework to be used, and assign initial roles and responsibilities for future planning steps, especially steps relating to demand creation (2), assessments of existing conditions (3), and monitoring and evaluation (8).

Activities in this step can include a community workshop to identify the problem areas, a launching workshop to inform key stakeholders of the process, and the establishment of a steering committee including ministry officials, health practitioners, engineers, planners, and utility workers. It will also be necessary to develop a communication strategy for passing information between the various stakeholders throughout the process.

The following table highlights the purpose, outcome, main products, and timing of this step, as well as some related activities and tasks necessary to reach the defined goals.

STEP 1	Description
Purpose	Official project start and launch of the activities being part of the planning process
Outcome	<ul style="list-style-type: none"> • Consensus regarding the sanitation planning and implementation principles in the concerned area • Consensus on stakeholder involvement, partnerships and responsibilities (including a preliminary financial plan) • Agreement on planning approach, further tasks and activities with focus on Steps 2 (Creation of Demand), Step 3 (Assessment of Existing Situation) and Step 8 (PM&E)
Product(s)	<ul style="list-style-type: none"> • Memorandum of Understanding (MoU), as documentation of an official consensus with community representatives, as well as other stakeholder groups, that the aimed project intervention is supported. • Official project document, outlining the local problem, defining the overall goal and the main objectives of the project. • Official and generally accepted decision about the planning area and its boundaries. • Concept of the responsibilities and necessary activities related to achieve demand creation (Step 2), assessing the existing situation (Step 3) and PM&E (Step 8) • Communication strategy
Timing	At the project start
Examples of Related Tasks*	<ul style="list-style-type: none"> • Initial workshop (WS 1) • Stakeholder mapping • Formation of the planning team within the local structures responsible for sanitation issues (village/municipal/district level) • Development of a communication strategy amongst the various stakeholders

* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 2: Creation of Demand for Sustainable Sanitation

Even when there is impetus for sanitation improvement among the municipal authorities, the level of demand within the general population may be much lower. Therefore it is necessary to create demand for sanitation services and generally market the project so that the impacts will be sustainable. Since sanitation requires intervention at both household and community levels, raising the demand for such services from individuals becomes of paramount importance for the project success. Awareness raising activities must reach out to all members of the community, including diverse gender, ethnic and class groups, and be structured so as to provide a relevant message to each group. The success of the project will depend on the effectiveness of such activities to create lasting behaviour change. However, since behaviour change is known to be a long-term process it is necessary to plan for a wide range of sanitation and hygiene promotion sessions that will exceed the project life-span. It is important to emphasize the continuous and on-going nature of this step. Demand creation is placed as step 2 in this framework since sensitization efforts are needed in the beginning, but in reality these activities will continue alongside all subsequent steps (refer to Figure 2).

The promotion of sanitation and hygiene is most effective if seen and designed from a holistic point of view. It implies creating and exchanging knowledge in three areas: technology and hardware (e.g. different types of sanitation systems, operation and maintenance procedures, resource reuse opportunities); social attitudes and software (e.g. hygiene education, behavioural change); and an enabling environment as described in chapter 3. The joint promotion of all three areas of sanitation is needed to obtain the maximum health and socio-economic benefits. However, it is not the sum of activities performed that will ensure success, but the adaptation of these activities to the project context and the local community. There are a wide range of tools available for sanitation and hygiene promotion (PHAST, CLTS, social marketing), but they must be adapted to the local setting. The table below provides some examples of activities for demand creation, and additional references can be found in Annex 7.6.

Additional issues to keep in mind when developing a promotion program:

- It is important to identify the different drivers for sanitation acquisition in different levels of society so that the sanitation message can be adapted appropriately (ex: It is usually important to highlight convenience, safety, privacy and cleanliness as reasons to buy into sanitation. In addition, the potential for resource reuse as fertilizers can be a driver in agricultural areas)
- Awareness raising efforts demand time and financing, therefore the local authorities will need support for planning, promoting and performing these activities. Such support will include fund raising, monitoring and networking.
- Stimulating demand for sanitation will put higher pressure on the supply side of the sanitation market. Thus there is a need to organize a suitable supply chain and system for disposal/reuse of the end products. Local authorities (or private service providers) must be able to provide these services as the demand increases or promotional efforts will be ineffective.

The following table highlights the purpose, outcome, main products, and timing of this step, as well as some related activities and tasks necessary to reach the defined goals.

STEP 2	Description
Purpose	Creation of demand for improved sanitation infrastructure, based on raised awareness, which results from an increased dissemination of sanitation, hygiene and fertilizing information among the population in the project area.
Outcome	<ul style="list-style-type: none"> • Increased awareness about the linkages between sanitation, hygiene, personal health fertilizing, crop production, diet and living conditions • Improved standard of knowledge of the social, ecological and economical advantages of sustainable sanitation systems in the local area • Increased demand for sanitary infrastructure and services amongst the local population
Product(s)	Program plan for the implementation of appropriate sanitation and hygiene promotion tools (as agreed upon during the conceptual planning of demand creating activities done in step 1)
Timing	Activities related to awareness raising and demand creation have to be conducted throughout the entire project duration. (Initiative and responsibilities for continued action on awareness raising activities should have been agreed upon during step 1).
Examples of Related Tasks*	<ul style="list-style-type: none"> • Establish community health clubs • Sanitation and hygiene programs in the schools • Promotion on local radio stations • Home visits to accompany media messages

* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 3: Assessment of Existing Sanitation Situation and User Priorities

The purpose of Step 3 in the planning procedure is to collect the background information necessary to determine the terms of requirement for a sanitation system from both technical and user perspectives. This step is performed through a comprehensive, participatory assessment of the current level of services and user attitudes towards sanitation across the domains of the project area. The collected information shall provide technical details necessary for system design and identify priority community needs related to water and sanitation. The goal of this step is not only to facilitate participatory decision-making in the planning process, but shall also enable further designs to meet users needs and address the operation and maintenance challenges of a day-to-day service delivery. The information collected during this step will feed into the design of demonstration units (step 4) and be a reference point for the selection of feasible sanitation systems (step 5).

The technical information on the existing system shall be gathered through a disaggregated analysis that seeks to understand the status of all the various flow-streams in each domain (see the flow-stream definitions in Annex 7.1). The main goal is to collect information regarding the area's sanitation systems and their level of integration in the settlement structure. Technical requirements for the proposed system will depend on a thorough assessment of information regarding geographic/environmental conditions, excreta and solid waste disposal practices, water availability, drainage, and fertilization/crop production practices in the area.

The system requirements will also depend heavily on the social and economic situation of the settlement. In designing feasible sanitation systems it is necessary to understand how user perceptions of sanitation, their hygiene practices, economic possibilities and priorities, as well as the existing institutional framework will affect decision making. In determining requirements for management and operation of the system it is also of interest to reveal the stakeholders' capacities (e.g. know-how, skills, manpower, equipment, financial resources). In addition, the assessment must look beyond sanitation issues to identify the external factors that drive decision making in the community and understand how they can be accounted for during the planning process. A comprehensive checklist of both technical and socio-economic information, such as the one developed in the ROSA project (<http://rosa.boku.ac.at>), can be used to help the project coordination team develop a comprehensive status assessment report (see Annex 7.6 for further details).

This information gathering step shall be performed by the project coordination team (members may include NGOs, citizens, promoters, officials or any other interested party) in conjunction with the local community. A variety of tools exist for participatory information gathering and creating dialogue about important community issues (refer to Annex 7.6). Tools such as Participatory Rural Appraisal (PRA) and Participatory Analysis for Community Action (PACA) aim to identify community problems and to plan solutions with the active participation of the community members (Selener et al., 1999). These tools can be useful entry points for assessing the existing situation and can easily be built into the processes started in steps 1 and 2 (i.e. a variety of stakeholders were already identified in Step 1). The continued participation of the various stakeholders shall also assist in planning for the distribution of activities and responsibilities during the subsequent steps of implementation, operation, maintenance and long-term service provision.

The following table highlights the purpose, outcome, main products, and timing of this step, as well as some related activities and tasks necessary to reach the defined goals.

STEP 3	Description
Purpose:	Provision of information which facilitates participatory decision-making in planning for future project development and day-to-day operational challenges of service delivery to the public in the field of water supply, sanitation, and solid waste management.
Outcome:	<ul style="list-style-type: none"> • Detailed information about the sanitation situation and the settlement status of the project area • Knowledge about the population's priority concerns, perspectives on sanitation, and expectations from the project. • Preliminary list of terms of requirement for a sanitation system, which will be used in designing demonstration projects
Product:	<ul style="list-style-type: none"> • Detailed and valuable information about the area's sanitation situation, including current sanitation systems, service providers, possible linkages to fertilization/crop production, technical and environmental constraints • Detailed data about the technical, economic, health and environmental conditions in the project area. • Documentation of the desired functions of the sanitation system and services; as identified by the users, authorities and service providers
Timing:	After the launching workshop(s).
Examples of Related Tasks*:	<ul style="list-style-type: none"> • Conduction of a workshop (WS2) with the users, farmers (potential resource re-users), authorities and the service providers, to identify the desired functions of the sanitation system. • Conduction of a community capacity assessment, checking the public and private sector's capacity to participate and implement actions • Holistic analysis of the available resource base: human resources, institutional capacity, technical capacity, financial resources, legal framework, land-ownership arrangements. • Conduct a situational analysis of regional and national issues such as political structure and stability, government policies, and foreign aid that can impact civil improvement projects (war, drought, disease, international debt, inflation, etc.) • Implementation of participatory assessment tools, ex: semi-structured interviews, key-informant interviews, transect walks, observations, household surveys, mapping.

* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 4: Construction of Demonstration Units:

To complement the awareness raising and demand creation process and to overcome the lack of local references for large-scale sustainable sanitation projects, setting up good-practice demonstrations is urgently needed. The goal is to enable the stakeholder group to make an informed choice on their sanitation system components, by building on their own experience with various sanitation schemes. These demonstration units shall introduce sustainable sanitation schemes before the identification of feasible sanitation concepts and service systems (step 5) for the whole project area is tackled. By giving stakeholders time to use, operate, maintain, discuss and reflect on the options provided in the setting of their own home they will be more able to contextualize the systems and propose creative, site-specific adaptations, which can then be integrated in the final designs. The data acquired in the baseline assessment in step 3, combined with the information revealed here, will give planners and decision-makers valid reference points, which will assist in the design and decision making process later on. The selection of the system components to be demonstrated will be performed together with the stakeholders and shall mainly be based on the facts and findings of step 3. Through this process it is hoped that future decisions will be based on actual knowledge of the systems rather than on assumptions and beliefs. Therefore, debriefing workshops are needed throughout the demonstration period to gather feedback on the users' perspectives and understanding of the systems. It is also essential that the engineers and planners involved are willing to listen to suggestions, integrate innovative proposals, work around local barriers, and generally be flexible to a process that will not be short or clearly defined.

In addition to providing physical references for decision making, demonstrations provide an opportunity to assess whether the system can be managed appropriately in each domain. For example, trial partnerships between households, service providers and the public sector for management of the demonstration units can test the feasibility of such arrangements. If the preferred options are demonstrated to be difficult to manage, adjustments (either institutionally or technically) or alternative systems are needed before the sanitation scheme can be scaled up.

The benefits of constructing demonstration units/projects are:

- To demonstrate and showcase a wide range of socially and culturally acceptable, sustainable and hygienically safe sanitation and reuse schemes to potential future users and political decision-makers.
- Optimizing the design of sanitation facilities according to user feedback.
- Identification of the users' desires and their real drivers for improved sanitation and mobilization of demand.
- To allow potential users to gain confidence and trust in the system being advocated [examples drawn from the Strategic Sanitation Approach in Ouagadougou in the early 1990's pointed to this issue as being important in creating momentum and interest in the sanitation campaign]
- To demonstrate the reuse and application of recyclates (i.e. urine and finished compost/desiccated faeces) and treated water in agricultural and/or aqua-cultural production.

- To introduce wastewater-fed and/or organically grown agricultural and/or aqua-cultural produce to the future re-users and to the local market.
- Provide scientific background for the amendment to existing codes and regulations regarding effluent standards and/or reuse/application of recyclates and/or treated wastewater.
- To enable local enterprises, active in construction, maintenance and/or service provision to open up to new markets

STEP 4	Description
Purpose:	Demonstrate alternative sanitation and re-use concepts in the project area to the user community
Outcome:	<ul style="list-style-type: none"> • The stakeholders are aware of the variety of possible concepts and have the possibility to test / use some of the optional system components. • Enable the supposed user community to conduct an informed choice • Gathering information for required design modifications related to local site specific conditions
Product(s):	<ul style="list-style-type: none"> • Construction, operation and maintenance of various demonstration units for the various processing steps and flowstreams. • Revised designs for the various sanitation schemes are available • First set of updated user priorities concerning sanitation schemes in the project area
Timing:	Adjacent to step 3 with several months time for usage, awareness creation and PM&E before step 5 sets in.
Examples of Related Tasks*:	<ul style="list-style-type: none"> • Pre-demo workshop (WS3) where the task force pre-selects system alternatives based on the findings in the earlier steps. A broad range of schemes and technologies should be included. The O & M needs and their availability of each pre-selected system should be identified by the task force and discussed with the users. • Make detailed drawings and cost estimates for the demonstration units available • Investigate the availability of construction material, tools, skilled labour and other essential components for the construction works

* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 5: Identification of Feasible Sanitation Concepts and Service Systems

The overall objective of this step is to reach a decision about the most suitable sanitation system(s). However, the process leading towards that decision has to be divided in two sub-steps:

- a) The elaboration of sanitation system options
- b) The lead through of a decision making process, which results in the agreement on the option(s), considered most appropriate for the project area.

First of all the planners and consultants of the stakeholder group gather together all the information that has been generated concerning the various sanitation system options, which are technically suit the large scale implementation in the project area. Information from the following sources must be synthesized so that it can be presented and discussed in a participatory workshop.

- Baseline data about the sanitation situation and settlement status of the project area (step 3)
- Enabling environment framework conditions
- Information about user priorities, either from Step 3 or Step 4
- Knowledge gained during activities in step 4 about the performance and acceptance of the demonstration units

The options should be characterised by a commonality concerning their technical as well as financial feasibility. The technical components shall incorporate components and services for all flow-streams in the various processing steps. Special emphasis shall be laid on realistic assessment of O&M requirements (material, personnel, costs) taking into account the local framework conditions.

Enabling an unbiased comparison amongst the various system alternatives a set of criteria (as for example the one of WP 3 or those identified in step 3) shall be used. At this stage no decision about the system(s) considered best has to be made, the criteria shall only facilitate the comparison of the alternatives. It has to be taken care of that the comparison is easily understandable for non-specialists, since the stakeholder group, which can be summarized as decision-makers are rarely sanitation experts.

As soon as these options, including a well arranged comparison, are available a participatory decision making process can be started. The various stakeholders will get the opportunity to ask questions, discuss, propose modifications and give feedback to the options. Information revealed during such workshops shall be reflected in an adapted design of the various system alternatives.

Finally the decision-making stakeholders should get following set of information:

- Baseline data of the project area (step 3)
- Detailed descriptions of the system options short-listed by the consultants and commented by the other stakeholders (step 4 and first part of 5)
- A well arranged comparison of the alternatives, based on a fixed set of criteria

Based on that, it should be envisaged to rank the various sanitation options, reflecting the decision-makers' priorities for every single criteria (or group of criteria). This ranking process will in the end result in one system option, or selection of systems, which has to be considered most appropriate for the project area.

STEP 5	Description
Purpose	Evaluation of the desirability of the demonstration units based on the information gathered and compiled in the previous planning steps and user preferences based on their experience with the demonstration units.
Outcome:	<ul style="list-style-type: none"> • Suitable service combinations are developed and evaluated based on the information gained during the planning process. • Revised matrix of criteria and adjusted priorities of the different stakeholder groups that can be used in a multi-criteria decision-making process. • Conduction of a participatory decision making process integrating all stakeholder groups and targeting an agreement on an option considered most appropriate. • Final decision on the sanitation system and service concept.
Product(s):	<ul style="list-style-type: none"> • Description of options • Revised catalogue of assessment criteria • Final agreement on chosen sanitation system(s)
Timing:	There has to be some period of time between the construction of the demonstration units and the activities of Step 5 in order to enable the user community to make get used to the new infrastructure.
Examples of Related Tasks*:	<p>Workshop 4: The goal this workshop is to bring together reflections, concerns and priorities of the community. The users shall have the possibility to co-determine the style of the various system options. A decision about the most feasible system is not goal of this workshop, but based on the feedback, the options can be refined, adjusted, and re-designed until the user see their priorities and experiences reflected appropriately.</p> <p>Workshop 5: With the revised set of system alternative a final workshop is held with the decision-makers in the project area. Goal of this workshop is to define which option(s) is considered most feasible and shall be implemented.</p>

* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 6: Consolidation and Finalization of Implementation Plans for Sustainable Sanitation

The decision about the favoured sanitation system(s) lays the foundation on which to build an action plan for implementation of the required hard- and software. This plan will take into consideration the available resources (human and material), and should cover a period of 3 to 5 years.

In parallel the implementation of the new infrastructure, the operation and maintenance of the system components must be assured. This will require, particularly in the beginning, the development of the necessary structures (organisation and methods). It is also possible that other environmental sanitation services, such as solid waste or drainage, will have to be improved for the overall improvement of the sanitary status of the area. These possible interventions are best planned together with the implementation of the excreta and greywater interventions (what we refer to as the sanitation system in this report). The larger interventions of solid waste handling and drainage would typically also cover a larger area (maybe the whole village, town) than the area for which the NETSSAF planning steps have been used.

The implementation plan will have to take into consideration technical, institutional, financial, human resources necessary for achievement of the planned interventions. This plan will have to be developed in close cooperation with the entity responsible for the sanitation implementation, with strong support from the stakeholders.

STEP 6	Description
Purpose:	Development of action plan where (preferably) the sanitation planning can be integrated in the overall planning for the area (solid waste etc)
Output:	<ul style="list-style-type: none"> • An action plan for implementation is in place • Decision on a management system is made • Financing model is developed
Product(s):	<ul style="list-style-type: none"> • Official documentation stating which system(s) was chosen • Implementation Plan • Operation and maintenance plan
Timing:	After steps 4 and 5
Examples of Related Tasks*:	<ul style="list-style-type: none"> • This planning includes human resources, more specific calendars, and clearly defined activities. There are both technical and institutional sides to this. The technicians will need to be involved in identifying the technical needs for implementing the system (materials, trained masons, land, etc.). They will have to work closely with the managing institutions/people (Mayor, regional authorities, community leaders, etc.) in developing a plan for how to provide these needs (availability of masons, need for training workshops, and cost of supplies). • The financing system should be laid out clearly (who pays for what), including any subsidies, household contributions, municipal funding, etc. • A management system should also be set up to direct the implementation process and provide monitoring and evaluation afterwards. This includes identifying a local project coordinator to oversee the work and possibly a project advisory counsel. • A document should be drafted and approved by the local government authority

	(likely the Mayor) so that this approach becomes the municipal sanitation policy (or at least that the proper officials know what is going on).
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* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 7: Implementation

The logical conclusion to adopting the aforementioned planning framework is to arrive at the point of implementation and service delivery. Step 7 is therefore designed to govern this process and the key conditions which need to be observed during this stage of the project / programme. Although there are a few high profile cases relating to large-scale sanitation scheme implementation [for instance, the National Sanitation Programme in Mozambique], their number is limited and generally the level of documentation available is poor. Nevertheless, project implementers should be aware of some generally applicable fundamentals:

- The local policy context is inextricably linked to implementation – policy support from state/national government will be a key success factor for large scale schemes.
- Lessons learned from pilot projects will help in the refinement and effective implementation of these initiatives on the large scale [although it is noted that pilot projects are not in all cases scalable for large scale implementation]
- Implementation is a process; this requires adaptive and flexible project management through continued feed-back via monitoring and evaluation systems. In turn, this implies a need to make on-going adjustments in budgeting, timelines, design adjustments, etc. Critically, recognize that implementation takes time and external time constraints should be factored in (i.e. seasonality in availability of community engagement / resources).
- Much of the benefit from large scale implementation will be achieved through focusing on effective operation and maintenance works; from the outset in the planning process, the implementation stage will need to consider how O&M of infrastructure will be managed. Specific capacity strengthening of different segments of target communities [especially women] will be critical in achieving sustainability to service operations.
- Quality of service is or primary concern – this needs to apply both to the quality of construction and to the quality of management in implementation. Detailed consideration of the concerns of users is essential to quality – project planners and managers must pay attention to consultation processes and to maintaining quality throughout implementation.
- External finance for subsidies needs to be carefully targeted – subsidies can frequently lead to unintended outcomes which do benefit community members equally. In general, subsidies that prioritize ‘software’ activities such as sanitation promotion tend to be a better use of public or external funds in support of implementation. More sophisticated approaches to subsidy lead to financing of different parts of the system – government or public support focused on non-hardware elements, private sector investment to support supply chain development and other stakeholder inputs targeted to different aspects of the waste management system.
- Development of supply side: a focus on non-technical elements of implementation [demand generation, marketing approaches, hygiene behaviour change] can lead to increased levels of

demand for sanitation. When the project is responding to this heightened demand, understanding of and organization of this *chain* of suppliers is critical – each operate under different conditions and constraints; each have separate roles and responsibilities.

- Capacity development: as more diverse organizations are drawn into large scale implementation schemes, the need for consistency of approach in implementation will be paramount. In this case, coordination mechanisms will be required, supported by personnel development and training courses to oversee project management and delivery.
- Monitoring and Evaluation – as a prerequisite to adaptive and flexible management, project implementation relies on consistent and timely M&E to ensure the type of feedback that project managers can interpret and build into course correction actions.

STEP 7	Description
Purpose:	Application of the chosen sanitation system and its components at large scale
Outcome:	<ul style="list-style-type: none"> • Sustainable sanitation becomes commonplace in national sanitation campaign planning. • Small and medium enterprises are able to install, maintain and repair as well as commercialise recycles (i.e. compost and urine) as natural fertilizer to the agricultural sector. • A new market has been created promoting income and job generation. • Medium sized local enterprises will provide required sanitary wares and sell them to SME for installation purposes. • The construction sector has become more professionalized through new products in sanitation.
Product(s):	<ul style="list-style-type: none"> • Construction of sustainable sanitation systems • Alignment of support systems for O&M and M&E
Timing:	Following the logical sequence of planning – implementation follows from finalization of planning and lesson learning from pilot programmes
Examples of Related Tasks*:	<ul style="list-style-type: none"> • Training courses for technicians, masons • Lobbying processes with policy decision makers • Marketing of new sanitation products

* Refer to Annex 7.6 for further details on related activities and reference for more information

STEP 8: Participatory Monitoring and Evaluation

Participatory Monitoring and Evaluation (M&E) is an established, well tested participatory methodology from the basket of PLA (Participatory Learning and Action) approaches applied to development programmes internationally. It seeks to engage participants (citizens, communities, social groups) in monitoring and evaluation, and creates ownership over evaluation results and of development project interventions.

Using participatory monitoring and evaluation (M&E) approaches leads to significant benefits and outcomes: increasing the consensus on (project) goals, objectives and activities as well as providing timely, reliable, and valid feedback information for management decision making. The use of PM&E can increase learning, skills and confidence in the local groups responsible for sanitation management, and encourage them to add local knowledge to the process. It has also been shown to increase the cost-effectiveness of M&E information.

Activities related to PM&E should be carried out during the whole planning process and have to be continued after the implementation has been finished. PM&E must be viewed as one process that runs across the other steps in planning, even though it is actually split into three separate components. There is little point in (i) collecting data [monitoring] unless the data is then (ii) reviewed [analysed] and the conclusions (iii) used to improve the process being monitored.

A key element is to identify indicators for PM&E. These might be relatively simple for physical progress [such as the hardware connections made or quality of work] but much more difficult when trying to evaluate social objectives [such as stakeholder participation]. These indicators should be identified early in the planning process, before constructing demonstration units, but they can be revised as more information becomes available.

STEP 8	Description
Purpose:	Review and reflection process to govern and link project activities to stated goals
Outcome:	<ul style="list-style-type: none"> • Consensus building and creation of a sense of project ownership in the local community • Course correction of project objectives through consultation process and learning through doing
Product(s):	<ul style="list-style-type: none"> • PM&E indicator set • Periodic M&E reports on outcomes in relation to objectives
Timing:	Throughout the planning process, but especially following implementation, as basis for initiating new design and planning processes
Examples of Related Tasks*:	<ul style="list-style-type: none"> • Community consultation meetings and use of participatory assessment methodologies • Situational analysis activities to provide baseline and benchmark for monitoring purposes

* Refer to Annex 7.6 for further details on related activities and reference for more information

5 Case Studies / Examples

To demonstrate the application of the planning steps as proposed by NETSSAF to a participatory decision-making process, two fictive cases are used to illustrate how the process could be applied: (i) in a rural, dry settlement and (ii) in a peri-urban wet settlement. The cases are based on the information on typical West African settlements (provided in NETSSAF document D24) which describe both rural and peri-urban settlements with respect to aspects such as settlement characteristics, cultural, climatic and agricultural issues. However, the NETSSAF consortium realizes that applying the proposed planning steps to a real planning and decision making process needs far more information on a wide variety of aspects (e.g. cultural characteristics, economic situation, national strategies, hygiene practices, and environmental concerns) than can be provided in a simple example on how to apply the NETSSAF to the participatory decision-making on a sustainable sanitation scheme. In short, each planning situation is unique and context dependent. Therefore the following examples should not be taken too literally, but rather seen as a method of explaining and illustrating a complex process. In the following sections we will quickly go through the different planning steps shown in Figure 2.

5.1 Rural Dry Settlement Example

A rural municipality in Burkina Faso consists of 15 villages having a total population of about 18,000 inhabitants who are predominantly Mossi, although there are Fulani and Bobo ethnic groups present as well. The municipal centre village has approximately 4,000 inhabitants and is located about 100 km from the regional capital at the banks of a river that meanders through a vast open plain.

5.1.1 Project Start

The newly elected mayor of the commune sees sanitation as a key issue and has thus decided to make an effort to improve on the sanitation situation in his municipality. He has support for his vision from the municipal Council and the decentralized office of the Direction de l'Assainissement (DA) which is the entity responsible for rural sanitation planning and implementation in Burkina and he has managed to secure some funding and capacity support to try out a participatory approach towards sanitation planning and implementation through an agreement with a national/international NGO. The mayor's goal is to have the entire municipality covered by sanitation systems within 10 years.

To initiate the sanitation project, the mayor and the national/international NGO decide to prepare a proposal to be submitted to the municipal council for approval. The next step is to conduct a launching workshop where they invite key stakeholders (municipal council, community and religious leaders, youth groups, women's groups, farmer's cooperative, and local business/service providers) in the community to discuss the municipal council's vision. The participants recognized the need for improvement of the sanitary situation

and commit themselves to the NETSSAF planning approach. They select an area in the centre village where they think that the approach has the best chance to succeed and can thus set a guiding example for the rest of the municipality. The chosen area has the following characteristics:

- High level of self-organization, proven by the presence of community organizations
- Low mobility of people
- Previous hygiene campaigns have should positive results
- Lack of sustainable sanitation systems
- High level of owned housing

During the launching workshop a planning team is formed to initiate the project in the center village. The team consists of representatives from the municipal council, the DA, the national/international NGO, the school board, and members of several community organizations. Together with the mayor the planning team drafts a Memorandum of Understanding which outlines the roles and responsibilities that the different stakeholders will have in future planning steps. The division of roles and responsibilities are shown in Table 4.

Table 4: Distribution of role and responsibilities in rural case study

Stakeholder group	Roles	Responsibilities
Local government (Mayor, municipal council)	Guiding process, building political support, running sanitation demand campaigns	Ensure political and financial support to complete the planning and implementation process
Planning team	Performing/managing planning steps, raising awareness, bringing in other stakeholders as needed	Complete the planning and implementation process
NGO	Assisting in fundraising efforts and financing planning, technical advice and capacity building	Support to local government and planning team
Service providers	Construction of infrastructures, and provision of services (installation, O&M, etc.)	To be able to respond to a sanitation demand
Reusers/farmers	Participation in planning process	To be available and active in the planning process
Users (opinion leaders)	Participation in planning	To be available and active in

	process, particularly in awareness raising	the planning process
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5.1.2 Demand creation

Years of hygiene campaigns in the area have impacted the general level of hygiene understanding and most families, especially mothers with children, are familiar with the concept of disease cycles and transmission routes of disease (i.e. food, fingers, faeces, flies). Many families have constructed traditional pit latrines, but open defecation is still common. They are interested in sanitation, but it is not their top priority and they believe they lack the money and technical expertise to modify the current situation. There are no known taboos or cultural beliefs which would hinder the introduction of reuse oriented sanitation concepts and most families have some land where they could apply sanitized excreta products (i.e. garden plots for vegetables).

The planning committee decides that the main objective of the demand creation step is to increase sanitation as a priority for the population and to convince them that affordable technologies exist. The national/international NGO has experience with hygiene promotion campaigns and they offer to assist with the demand creation activities in conjunction with the planning team. They devise a program that focuses on community discussion groups in which community members will discuss barriers to sanitation, ideas for improvements, and how these can be made to fit with other community priorities, including their priorities on increased crop productivity. The NGO trains several facilitators to lead these groups, using their own experience and borrowing ideas from community-lead total sanitation (CLTS) techniques (Kar, 2005). These groups are also designed to be active in the demonstration units where they will continue to discuss and respond to technical options. In order to build a continuing tradition of sanitation in the community, a hygiene and sanitation program integrated with nutrient reuse in vegetable production for healthy diets is developed for the local schools. The directors of the local schools are enthusiastic about the project and institute student sanitation clubs which are responsible for the cleanliness of the school grounds, as well as the sanitation activities which are part of the new program.

5.1.3 Assessment of existing sanitary situation and user priorities:

The information collecting step is divided into two parts, (i) assessment of the physical surroundings, and (ii) assessment of user priorities and perspectives. The DA takes responsibility for the physical assessment, and with the support of local authorities, they draft a report of the existing sanitary situation.

Highlights from the physical assessment are shown below:

1. Human Landscape:

The settlement structure is dominated by a small number of clustered houses, where open areas for construction of on-site sanitation facilities or other treatment infrastructure are available. These open areas are currently used for production of food crops. The electricity supply is erratic and can not be counted on for irrigation pumps or other mechanized tasks. Transportation to the village can be a problematic, especially during the rainy season.

2. Economics:

The economic activity in the municipal central village is composed primarily of farming, animal husbandry, fishing, and trading. Most families grow their own vegetables and staple food (maize and beans) for consumption and a cash crop of cotton. Fishing in the river is not very profitable due to the increasingly polluted state of the river. Trade relates to agricultural and livestock products, but weak producer organizations and lack of transportation and infrastructure are hindering the development of the agricultural sector. Raw construction material can be found in the area, but manufactured materials are often not available locally and must be brought from the regional capital. The municipality has very limited funds for sanitation infrastructure, but receives occasionally external funding from donors.

3. Environment information:

The municipality is situated in a vast plain that is prone to seasonal flooding during the rainy season. The soil is a sandy-loamy mixture, but it is not very productive and does not have a high capacity to hold moisture. The soil is devoid of nutrients due to over-use and local farmers often supplement manure fertilizers with costly chemical ones, especially for the cotton fields. The main water source is groundwater. The groundwater table fluctuates seasonally, which means that some of the shallower wells often run dry in the dry season and people are forced to travel long distances to collect water or use river water, which is heavily contaminated from a variety of uses.

4. Existing sanitary situation

Although open defecation is still common, many families have constructed traditional, shallow pit latrines (which may be shared with their neighbors). One public latrine exists near the market in the centre village, as well as latrines for the school. The emptying of these latrines is done manually on an as-needed basis and the contents dumped in the fields outside of the village. Soakaway pits for shower areas (often combined with traditional latrines) are uncommon and greywater is dumped in open pits outside the dwellings or runs directly into the street.

In order to assess the social aspects, the planning team uses participatory appraisal techniques (focus groups, household surveys, and interviews). The national/international NGO has experience with such methods and provides staff and advice on how to collect this information. Highlights from the social assessment are shown below:

- Priority concerns among the populations are income generating activities, access to water, and health care.
- Having to spend a high proportion of their income on chemical fertilizers, farmers have grown increasingly innovative, and are quick to adopt and integrate new technologies that are introduced.
- Regarding sanitation systems, the major concerns of the population are the costs and potential for odor problems. Although several women hinted at they desire something that is easier to clean.

- The dominant ethnic group living in the villages is Christian Mossi who are wipers and not washers. The minority groups of Fulani and Bobo who also inhabit the villages have adapted to the predominant hygiene customs and are also wipers.

After the initial results of the surveys are back, the planning team holds a second workshop to discuss the desired functions of a sanitation system from the perspective of the various stakeholders. Through a series of discussions in which the results of the surveys are presented, each stakeholder group is given a chance to comment. Finally, and the community develops the following list of functions that the sanitation system should perform:

- User aspects: easy to construct/use, reduce odor, well lighted, hygienic and clean
- Health aspects: provide safe handling of excreta
- Environmental aspects: avoid surface and groundwater contamination (especially during floods)
- Economic aspects: affordable for individual households, potential for nutrient reuse
- Management: manageable at a household level with minimal municipal support
- Technical aspects: low maintenance, robust in extreme situations, no electricity

5.1.4 Demonstration units

Consecutive to the situation assessment, the planning team prepared a list of different technologies from the recommendations of NETSSAF WP3, which were deemed able to fulfill the preferences of the users, and be adapted to the local context (Table 5 -6). Based on the initially comprehensive lists of potential technologies, the planning team began to narrow down the options based on the criteria identified in step three. The affordability issue ruled out all piped systems, even condominal sewers, and the planning team realized that there was no chance for cost recovery on any centralized system in this particular setting. The municipality also favors all solutions with low demand on centralized service since the municipal budget is limited and it can not afford sustained expenditures on sanitation. Therefore, the systems proposed were all on-site versions of the (i) dry excreta and greywater separate system or (Figure 3), (ii) dry urine, feces and greywater diversion systems (Figure 4 and see D22-23 for details on these systems). In order to simplify this example, the selection of greywater treatment systems is left out of the discussion in the rest of this example, assuming that choice of a greywater system will be left to the households.

Table 5: The excreta systems assessed as fulfilling the functions identified by the stakeholders

On-site storage, collection and treatment	Location	Transport	Off-site treatment	Reuse	Disposal
VIP	Space available for infrastructure construction	Cesspool emptier called on when pit is full	Sludge drying bed at landfill	Possible, after drying but at least 80% of	If no reuse, then disposal at landfill

	and transport of sanitation by-products			nitrogen is then lost	
Fossa Alterna	4.5 m ² available	-	-	Possible, but at least 80% of nitrogen is lost	If no reuse, then disposal through burying
Arborloo	Outskirts of village	-	-	Through tree plantation, but only small areas	-
Alternating Double Dehydrating Latrine	4.5 m ² available	Removal manually of urine cans for storage	Storage of urine and secondary treatment of excreta	Urine as fertilizer, and dried faeces as soil conditioner	If no reuse, then disposal through burying
Dehydrating latrine	≥4.5 m ² available	Removal of urine cans for storage, removal also of excreta for off-site treatment	Storage of urine and secondary treatment of excreta	Urine as fertilizer, and dried faeces as soil conditioner	If no reuse, then disposal through burying
Pour-flush latrine with septic tank	Space available for infrastructure construction and transport of sanitation by-products	Cesspool emptier called on when septic tank is full	Sludge drying bed at landfill Alternative option: co-composting with organic waste	Possible to use sludge as soil conditioner and fertilizer after drying, but at least 90% of nitrogen lost	If no reuse, then disposal at landfill
Pour-flush latrine with biogas plant	Space available for infrastructure construction and transport of sanitation by-products	Users bring sludge to fields	Alternative option: co-composting with organic waste	Sludge as soil conditioner and fertilizer	If no reuse, then disposal at landfill

Table 6: Greywater treatment technologies

On-site storage, collection and treatment	Location	Transport	Off-site treatment	Reuse	Disposal
Mulch trench		-	-	Possible if mulch trench is planted	To groundwater
Tower garden		-	-	Yes	-
Grease trap with		-	-	-	To

infiltration trench					groundwater
Simple soakaway, filled with porous material		-	-	-	To groundwater

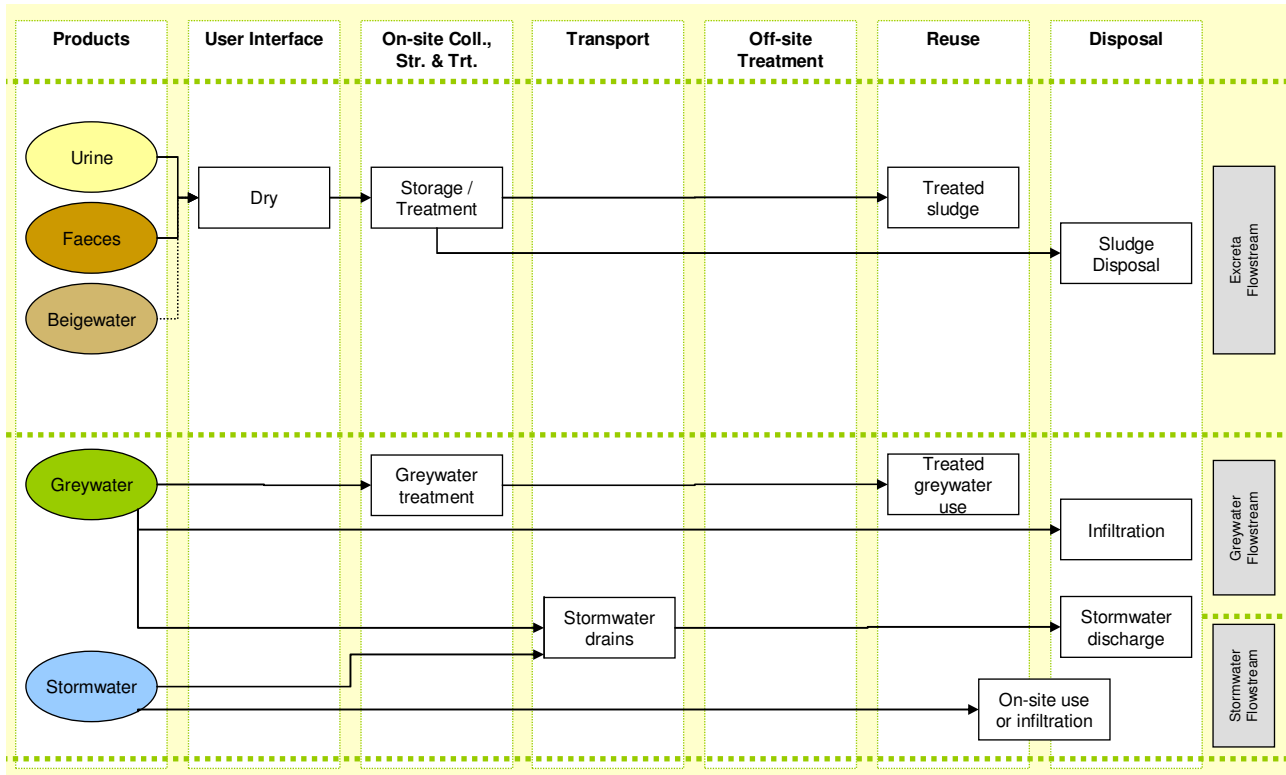


Figure 3: Schematic of potential sanitation systems from WP3: Dry excreta and greywater separate system

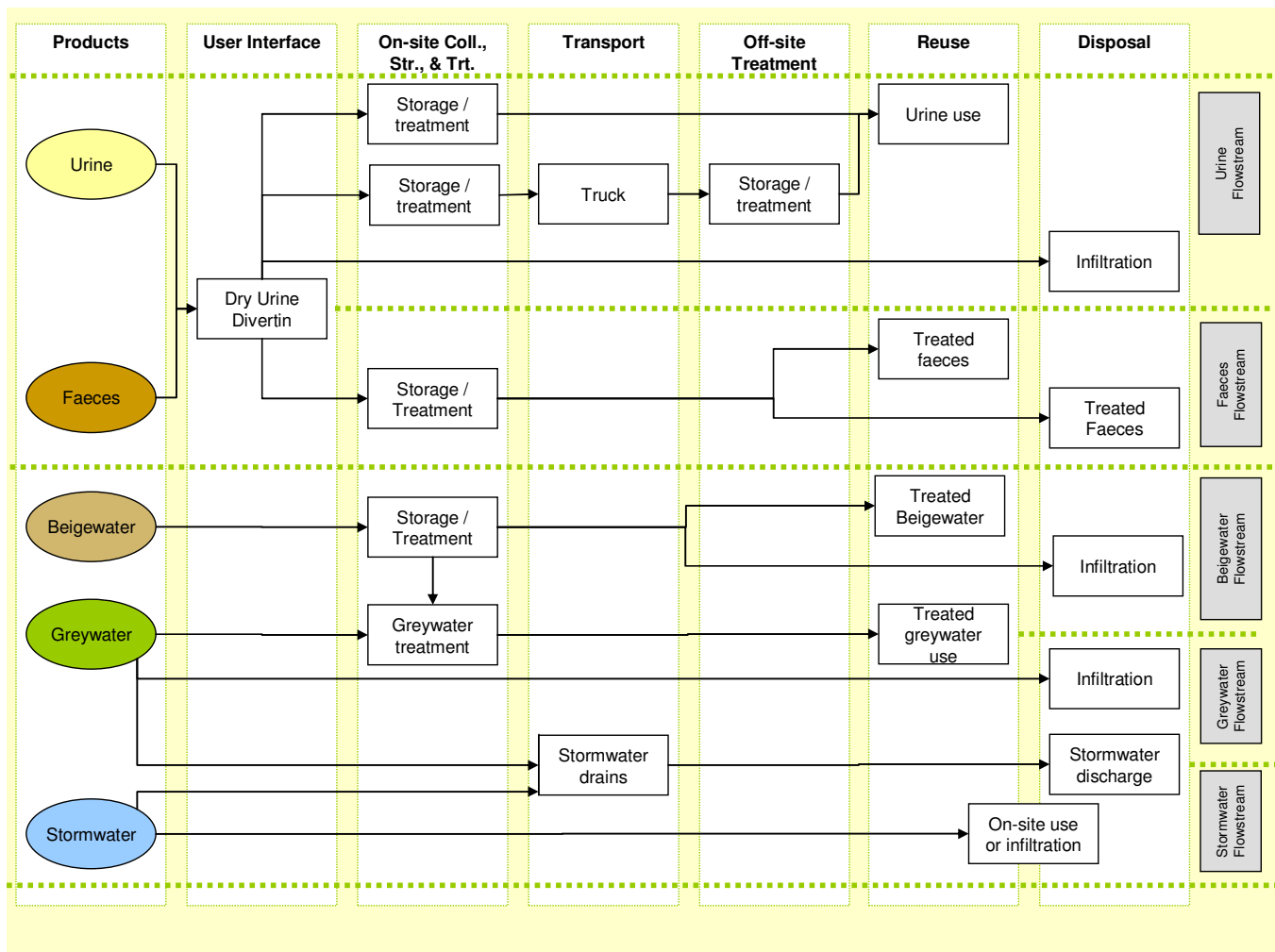


Figure 4: dry urine, feces and greywater diversion systems

The planning team made estimates of costs for the different technologies, including both the individual cost and the non-monetary costs (land use, reuse potential, time demands for O&M, etc.). The different technologies and their pros and cons in regards to the desired functions and priorities (as identified in workshop 2) were then presented to the stakeholders in the options workshop, WS3. During this workshop, it was also made clear that limited municipal funding was available and that households would have to bear most of the costs.

Finally, five excreta systems (VIP, Fossa Alterna, Alternating Double Dehydrating Latrine, Arborloo, and Pour-flush with septic tank) were constructed at locations where community members could become acquainted with the systems during a 6 month period. The fertilizing value of urine and the quality of faeces as soil conditioner were demonstrated in a school garden and in some farmer's fields. Three household greywater systems were demonstrated (tower garden, simple soakaway and grease trap with infiltration).

The demonstration period gave the users and planning team a better understanding of how the proposed sanitation technologies work in the local context. Most of the demonstration units were modified at some points during the trial period to adapt them to unforeseen problems. For example, local masons found that it was possible to reduce costs for both the VIP system and the Alternating Double Dehydrating Latrine,

through the use of local materials. The concept of reuse of treated excreta and urine as fertilizer was enthusiastically received and the demo units for the arborloo and dehydrating latrines were extremely popular. The planning team noticed that the demo period had the additional positive effects of creating interest for the planning approach in the remaining areas of the village centre and the surrounding villages.

5.1.5 Identification of Feasible Sanitation Concepts and Service Systems

After the 6 month trial period another workshop (WS4) was held with the stakeholders to discuss which systems were most appropriate to their specific context. The discussion revolved around the real preference of the users, true cost estimates of the systems, the management capacity of the local government, and appropriateness of household O&M. The demonstration units had shown that the fertilizing value of urine and excreta was a key driver in the demand for on-site sanitation. The stakeholders liked the simplicity of the arborloos and the potential for planting trees. In fact, several arborloos had already been constructed on private initiatives. The dehydrating latrines were also a popular choice.

During the workshop the planning team and stakeholders ranked the five demonstration units using a multi-criteria assessment of cost, fertilizing capacity, ease of maintenance, protection of health and environment, and overall user opinion. It was again emphasized that the full costs of the household constructions and O&M of the household constructions were to be carried by the household, although, the national/international NGO and the technicians of the DA would train masons in the construction of the selected options and their services would be available for hire through the mayor's office. This fact changed the ranking of the proposed systems, especially for some of the poorer households. At the end, the workshop participants were divided over whether they preferred the arborloo or one of the two dehydrating latrine options. Different sections of the planning area and even different households preferred different systems. It was thus decided that the implementation phase would allow for the construction of either arborloos or dehydrating latrines, depending on the choice and the ability to pay of the households. The same process for the greywater revealed that the different piloted technologies all had functioned well during the demo period. The costs for the grease trap with infiltration, otherwise a popular model, turned out to switch the main preferences towards the tower garden and the simple soakaway.

5.1.6 Consolidation and Finalization of Implementation Plans for Sustainable Sanitation

Once the planning team and stakeholders had selected a number of on-site sanitation systems as the most appropriate for the community, they had to decide what the best way of implementing them. An implementation plan was developed where the demands on human, financial, technical and institutional resources were identified. This plan laid out the roles and responsibilities of each party in terms of who would pay for what, who had the knowledge for construction and who would organize the implementation.

It had already been decided in the planning process that the costs of construction and maintenance would be borne by the households. From the household standpoint, they would be responsible for on-plot investments for the excreta and greywater handling. However, households often lacked the skills and money initially for such an investment. Therefore, they would need support in capacity building and financing from the

municipality. For the first, the municipality would provide training for construction and maintenance techniques and safe reuse (although, the households would still have to pay for the hire of skilled construction workers). For financing, the local government, together with the NGO arranged a micro credit scheme, to allow people to access the finance market for improved sanitation.

The municipality committed to providing support for training specialists in the construction techniques and households on proper operation and maintenance measures. It was also concluded that the sanitation demand creating activities would have to continue if the target goal of 100% sanitation coverage was to be achieved. Therefore, the municipality, with the support of the DA, would budget for the continued costs of awareness raising and capacity building, and solicit donor organizations for support. The mayor was satisfied with this arrangement as the process would lead to capacity building for his staff and not strain his limited budget. To support the on-site sanitation initiatives and to build on the awareness campaign he intends to solicit national funding to improve the drainage of three main roads in the center village by paving them and installing drainage ditches.

The entire process would be directed through the municipality, with the Mayor's office organizing the demand-creating activities, the micro-credit scheme, and the services of the trained masons. The mayor's office drafts a document detailing the new sanitation policy.

5.1.7 Implementation

The municipality and DA initiate the implementation step by starting a marketing campaign that highlights the micro-credit system for latrine construction and the availability of training technicians for household construction. They are assisted in this by the same facilitators who have been working on demand creation in the community for the past year. The facilitators know the community well and start by targeting the families who they believe will be early adapters of the new systems. The DA and NGO provide the training for 10 masons in the construction techniques, maintenance and reuse for arborloos and dehydrating latrines. The masons than also act as a promoting force for the latrines since they get paid for any construction they complete.

5.1.8 Participatory Monitoring and Evaluation

Participatory Monitoring and Evaluation (PM&E) tools were used throughout the planning and implementation of the project. Through the use of PM&E an extra sense of ownership in the project was created. It also ensured that the local knowledge was utilized efficiently and came to knowledge of the planning team.

5.2 Peri-Urban Wet Settlement Example

The peri-urban, wet area is located in the outskirts of a larger city in Côte d'Ivoire. It is in a well accessible part of the country, with a humid climate. The quaternary and current sea sands constitute the soil of the coastal region. This region is separated from tertiary sands by the lagoon ecosystem or is linked to it by marshy plains. The population of the peri-urban area is approximately 2000 inhabitants with a considerable percentage of immigrants from Northern Côte d'Ivoire, Mali and Burkina Faso. The economy of the peri-urban area is based on labor in the rubber and palm tree plantations. One can find some market gardening during the rainy season.

5.2.1 Project Start

A local NGO, which has been active in the peri-urban settlements for many years, received financial support from an international donor to improve the sanitation situation. The NGO has had good experiences with participatory planning in the past and had recently heard about the success of Community Led Total Sanitation (CLTS). Thus they decided to combine this approach with traditional methods of hygiene and sanitation promotion. The local authorities were more than willing to try out the CLTS concept to create some sanitation demand in the area, and also very motivated to include the NETSSAF sanitation planning steps in their plan of action for the coming years.

The local authorities and the NGO invited a trainer from the Livelihoods Network, who trained 15 facilitators on the process of CLTS. After a one week of intensive training, the local authorities and the NGO developed a detailed project plan and decided to start with a first workshop to introduce CLTS to the municipal officials, as well as to key stakeholders in the community and representatives from the national authority for sanitation. The participants agreed to support the initiative launched by the NGO and decided to start implementation within a small neighborhood. The chosen area has the following characteristics:

- a dense, informal, urban setting that is prone to frequent floods
- most houses are rented
- basic sanitation infrastructure (mainly open defecation, flying toilets, a few pit latrines and some public toilets)

During the workshop the participants formed a Community Development Committee (CDC) in order to manage this process as part of the planning team.

5.2.2 Demand Creation

Past health interventions in the urban slums were often delivered as 'top-down' intervention programs where the residents were passive recipients of messages that they felt did not connect well with their daily lives. This coupled with a shortage of schools and public education services means that awareness levels of hygiene benefits and disease transmission is generally low. The majority of dwellers are working in rubber and palm tree agriculture and their general level of wealth is low. During the last few years, several NGOs have proposed different sanitation solutions, but the community members did not change their behavior of

open defecation and using flying toilets. So far, only a few houses have pit latrines. Most of the dwellers would prefer a fully sewerred system, with water supply and flushing toilets, to pit latrines. Therefore, the planning team decides that awareness creation in the community is of utmost importance. Thus the participatory approach of CLTS is supplemented with radio broadcasts and a touring theatre group that highlights the importance of sanitation. The planning team can enlist a very well known theatre group for that purpose which offers also a special program for school children.

5.2.3 Assessment of existing sanitary situation and user priorities

The information collecting step is divided into two parts, (i) assessment of the physical surroundings, and (ii) assessment of user priorities and perspectives. The physical assessment was already done by another NGO in the previous year and can be summarized as the following:

1. Human Landscape:

The settlement is a dense, informal, urban setting with no space behind the homes. Only very limited space is available for the construction of on-site sanitation and treatment infrastructure. The settlement is a mixture between resident-owned informal constructions and other houses that are rented by owners who do not live in the community. Those that live in their own homes have no property rights and therefore little incentive to invest in upgrading the infrastructure and those that live in rental units, have no authority or long-term incentive to proceed with infrastructure upgrades. The city recently installed above-ground electricity and it is generally reliable and accessible to the occupants.

2. Economics:

The main economic activity is based labor on rubber and palm tree plantations. All food is brought in and/or bought from the city. Without property rights or available space, there are no household gardens, and residents generally do not have access to areas outside the city for cultivation.

3. Environment information:

The settlement is prone to frequent floods especially during the rainy season, due to its low-lying elevation. The sandy soil does not hold well during flash floods that are frequent in the long, rainy season, and roads and houses are often damaged by the resulting erosion. Those who live at the lowest points of the community are often inundated with the wastewater and surface runoff from the higher parts of the settlement. The groundwater table is very high and during wet-weather events, it can rise up almost to the soil surface. Most people get their drinking water from the public wells or the numerous hand pumps that are common throughout the settlement. The high groundwater table means that the wells are rarely dry.

4. Existing sanitary situation

The flying toilet is common and some pit latrines exist in the area. In addition, there are public toilets, but they are under dimensioned and generally over used and not very well maintained. Residents near the main road dispose of greywater into the stormwater ditches, while those living

deeper in the settlement dispose of their greywater either into dug pits or allow it to run off on the non-paved streets to the closest open drain or ditch. This has created tension among the neighbors in the past since the open flowing greywater is a nuisance for the inhabitants. However, a negligible amount of income is spent on sanitation services. The citizens are 'washers' and are used to carrying water for that practice. One of the main trunk sewers runs parallel to the community 10 km away. The trunk sewers lead to an ocean outfall, without any prior treatment.

The planning team completed the assessment of social aspects of the community using participatory appraisal techniques; transect walks, and mapping activities to stimulate discussions among the inhabitants.

- The main outcomes are shown below:
- Inhabitants of the peri-urban settlement have little use for any kind of fertilizer produced neither from organic waste nor from human excrements.
- The current sanitation practice is seen as a problem and the need for an improvement is clearly stated. But having seen the sanitation system in the city centre, the residents are convinced that a seweraged system for their setting is most appropriate.
- However, the affordability is an issue also recognized by the community. In-house seweraged connections are not within the financial reach of the community in the area
- There is a low willingness to perform maintenance (again due to knowledge of centralized sewerage systems and due to the housing situation).
- Sanitation is seen as a status symbol and people attach a high value to the appearances of their houses and latrines
- Income levels are low and the affordability of the system is a key concern
- The population is washers, requiring the system to be able to handle excess amounts of water

After analyzing the collected information, the planning team invited the stakeholders to sit together and to discuss their priorities for a sanitation system. The community members came up with the following list of criteria that the sanitation system should perform:

- User aspects: appropriate for washers, appearance of hygienic and clean conditions
- Health aspects: provide safe handling of excreta
- Environmental aspects: avoid surface and groundwater contamination (especially during floods)
- Economic aspects: affordable for individual households, employment creation
- Management: low household responsibility
- Technical aspects: low maintenance, robust in extreme situations, low electricity needs

5.2.4 Demonstration Units

Based on the information gathered in step 3 and knowledge of WP3, the planning team conducted a screening process of potential sanitation system combinations (Tables 7–8). Centralized systems were originally given preference, due to the limited space availability. However, it was also recognized that the costs for connecting systems from individual households to a centralized system may be too high for the community to bear, and an improvement of the sanitary situation may be more achievable through an improved coverage and design of public toilets, with individual greywater treatment (Table 6). (As for the rural dry example above, the choice of greywater systems will be left to the households, and not discussed in detail in this planning process). Therefore the systems proposed were excreta systems that could be managed as public toilets: (i) Dry onsite excreta storage with greywater diversion system (Figure 5), (ii) Wet blackwater system where greywater is managed separately (Figure 6), and (iii) Wet urine diversion system where urine and brownwater (with greywater) are managed separately (Figure 7).

Since demonstrating centralized sewer systems is impossible because of the high costs involved in construction, it was decided that three different public toilets would be built to illustrate the different collection methods and to test management schemes for the operation and maintenance. The three public toilet sites would offer: (i) urine-diversion dehydrating latrines with diversion of wash water (leading to greywater disposal system) and dry urinals with urine collection, (ii) pour flush and low flush urinals connected to septic tanks, and (iii) urine-diverting low flow toilets and dry urinals with septic tanks and storage of the collected urine. The trial management schemes included emptying of the pits/septic tanks and urine cans, and transportation for secondary treatment. Two methods of faecal sludge treatment were demonstrated; co-composting and unplanted drying beds.

The five demonstration sites were constructed and community-based organizations (CBOs) solicited to test the proposed management schemes during a 6-month demonstration period. The toilet units were highly frequented and the management organizations gained a lot of experience. The trial period was probably most beneficial for the service organizations as the management schemes were adapted continually throughout the process and the CBOs gained knowledge and skills necessary for operational and maintenance. By the end of the demonstration period the CBOs were making management choices without the aid of the CDC. As far as the toilets, the pour flush and low flush designs were both well received. The urine-diverting toilet had trouble as not all users understood the importance of keeping the wash water separate, and the pit often ended up wet. Modifications were made to the design to increase the dehydrating capacity and robustness of the system against misuse, but it continued to be plagued with odour problems. Both urinal systems functioned well, although there were some complaints of odour problems from the dry urinals. Management of the sludge treatment facilities and urine storage proved more problematic. The operators of the co-composting system found it to be labour intensive and felt that there was a low rate of return on investment. Reuse of the treated urine was also difficult due to the low level of agriculture in the area. The CBOs in charge of the urine collection tried approaching the owners of the rubber and palm plantations to see if they were interested in natural fertilizers, but were not well received (members of the CDC and planning teams realized that it would have been better to have approached them earlier in the process).

Table 7: The excreta systems assessed as fulfilling the functions identified by the stakeholders

Collection	On-site treatment	Transport	Off-site treatment	Reuse	Disposal
VIP	Storage in a lined pit	Cesspool emptier called on when pit is full	Off-site sludge treatment (see Table 8)	Possible, after drying but at least 80% of nitrogen is then lost	If no reuse, then disposal at landfill
Dehydrating latrine	Storage and dehydrating	Removal of urine cans for storage, removal also of excreta for off-site treatment	Storage of urine and off-site sludge treatment (see Table 8)	Urine as fertilizer, and dried faeces as soil conditioner	If no reuse, then disposal through burying
Pour-flush latrine	Septic tank	Cesspool emptier called on when septic tank is full or sewerage connection	Off-site sludge treatment (see Table 8)	Possible to use sludge as soil conditioner and fertilizer after treatment	If no reuse, then disposal at landfill
Low-flush toilets	Septic tank	Cesspool emptier called on when septic tank is full or sewerage connection	Off-site sludge treatment (see Table 8)	Possible to use sludge as soil conditioner and fertilizer after treatment	If no reuse, treated wastewater discharge
Pour Flush with urine separation	Septic tank and urine storage	Cesspool emptier called on when septic tank is full or sewerage connection. Removal of urine cans for storage	Off-site sludge treatment (see Table 8)	Urine as fertilizer, use sludge as soil conditioner and fertilizer after treatment	If no reuse, treated wastewater discharge
Low flush urinals	Septic tank	Cesspool emptier called on when septic tank is full or sewerage connection	Off-site sludge treatment (see Table 8)	Possible to use sludge as soil conditioner and fertilizer after treatment	If no reuse, treated wastewater discharge
Dry urinals	Urine storage	Removal of urine cans for storage	Storage of urine	Urine as fertilizer	If no reuse, then disposal through burying

Table 8: Faecal sludge treatment

Off-site treatment	Reuse	Disposal
Faecal sludge co-composting	Faecal sludge reuse in agriculture	If no reuse, disposal of sludge
Humidification beds (constructed wetlands)	Faecal sludge reuse in agriculture	If no reuse, disposal of sludge
Unplanted drying beds	Faecal sludge reuse in agriculture	If no reuse, disposal of sludge
Settling ponds	Faecal sludge reuse in agriculture	If no reuse, disposal of sludge

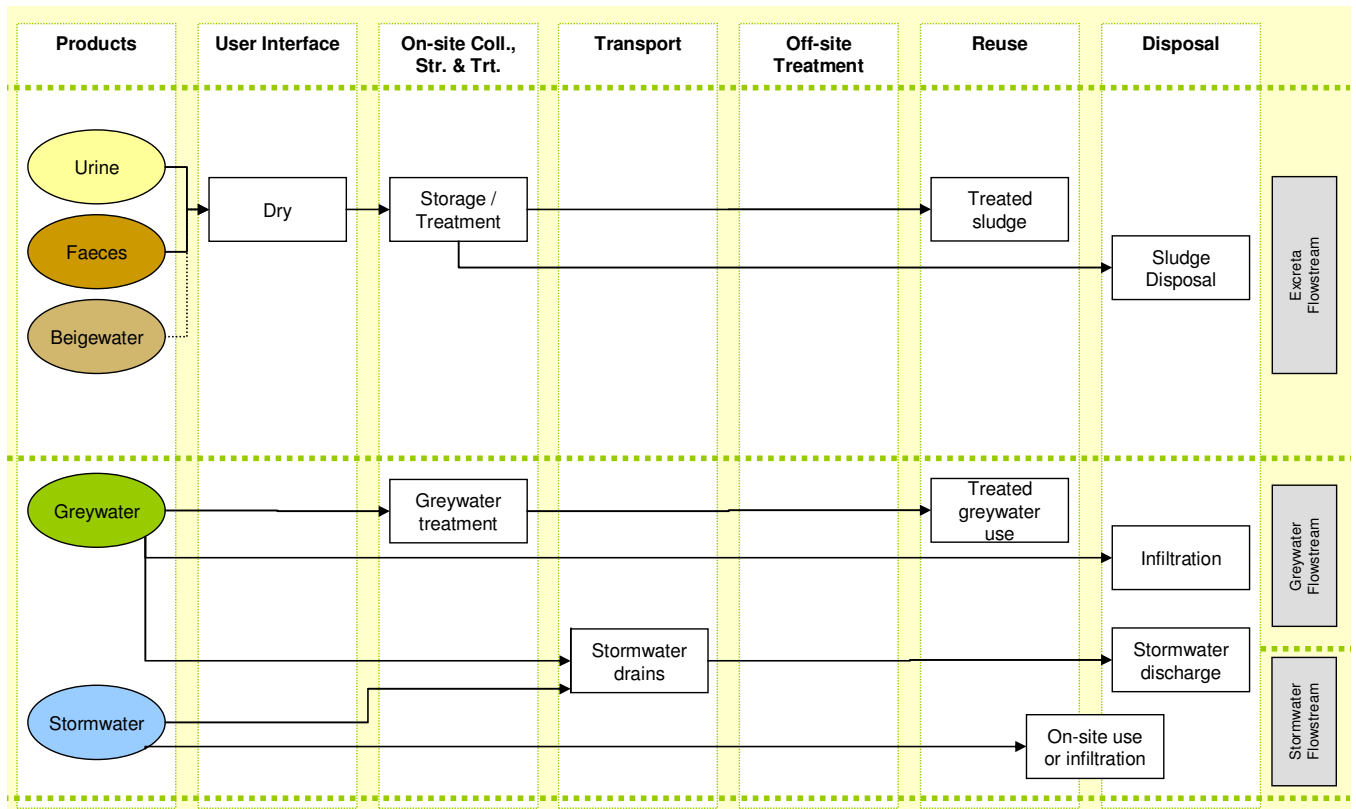


Figure 5: Dry onsite excreta storage with greywater diversion system

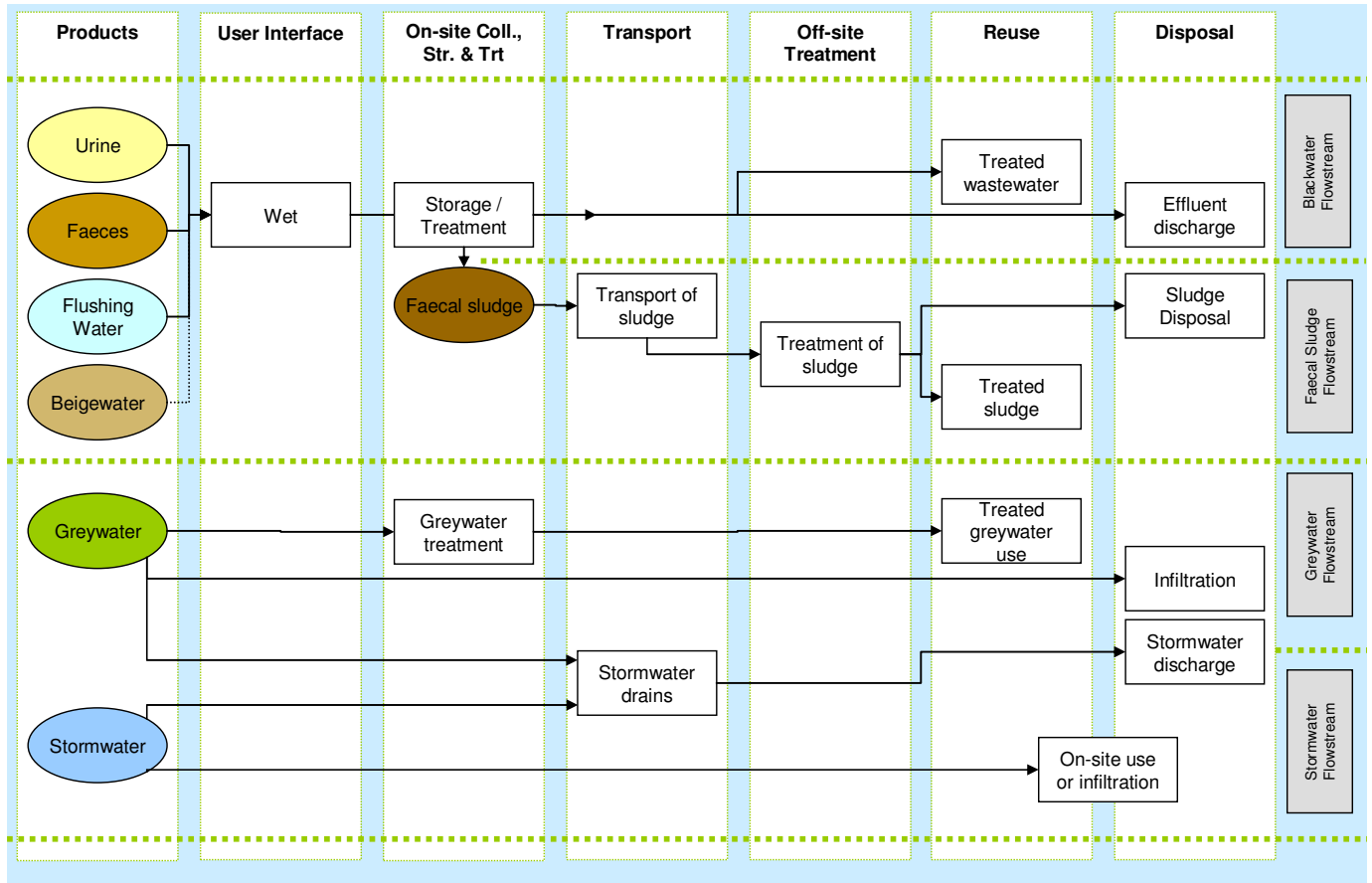


Figure 6: Wet blackwater system where greywater is managed separately

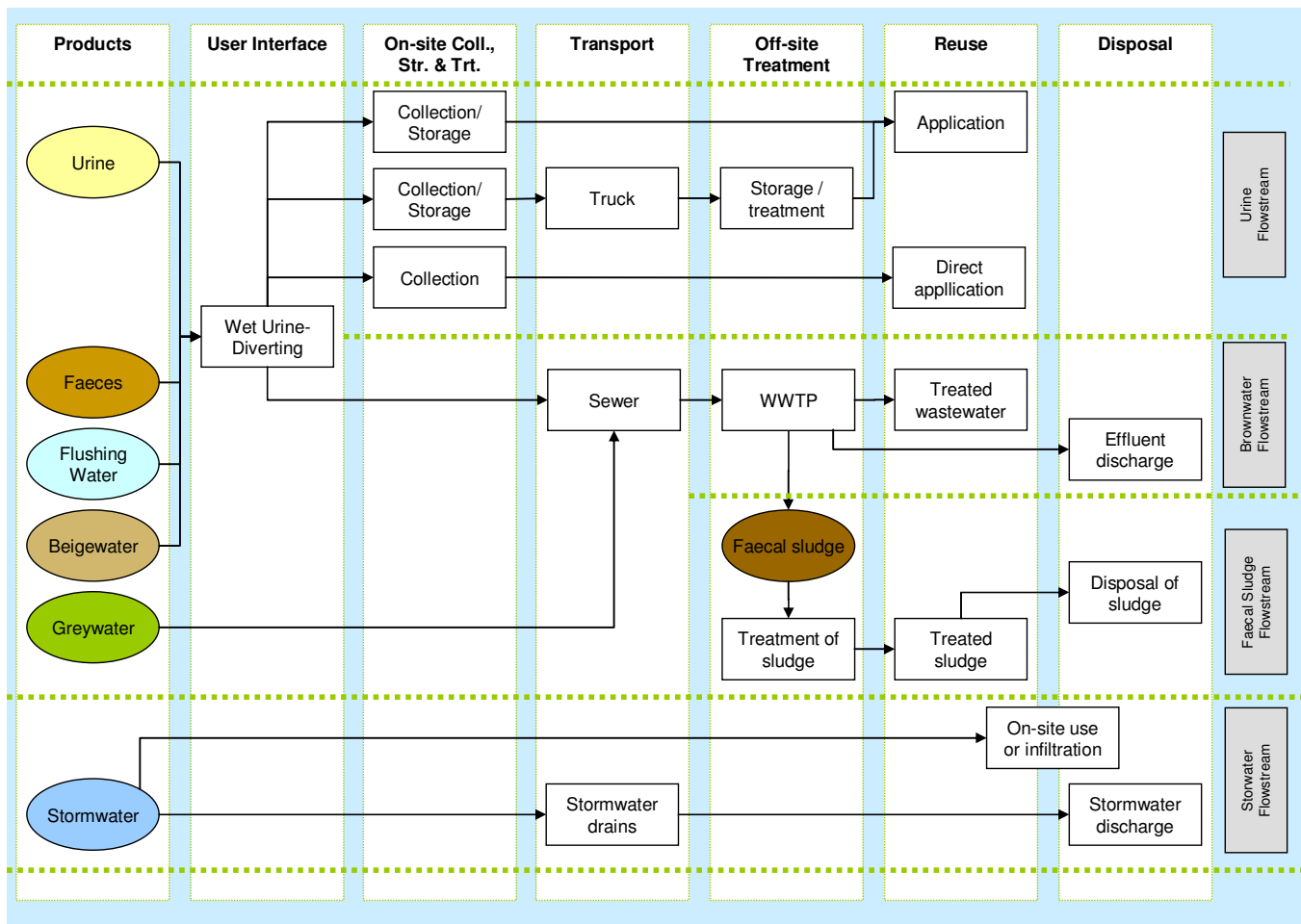


Figure 7: Wet urine diversion system where urine and brownwater (with greywater) are managed separately. This example proposes to modify this streamflow with on-site collection and treatment of both flows instead of the sewerage system.

5.2.5 Identification of Feasible Sanitation Concepts and Systems

Following the demonstration period the CDC called another workshop (WS4) in order to discuss with the stakeholders which systems were most appropriate to their specific situation. Many of the stakeholders originally approached this workshop with the intention to push for a full sewerage system. A heated debate broke out, but it was finally agreed that the cost for such a system and the municipality's inability to prioritize such spending, made such a solution unrealistic. The discussion returned to the selection of an appropriate network of public toilets. The stakeholders debated the pros and cons of the possible technologies based on the overall opinion of the users, true cost estimates of the systems, protection of health and environment, and the management capacity of the local organizations for O&M. The CDC members running the workshop guided the participants through a multi-criteria assessment to rank the technologies. Due to the low prioritization of the reuse of excreta products, the urine diversion systems and co-composting options were deemed inappropriate. The stakeholders preferred the low maintenance and robustness of the pour flush options. It was therefore decided that the public toilets would offer pour flush toilets and urinals that connected to septic tanks. The sludge from the septic tanks would be collected and treated in unplanted drying beds.

5.2.6 Consolidation and Finalization of Implementation Plan for Sustainable Sanitation

With a final decision made on the technology design for the public toilets, the municipality was able to draft a plan and budget for the construction process. The municipality would finance the cost of construction and with the support of the CDC and NGO provide assistance for continued capacity building and awareness-raising activities. The operation and maintenance of the systems would be contracted out to CBOs, however, the municipality would retain the right to monitor and control the activities of the CBOs. A document containing the terms of requirement regarding the operation of the public toilets was drafted and formed the basis for the contractual relationship between the mayor and the CBOs. The CBOs would be responsible for the daily operations of the services and collecting fees to maintain their services. However, since many of these CBOs initially lacked the skills and financial resources to start operations, the municipality and NGO arranged to offer training sessions for capacity building and a micro-credit system that would allow the organizations to purchase the start-up equipment needed.

5.2.7 Implementation

Lead by the CDC and the municipal representative, a task force of trained masons worked to construct the public toilets. They were assisted by local 'animatrices' from the women's group who accompanied the construction process with a series of awareness raising efforts to stimulate demand and educate new user of the systems. The community-based service organizations were outfitted with supplies through the micro-credit system and began operation. Several service organizations also enlisted the support of a local youth association in a social marketing campaign to increase the usage of the toilets (and profits of the service providers).

5.2.8 Participatory Monitoring and Evaluation

Participatory Monitoring and Evaluation (PM&E) tools were used throughout the planning and implementation of the project. This task was specifically given to local actors, such women and youth associations, under the supervision of the technicians at the municipality and the CDC. Members from each of these organizations were given special training in PM&E techniques and the CDC used them as focus groups for feedback throughout the process.

6 References

- Bracken, P., Kvarnström, E., Ysunza, A., Kärman, E., Finnson, A., and Saywell, D. (2005). Making sustainable choices – development and use of sustainability oriented criteria in sanitary decision-making. In *Ecological Sanitation: A Sustainable, Integrated Solution*, Conference Document. 3rd International Ecological Sanitation Conference, pp. 486-494.
- Choguill, C. (1996) Ten steps to sustainable infrastructure, *Habitat International*, vol. 20 (3), 389-404.
- Eawag: Swiss Federal Institute of Aquatic Science and Technology. (2005). *Household-Centred Environmental Sanitation (HCES): Implementing the Bellagio Principles in Urban Environmental Sanitation*. Duebendorf, Switzerland: Eawag.
- GHK Research and Training Ltd. (2000). *Strategic Planning for Municipal Sanitation – A Guide*. GHK Research & Training Ltd. London, UK
- GHK Research and Training Ltd. (2002). *Effective strategic planning for urban sanitation services*. <http://www.ghkint.com/products/downloads/Publications/Strategic%20planning%20for%20urban%20sanitation.pdf> (visited 2007-07-31)
- International Water Association (IWA). (2006). *Sanitation 21: Simple Approaches to Complex Sanitation, a Draft Framework for Analysis*. London: International Water Association.
- Kar, Kamal. (2005). *Practical Guide to Triggering Community-Led Total Sanitation (CLTS)*. Institute of Development Studies, University of Sussex, Brighton, UK.
- Kvarnström, E. and af Petersens, E. (2004). *Open Planning of Sanitation Systems, Report 2004-3*. EcoSanRes Program, Stockholm Environment Institute: Stockholm, Sweden.
- Moriarty, P., Fonseca, C., Smits, S., and Schouten, T. (2005). *Background paper for the symposium: Learning Alliances for scaling up innovative approaches in the Water and Sanitation sector*. Delft, Netherlands: International Water and Sanitation Centre (IRC).
- Norström, A. *Planning for Drinking Water and Sanitation in Peri-Urban Areas*. Swedish Water House Report 21. SIWI, 2007.
- Örtengren, K. (2004). *A summary of the Theory behind the LFA method- The Logical Framework Approach*. Stockholm: Swedish International Development Cooperation Agency (SIDA). www.sida.se/publications Visited 2007-06-13
- Pyburn, P.J. (1983). *Linking the MIS plan with corporate strategy: an exploratory study*, *MIS Quarterly* 7(2), pp. 1–14.
- Ridderstolpe, P. (2000). *Comparing Consequences Analysis – a Practical Method to Find the Right Solution for Wastewater Treatment*. http://www.iees.ch/EcoEng001/EcoEng001_R4.html (visited 2008-01-31).
- Selener, D, Endara, N, and Carvajal (1999). *Participatory Rural Appraisal and Planning*. International Institute for Rural Reconstruction (IIRR).

- Sharp, C., Alveteg, T., and Johansson, P.O. (1998). Participatory protection of groundwater- experiences from methods developed for the Managua groundwater system. Submitted to Journal of Environmental Management, 19 pp3.
- Wiwe, S. (2005). Participatory Multi-Criteria Decision Making in Sewer Planning in Ecuador: Case study Fanca (Bahia de Caraquez), Ecuador. Technical University of Denmark, Dept. of Environment & Resources: Masters Thesis Report, S973370.
- Wright, A. (1997). Toward a Strategic Sanitation Approach: Improving the Sustainability of Urban sanitation in Developing Countries. Washington, DC, USA: UNDP-World Bank Water and Sanitation Program. http://www.environment-integration.org/Download/E33d_Water/global_ssa.pdf (Visited 2008-01-31).
- Wood, S., Sawyer, R., Simpson-Herbert, M. (1998). PHAST step-by-step guide: a participatory approach for the control of diarrhoeal disease. Geneva, World Health Organization (unpublished documents WHO/EOS/98.3).
- World Bank Participation Source Book, 1996.
- The Worldbank Group (2002). http://www.worldbank.org/html/fpd/water/topics/hsp/hsp_definitions.html (accessed 10 October 2007)].

7 Annexes

7.1 Definition of Sanitation Systems / Terminology

Product:

A product has classically been known as a 'waste'. Each product differs in its characteristics due to mixing or separating different waste materials. Each product passes through different process steps in its lifecycle, or along its '**flowstream**'. Sometimes the flowstream can have the same name as the product if no products are combined into the same flowstream. Because each product is so unique, it is important then that the technologies comprising the sanitation system are product-appropriate. Following products are considered:

- **Blackwater:** is the mixture of urine, faeces and flushing water, along with anal cleansing water (if water-based anal cleansing is practiced) or dry cleansing material (e.g. toilet paper)
- **Excreta:** is the mixture of urine and faeces that is not mixed with any flushing water (although small amounts of anal cleansing water may be included)
- **Urine:** is urine that is not mixed with any faeces or water
- **Faeces:** refers to (semi)solid excrement without any urine or water
- **Faecal Sludge:** is the general term for the undigested or partially digested slurry or solid that results from the storage or treatment of blackwater or excreta
- **Beigewater:** is anal cleansing water. It is generated by those who use water rather than dry material for washing.
- **Greywater:** is used water which results from bathing, hand-washing, cooking or the laundry. It is sometimes mixed with, or treated along with other types of products.
- **Stormwater:** is the general term for the rainfall that runs off of roofs, roads and other surfaces before flowing towards low-lying land. It is the portion of rainfall that does not infiltrate into the soil.

Technology:

Is a product-specific method or tool designed to collect, store, transform (change), move, or dissipate a product. Each technology component is responsible for performing a process (task). The technologies are described in Part 2, and evaluated in Part 3 of this document

Flowstream:

This describes the path that the product takes as it moves from the point of generation to the point of disposal: from 'cradle to grave'. It could be described as the lifecycle of the product as it passes through the various process steps, which transform and transfer the product to its ultimate release into the environment.

Sanitation system:

This describes a comprehensive combination of product-specific technology components designed to process each product from the point of generation until the point reuse or disposal (from cradle to grave).

7.2. Checklist of Non-technical Requirements

Checklist of non-technical requirements								
	Project start & launch of planning process	Creation of demand for sustainable sanitation	Assessment of existing sanitation situation and user priorities	Construction of demonstration units	Identification of feasible sanitation concepts and service systems	Consolidation and finalization of implementation plans for sustainable sanitation	Implementation	Participatory monitoring and evaluation
Stakeholder aspects:								
All local stakeholder groups (i.e. individuals, organisations, institutions, etc.) have been identified by means of a stakeholder analysis.	○							
Opinion leaders such as religious and traditional leaders, comedians (artists), women and youth associations, etc. and their implication to trigger participation of all users/stakeholders have been identified.	○							
Differences in gender roles in decision-making and operation/maintenance of sanitation systems have been recognized.	○		○					
Participation/involvement of all stakeholder groups has been triggered and teams (including key stakeholders) have been put in charge of certain project steps.	○							
Local, national and/or international experts (individuals, organisations, institutions, etc.) implementing (i.e. planning, designing, building and O&M) large-scale sustainable	○							

sanitation schemes in West Africa (and abroad) have been identified and are linked to the activities.								
International stakeholders have been streamlined to the national sanitation strategy.	○							
An official and mutually accepted decision on the planning/project area and its boundaries has been taken.	○							
Stakeholders have participated in workshops/discussions to identify local concerns and priorities in the broader context (beyond sanitation). This is done so that demand raising activities and system planning can be adapted to the local situation and adjusted to match with the primary concerns of the people.		○						
Demand for sustainable sanitation has been created.		○						
Social preferences and traditional beliefs associated with sanitation practices (religious, traditional or superstitious beliefs and taboos) have been identified.			○					
Affects of the proposed interventions on daily activities and socio-cultural roles within the community have been assessed.			○					
The capacity, skills and the knowledge to be developed have been evaluated for each stakeholder group.			○					
A comprehensive status assessment report covering topics such as: geographic, demographic and environmental issues; the social and economic situation; laws, policies, national strategies and the institutional framework; excreta, greywater and solid waste management/disposal practices; health and hygiene practices; environmental, institutional and financial issues; agricultural activities and crop production in the project area ; etc. has been prepared.			○					
Acceptance for new systems and how the systems will be adapted to social conditions has been assessed.				○				
The position, needs, demands and general expectations of all stakeholder groups					○			

regarding sustainable sanitation concepts have been determined and taking into account in the pre-selection of feasible sanitation concepts.								
User needs and priorities with respect to other issues than sustainable sanitation have been identified.					○			
All stakeholders have been provided sufficient information on possible sustainable sanitation concepts to go for an informed choice for their sanitation scheme.					○			
Stakeholders have decided on their sustainable sanitation scheme.					○			
Future users of the sanitary facilities have been provided the opportunity to contribute in the implementation of their sanitation facilities.						○		
User of the sanitary facilities and recyclates are guided in the use of sanitary facilities and the application of recyclates, respectively.							○	
A scheme for regular self-monitoring and evaluation has been established and is followed by all stakeholders.								○
Financial aspects:								
Financial institutions have been identified and contacted.	○							
The local body responsible for implementing the sustainable sanitation project has been provided skills in mobilizing and use of funds.		○						
Financial means for conducting awareness raising campaigns and capacity building activities are approved.		○						
Financial means for conducting an assessment of the present sanitation situation and the settlement status is approved.		○						
Basic financial information on current costs for sanitation has been assessed and potential sources of funding for capital investment identified.			○					

A budget for the implementation of the sustainable sanitation scheme has been approved.				○				
Site-specific costs for sustainable sanitation concepts have been determined.				○				
A suitable financing and funding scheme has been established.						○		
Financial mechanisms that support O&M of the sustainable sanitation scheme have been identified and/or established.						○		
A billing and collection system for the sustainable sanitation scheme has been put in place.						○		
Regularly review and adjust the financing system is included in the monitoring & evaluation step								○
Economic aspects:								
Good understand of local economic situation (sources of income, monetary and non-monetary flows) and how it can be linked to sanitation issues has been reached.			○					
Existing production activities (agriculture, industry, trade, etc.) have been identified and assessed in order to evaluate local economy and reuse potential for productive agriculture and income generation.			○					
Mapping out of enterprises in (water and) sanitation sector has been done.			○					
Determine the yearly calendar of work and social life in the community, as it can be used to infer the seasonal changes in labour supply, cash and water use.			○					
Current expenditures on sanitation and willingness and ability of users to pay for a certain/higher level of service have been evaluated.			○					
Cost analysis of pre-selected sustainable sanitation systems has been prepared				○				

(investment costs, running costs, revenues, etc.).								
Conduct an economic feasibility assessment to evaluate long-term project viability based on cost estimates, projected operation and maintenance costs, community willingness to pay, the need for outside resources, and the availability of outside funding.					○			
A “supply side” covering construction of sanitation systems, service provisions, and crop production has been fully developed.							○	
Markets for organically grown agricultural produce (i.e. produce irrigated and fertilized with recovered and treated domestic wastewater and/or certain flow streams) has been established.							○	
Small, medium and large-size local enterprises provide required sanitary wares and sell them to SME for installation purposes.							○	
Environmental and health aspects:								
A hygiene and sanitation promotion programme (targets, types of sanitation facilities to promote, operation and maintenance, hygiene promotion, reuse issues, promotion of private sector to provide services including the promotion of sanitation) has been elaborated and implemented.		○						
Environmental concerns of all stakeholders have been identified.			○					
Existing sanitation systems have been evaluated with respect to public health and environment			○					
Potential and actual environmental impacts of the proposed sustainable sanitation concepts (impacts on: natural resources, soil fertility, energy consumption, water resources, climate change, etc.) have been assessed.					○			
Benefits through safer environment, better health, job creation, enhanced agricultural productivity, promotion of SMEs, etc. have been analysed.						○		

Monitoring program in place for waste discharges, natural resources protection, and material use, paying special attention to secondary environmental impacts that were not anticipated in project planning.									○
Explore alternative plans for reducing the use of consumables, including replaced parts and energy or fuel consumption (batteries, fuel products, plastics, chemicals), and implement them where appropriate.									○
Political & policy aspects:									
Local decision makers have been empowered (in particular the economic independence of local level in decision making).		○							
Communication between local, regional and central government administration has been improved.		○							
Policy on sanitation promotes implementation of sustainable sanitation.							○		
Legal and institutional aspects:									
Recognition of need of assistance (There should be a clear need for assistance before any meaningful project can be established, as this would make the users fully involved).	○								
Understanding the processes for formalizing communities so that they can participate in the project's activities	○								
Understanding of the standards/codes/by-laws and regulation. Limitations and opportunities within the existing legal framework	○								
A Memorandum of Understanding (MoU) has been signed by community representatives and representatives of other stakeholder groups to confirm their support for the project intervention.	○								
Institutions having the legal responsibility for promoting sanitation have been identified.	○								

A planning team within the local structures responsible for sanitation issues (municipal/district level) has been formed and is institutionally hosting the project.	○							
Communication lines have been established between stakeholders (existing NGO, government, institutions and community partners).	○							
Local and regional bodies responsible for sanitation and hygiene promotion have the capacity (incl. available human, financial and technical resources to carry out suggested activities) to develop and implement a program for demand creation/awareness building and hygiene promotion.		○						
Distinct roles and responsibilities between central authorities and local authorities have been identified and distinct (“decentralization”).		○						
Institutional strengthening (in the context of incorporation of sustainable sanitation activities in existing structures and programmes) was done.		○						
Specific skills (e.g. construction companies, social workers, etc.) in the project area that might be interested to actively participate in the project have been identified.		○						
Local platforms have been identified/established for addressing water and sanitation issues		○						
Sustainable sanitation is part of municipal priority (municipal development plan) and national government priority (Part of national policy and strategy)		○						
Local standards on the reuse of liquid fertilizer and/or treated wastewater for agricultural reuse are derived from field tests.				○				
Scientific research provides for background for the amendment of existing codes and regulations regarding effluent standards and/or reuse/application of recyclates and/or treated wastewater.				○				
Consistency of proposed project with regionally identified development priorities and plans (PRSP, SWap, etc) has been checked.						○		

Training, education, sensitization and dissemination:								
A “Start-up” workshop for triggering participation of all stakeholder groups, defining project boundaries and the detailed and comprehensive explanation of the NETSSAF planning approach has been conducted.	○							
IEC analysis as described in Chapter 3.8 performed	○							
Different forms of site-specific instructional and promotional material to meet the needs of stakeholders such as participating households, neighbourhood/community organisations and leaders, small contractors have been developed.		○						
Training material has been translated into local languages.		○						
Health education has been integrated into sustainable sanitation planning to maximise benefits.		○						
Sanitation campaigns have been coordinated with health and environmental authorities, local radio stations and theatre groups, etc.		○						
Training packages on management, technology, finance and conflict management that are appropriate to the given environment have been developed.		○						
Education and training centres (e.g. schools, universities, etc.) have been identified and mapped. The respective institutions have been evaluated of their capacity and needs in terms of training of trainers in sustainable sanitation.		○						
Course plans for workshops and specialized training courses (“master trainers”) at different stakeholder levels have been prepared.		○						
Short training courses for professionals have been established and professionals are educated on standard designs.		○						
Means and ways for capacity building/institutional reinforcement activities have been identified.		○						

Demand creation and awareness building activities and practical education have improved the knowledge about sanitation and hygiene issues amongst the population in the project area.		○						
Increased awareness about the linkages of sanitation, hygiene, personal health and living conditions has raised demand for sanitary infrastructure and services amongst the local population.		○						
Mass media campaigns (e.g. postages, etc.) for sensitization are conducted.		○						
A workshop for authorities, users, re-users and service providers has been conducted to identify the desired functions of the sanitation system.			○					
Demonstration units/plants and reuse sites have been installed and are operated.				○				
All stakeholders have a good understanding on the principles of sustainable sanitation, are aware of the range of possible concepts and have the possibility to test/use some of the optional system components.				○				
Demonstration gardens for the reuse of sanitized flow streams have been installed and local organisations (i.e. private companies, NGOs, colleges, universities, etc.) are doing research on the effect of liquid fertilizer and/or treated wastewater on crop production.				○				
User community is provided sufficient information (i.e. advantages, disadvantages, costs, O&M aspects, etc.) on all sanitation scheme of relevance to conduct an informed choice on their sustainable sanitation scheme.					○			
Advisory/educational system to promote reuse practices has been established.						○		
Small and medium enterprises are able to install, maintain and repair as well as commercialise recyclates (i.e. compost and urine) as natural fertilizer to the agricultural sector.							○	

7.3. Checklist of Technical Requirements

Checklist of technical requirements								
	Project start & launch of planning process	Creation of demand for sustainable sanitation	Assessment of existing sanitation situation and settlement status	Implementation of pilot-projects to demonstrate alternative sanitation concepts	Identification of feasible sanitation concepts and service systems	Consolidation and finalization of sustainable sanitation plans	Implementation, operation and maintenance	Participatory monitoring and evaluation
Sourcing:								
Local, national and international experts and organisations having first-hand experience in the planning, designing, implementation and O&M of large-scale sustainable sanitation projects in peri-urban, semi-urban and rural area in West Africa and abroad have been identified to provide their experts' knowledge in the respective fields.		○						
Necessary human resources are identified and available.			○					
An attempt to identify local alternatives to required resources has been made.				○				
Local, national and international sources of supply (i.e. manufacturers/suppliers of required kind and types of sanitary wares, etc.) have been identified to provide required hardware.				○				

Potential of private sector involvement has been assessed (service providers)				○				
Designing:								
Project boundaries are set mutually.	○							
Existing sanitary infrastructure has been surveyed and mapped to identify good practice examples for sustainable sanitation in the region.			○					
The designs of various sanitation components at household level have been revised and/or adapted to local conditions and/or habits.				○				
Technical prototypes are available				○				
Design criteria are established through participatory discussions with stakeholders and sanitation professionals				○				
Potential pilot demonstration projects are designed and tested in the field. Feedback from the demonstration is used to adjust the final design requirements.				○				
Appropriate and sustainable sanitation and reuse systems designs and service levels are determined in accordance with householders, users and neighbourhood/community leaders and organisations.					○			
The designs of various local/neighbourhood treatment systems have been revised and/or adapted to local conditions and/or habits.					○			
The designs of reuse systems have been revised and/or adapted to local conditions and/or habits.					○			
Design considerations include environmental constraints (groundwater, land use, climate), treatment capacities, costs, robustness, and user acceptance.					○			
Management and logistics:								

Appropriate and reliable communication channels have been set up for all involved stakeholders.		○						
Appropriate facilities for conducting meetings and workshops are available.		○						
A local body responsible for the management of the sustainable sanitation scheme has been put in place, trained and equipped. (It is important that the management is non-political, not initiated by a mayor that might disappear in the next elections.)		○						
The local management body is involved in the demonstration projects, in order to understand their capacity to manage and provide an opportunity for training				○				
A definition of standard of sanitation facility and fertilisers and other end products					○			
A plan for transport, reception and storage of building materials has been worked out in detail to avoid bottlenecks.							○	
Implementation:								
Pilot projects have been implemented in consultation with stakeholders at all levels, and with their participation to demonstrate new sanitation/reuse concepts and gather information on required changes in the design, if any.				○				
Ways and means to start implementing sustainable sanitation at the large-scale has been agreed on in consultation with stakeholders and implementation has started						○		
Site supervision by experienced personal helps adhering to required quality standards.							○	
Construction of sanitation facilities is done							○	
Adaptive management during installation to deal with changes in budget, timing, and resource availability.							○	

Official opening ceremony to inaugurate the system with the appropriate stakeholders present (symbolic/motivational event),							○	
The installation plan has set a realistic work schedule, based on available resources and preferred work styles of the local community							○	
Operation and maintenance:								
A survey on and mapping of successfully established O&M schemes for sustainable sanitation schemes in West Africa and abroad have been conducted.			○					
A monitoring scheme has been defined and established. Monitoring of end users, service providers, public sector servant necessary to keep system operational				○				
O&M manuals have been elaborated and compiled of to allow for proper O&M.				○				
Technical training of maintenance staff has been conducted.				○				
Management body is operational and has necessary resources, capacity, and socio-political power to fulfil its role.							○	○
A monitoring scheme has been established. Monitoring of end users, process, end products, service providers, public sector servant necessary to keep system operational								○
Management body is connected to supporting local/regional/national institutions								○
Financing system exists to cover O&M costs and is regularly reviewed and adjusted								○
Transformation and sanitation of products:								
The national/local rules and regulations regarding the reuse of sanitation products in checked.			○					

Survey on and mapping of successful experiences in transformation and sanitation of all relevant flow streams for reuse/disposal in West Africa and abroad.				○				
The reuse and transformation methods are tested in demonstration projects in order to understand user opinions of the products and the feasibility of long-term usage.				○				
Experience gained on reuse internationally/nationally is transferred to concrete practice suited to local environment and circumstances				○				
Feedback and monitoring system to learn from the experiences of reuse is established				○				
The efficiency and hygienic quality of the reuse streams is regularly monitored						○		
Regulations regarding the application of reuse products, and recommend application procedures and limits are established.						○		
Treatment facility for production of fertilisers etc. is produced							○	
Logistics of distribution and application:								
The distribution and application system is tested during the demonstration project and adjusted appropriately to avoid long-term O&M problems				○				
Survey on and mapping of existing distribution and application schemes for sanitized flow streams and non-sanitized sanitation flow streams in West Africa and abroad.					○			
To sustain large-scale application of sanitized products in future a reliable logistics system for distribution and application has been set up.							○	

7.4 The Bellagio Principles

<p>1. Human dignity, quality of life and environmental security at household level should be at the centre of the new approach, which should be responsive and accountable to needs and demands in the local and national setting.</p> <ul style="list-style-type: none"> • solutions should be tailored to the full spectrum of social, economic, health and environmental concerns • the household and community environment should be protected • the economic opportunities of waste recovery and use should be harnessed
<p>2. In line with good governance principles, decision-making should involve participation of all stakeholders, especially the consumers and providers of services.</p> <ul style="list-style-type: none"> • decision-making at all levels should be based on informed choices • incentives for provision and consumption of services and facilities should be consistent with the overall goal and objective • rights of consumers and providers should be balanced by responsibilities to the wider human community and environment
<p>3. Waste should be considered a resource, and its management should be holistic and form part of integrated water resources, nutrient flows and waste management processes.</p> <ul style="list-style-type: none"> • inputs should be reduced so as to promote efficiency and water and environmental security • exports of waste should be minimised to promote efficiency and reduce the spread of pollution • wastewater should be recycled and added to the water budget
<p>4. The domain in which environmental sanitation problems are resolved should be kept to the minimum practicable size (household, community, town, district, catchment, and city) and wastes diluted as little as possible.</p> <ul style="list-style-type: none"> • waste should be managed as close as possible to its source • water should be minimally used to transport waste • additional technologies for waste sanitisation and reuse should be developed

(Eawag, 2005)

7.5 Characteristics of a Multiple Objective Decision Support System (MODSS)

(Text taken from MODSS web site: <http://www.coastal.crc.org.au/modss/about-dss.html>)

“At its broadest definition, a decision support system is any methodology that is helpful to a decision maker to resolve issues of trade-offs through the synthesis of information. In this sense, it is not necessary that a decision support system (DSS) be computer based provided the tool allows the user to make better informed decisions through the integration of information. The approach needs to be reproducible, consistent, defensible and capable of dealing with constraints of time, cost, and balancing requirements between production and conservation. The framework for making decisions will provide a structured approach to problem solving. In this way, there is a progressive direction, with each step building on the results of the previous component. A multiple criteria (MODSS) approach is preferred when there are many and possibly conflicting objectives to be addressed simultaneously.

Decision support systems need input from stakeholders. Ideally, stakeholder participation should occur throughout the process, where involvement occurs during problem identification, defining decision criteria and feasible alternatives, the selection of weights, and scenario analyses. This process must be interactive and the DSS framework must be sufficiently flexible to respond to the needs of specific users or groups. This may be done by examining various scenarios based on the importance user groups place on the decision criteria.

Typically, a DSS contains or relies on information from various data sources, ranging from qualitative information collected by PRA methods up to spatial information out of Geographical Information Systems. The actual analytical process may use linear programming techniques, decision theory or expert rule-based systems. Communicating outcomes in a language that is meaningful to stakeholders is crucial, and so a graphic user interface is normally developed to present results and accommodate 'what if' scenarios.

The success in using multi objective decision support systems to evaluate options is enhanced when the DSS is built in collaboration with the users. This process identifies the interrelationships between information streams and decision criteria, and allows a multidisciplinary team to study a complex problem across discipline boundaries. In addition, it captures people's attention at an early stage in the process. The integration of information is one of the characteristic features of a multiple objective decision support system. Information can be drawn from many sources, including measured data, simulation models and expert opinions. Through the integration of all information sources, a rational and supportive decision can be made. Unfortunately, the need to apply multiple objective decision support systems has outstripped the capacity of our databases, and the sophistication of simulation models may support biophysical detail but not social or economic information. As a result, the application of multiple objective decision support systems will become heavily reliant on expert or professional opinions in order to determine the impacts of alternative land on water management systems on the natural resources.

At the conclusion of the analysis, the user should be in a better position to identify a single or range of preferred options. The results of the analysis represent a position for further discussion having considered the trade offs between social, economic, natural resources, legislation and technological issues. Importantly, the DSS is not intended to be prescriptive. Although the analysis may provide a rank order listing of preferred

options, there may be other external factors that need to be considered before deciding on a course of action. However, the outcomes from the DSS may be used to identify those options that require further investigation and concentration of resources while eliminating less desirable options.”

The framework for developing a multi-criteria DSS is derived from a structured approach to problem solving and decision-making theory. Although specific guidelines for creating a DSS can vary, they generally follow the generic six steps approach outlined below:

1. Definition of the Problem, Goals and Objectives

In combination with the definition of the problem, the articulation and definition of the goal is often one of the first steps in the decision making process. In a MCDSS the community affected by an issue should be involved in defining the objectives and/or goals. These objectives or goals are an abstraction of the values of the community in which the decision is to be made. An objective or goal may be as specific as achieving a particular water quality standard at a point in a watercourse or as general as improving the quality of the natural environment, or economic maximisation and shall, once defined, not be changed during the decision making process.

2. Definition of Criteria

At this step it is necessary to define the criteria that will be used in the analysis. In many cases the important criteria are incommensurable (meaning that they are not comparable with respect to magnitude and value) and non-cooperative (meaning that at some point one objective, cannot be improved without decreasing the value of another). However, they must be measurable, even if the measurement is performed only at the nominal scale (yes/no; present/absent) and their outcomes must be measured for every decision alternative. Criterion outcomes provide the basis for comparison of choices and consequently facilitate the selection of one, satisfactory choice. The criteria shall then be used in the planning process to judge the various alternatives, enabling a clear comparison of their performance in the local framework set-up.

3. Definition of Alternatives

Based on the available information a variety of suitable and technical feasible options are proposed and designed. Each option, as part of a finite number of alternative plans or options, should be designed in a way that it would suit the local conditions, would solve the problem and reach the goal defined in step 1. In the MCDSS context, each alternative is then evaluated on the set of criteria, as defined in step 2. Criterion outcomes of decision alternatives can be collected in a table (called decision matrix or decision table), comprised of a set of columns and rows. The table rows represent criteria, with table columns representing decision alternatives. A value found at the intersection of row and column in the table represents a criterion outcome, or predicted performance of a certain decision alternative on a specific criterion. The decision matrix is a central structure of the MCDSS since it contains the data for comparison of decision alternatives and shall provide decision-makers with a process to gather and display the required data in a clear and transparent framework

4. Definition of Preferences

After the design matrix is created and a complete set of efficient possible solutions is generated, they will have to be evaluated based on defined preferences. Since, the community's values, beliefs and perceptions are the force behind almost any decision-making activity, it is critical that they are taken into account during this step. Stakeholder participation is required to weigh the criteria and define which ones shall dictate trade-offs in the decision-making process. This is a key step since stakeholder preferences for certain criteria over others can affect the final outcome of the decision. The defined preferences and the strength of these preferences will be used for ranking the alternatives based on how well they satisfy the criteria.

5. Decision Making

This final decision may be made by an individual or a group of people. The actual decision boils down to selecting "a good choice" based on the preference ranking of a number of available choices. It is important to keep in mind that many decision-support systems are not designed to find an optimal solution, but rather as an aid in the process. The decision maker(s) may still need to consider trade-offs and possibly negotiate the final decision with the other stakeholders.

Additional References on MCDSS:

- Multi-Criteria Decision Making (MCDM) (visited 2008-01-31)
<http://www.rfp-templates.com/Multi-Criteria-Decision-Making-MCDM.html>
- Multiple Objective Decision Support Systems (visited 2008-01-31)
<http://www.coastal.crc.org.au/modss/whatismodss.html>

7.6 NETSSAF Planning Steps: Additional Information

STEP 1	Project Start & Launch of the Planning Process	
	Description	Input into software and/or manual
Purpose	Official project start and launch of the activities being part of the planning process	
Possible Tools and Methods	Workshops Stakeholder analysis Formation of a planning team Development of community strategy	Workshop guidelines Tools for stakeholder analysis: identifying/mapping stakeholders Pamphlets and guidelines for basis planning approach: strategies for community development
Examples	Initiating Workshop: Each step takes about 1-3 hrs, which can be done over several days if necessary. 1. Problem identification 2. Identification of stakeholders 3. Problem analysis, looking at good and bad hygiene behaviours, investigating community behaviour etc, 4. Planning for solutions, blocking the spread of disease, selecting barriers, tasks of men and women in the community.	Instructions for WS 1 (including instructions for adaptation for gender sensitivity, local culture, end-users of reuse products, rural/ peri-urban setting, etc.) Workshop template from HCES Give suggestions on how workshops can be conducted, tools needed and some references.
Additional guidelines	Workshop facilitator should be someone with a good knowledge of community and non-partisan background The points brainstormed could be written on a board visible for all and the rejected points remained cancelled on the board as a result of the workshop.	Supplemental reference material regarding best-practices for facilitators and brainstorming

Reference for more information:

- Eawag (2005). Household-Centred Environmental Sanitation (HCES) Step 2. Eawag: Swiss Federal Institute of Aquatic Science and Technology
- GHK Research and Training Ltd. (2000). Strategic Planning for Municipal Sanitation – A Guide. GHK Research & Training Ltd. London, UK
- Mugabi, J., Kayaga, S. & Njiru, C. (2007) Strategic planning for water utilities in developing countries. Utilities Policy 15, pp. 1-8.

STEP 2	Creation of Demand for Improved Sanitation	
	Description	Input into software and/or manual
Purpose	<p>Continuous provision of information about sanitation and hygiene topics combined with awareness raising</p> <p>Promotion of sustainable sanitation systems</p> <p>Creation of demand for improved sanitation infrastructure</p>	
Possible Tools and Methods	Sanitation weeks/campaigns	
	Foundation of Community Health Clubs, School Health Clubs	Outline of what a community health club could do
	Lobbying with religious and socio-cultural leaders	
	Photo exhibitions highlighting good and bad sanitation practices, fertilized and non-fertilized crops	Example of photos to be used
	School children competitions in painting and cleanliness with award giving ceremonies for the best schools	Example of titles
	Student Essay Competitions	Example of titles
	Promotion in local radio stations with talk shows (call-ins) and other publicity	Example of texts to be used
	National song competitions on sanitation	
	Composition of theme songs to be performed by leading musicians, based on sanitation and hygiene themes	
	Promotion among the private sector (private companies) to sponsor events;	Posters and brochures

	Awareness raising drama performances focussing on hygiene, sanitation, and crop fertilization and production	Plays
	Home visits to accompany media messages	Suggestion on topics to cover during a home visit
	Establishing learning alliances for sharing and spreading sanitation information	

Reference for more information:

- Kar, Kamal. (2005). Practical Guide to Triggering Community-Led Total Sanitation (CLTS). Institute of Development Studies, University of Sussex, Brighton, UK.
- Moriarty, P., Fonseca, C., Smits, S., and Schouten, T. (2005). Background paper for the symposium: Learning Alliances for scaling up innovative approaches in the Water and Sanitation sector. Delft, Netherlands: International Water and Sanitation Centre (IRC).
- UNESCO. (2006) Capacity building for ecological sanitation: Concepts for ecologically sustainable sanitation in formal and continuing education. Paris: International Hydrological Programme (IHP), United Nations Educational, Scientific and Cultural Organisation (UNESCO).
- WSP (2002). Case study of hygiene promotion in Burkina Faso and Zimbabwe
- GTZ sector project ecosan (GTZ GmbH, Postfach 5180 //65726, Eschborn // Germany. E-mail: ecosan@gtz.de)

STEP 3	Assessment of Existing Sanitation Situation and User Priorities	
	Description	Input into software and/or manual
Purpose	Provision of information which facilitates participatory decision-making in planning for future project development and in day-to-day operational challenges for service delivery to the public in the field of water supply, sanitation, and solid waste management.	
Possible Tools and Methods	Conduction of a workshop (WS2) with the users, reusers/farmers, authorities and the service providers, to identify the desired functions of the sanitation system. Conduction of a capacity assessment, checking the	Give suggestions on how workshops can be conducted, tools needed and some references. References to suitable methods for the performance of such a baseline assessment may be

	<p>community's capacity to participate and implement actions, as well as the capacity of the local public and private sector</p> <p>Holistic analysis of the resource base available, required in the planning process (human resources, institutional capacity, technical capacity, financial resources, legal framework, land-ownership arrangements)</p> <p>Conduct a situational analysis of regional and national issues such as political structure and stability, government policies, and foreign aid that can impact civil improvement projects (war, drought, disease, international debt, inflation, etc.)</p> <p>Application of participatory assessment tools</p>	<p>found in (LIST DOCS on PRA, RRA, PACAR, SARAR).</p> <p>Directions for performing semi-structured interviews, key-informant interviews, transect walks, observations, household surveys, mapping.</p>
Examples	<p>The project coordination team will collect information through stakeholder workshops and field studies, and report on issues such as:</p> <ul style="list-style-type: none"> • The desired functions of the sanitation system are identified with the users, the authorities and the service providers. • Description of local physical conditions (e.g. population size, density, soil type, drainage patterns, climate, etc) • Inventory of existing household level sanitation technologies, hygiene practices, and their perceived benefits • Description of the conditions of the existing sanitation system and operation & maintenance procedures • Assessment of the community's resources, farming practices, and occupations. • Assessment of current/future use and availability of water 	<p>Direction on how to use community-based mapping combined with GPS.</p> <p>Suggestion for a participatory workshop to help community assess their own resources (physical, economic, institutional, organizational, etc.)</p>
Additional guidelines	<p>Workshop facilitator should be someone with a good knowledge of community and non-partisan</p>	<p>Supplemental reference material regarding best-practices for facilitators</p>

	background.	
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Reference for more information:

- Wood, S., Sawyer, R & Simpson-Herbert, M. (1998). PHAST Step-by-step Guide. WHO. 127 p.
- Traore, A. (1996). Manuel de formation participative. CREPA
- Zurbrügg & Sterkele (2003). Baseline Study on Water Supply, Sanitation and Solid Waste in Upper Dharamsala, India. SANDEC & EAWAG
- Resource-oriented Sanitation Concepts (ROSA) project homepage : www.rosa.boku.ac.at
- Peace Corps (2007). Participatory Analysis for Community Action (PACA) Training Manual
- Deverill P. et.al. (2002). Designing water supply and sanitation projects to meet the demand in rural and peri-urban communities – Book 1. Concept, Principles and Practice. WEDC. 2002
- Eawag (2005). Household-Centred Environmental Sanitation (HCES) Steps 3-5. Eawag: Swiss Federal Institute of Aquatic Science and Technology
- International Water Association (IWA). (2006). Sanitation 21: Simple Approaches to Complex Sanitation, a Draft Framework for Analysis. London: International Water Association.

STEP 4	Construction of Demonstration Units	
	Description	Input into software and/or manual
Purpose	Demonstrate alternative sanitation and re-use concepts in the project area to the user community	
Possible Tools and Methods	Workshops Construction of infrastructure Establishment of service provision	Workshop guidelines Charts with systems and technical options, presented in a simple form
Examples	Workshop (WS3) needs to be conducted where the task force pre-selects system alternatives based on the findings in the earlier steps. A broad range of systems and technologies should be included. The O & M needs and their availability of each pre-selected system should be identified by the task force and discussed with the users.	Charts with systems and technical options, presented in a simple form, including a picture of the system, O&M, approximate costs, reuse possibilities etc Charts from D22&D23

	<p>Community members are given the opportunity to ask questions, discuss, and give feedback to the options. It is the goal then, that community members will think and discuss the options and thus, refine their ideas, opinions and priorities in light of their day-to-day situation, which can now be viewed in context of the options presented.</p> <p>The workshop should come out with a narrowed down list of systems to demonstrate.</p>	
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Reference for more information:

- Peter Morgan (2007). Toilets That Make Compost – Low cost, sanitary toilets that produce valuable compost for crops in an African context. SEI, Sweden
- IWMI & SANDEC (2002). Co-composting of Faecal Sludge and Solid Waste – Preliminary Recommendations on Design and Operation of Co-composting Plants based on the Kumasi Pilot Investigation
- Rothenberger, S. & Zurbrügg, Ch. (2006). Decentralised Composting for Cities of Low- and Middle-Income Countries. Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Switzerland
- Schönning, C. & Stenström T. (2004). Guidelines for the Safe Use of Urine and Faeces in Ecological Sanitation Systems. SEI, Sweden
- Morel A. & Diener S. 2006. Greywater Management in Low and Middle-Income Countries, Review of different treatment systems for households or neighbourhoods. Swiss Federal Institute of Aquatic Science and Technology (Eawag). Dübendorf, Switzerland
- NETSSAF (2007). Deliverable 22&23. Evaluation of existing low-cost conventional as well as innovative sanitation systems and technologies
- WSP (2007). From Burden to Communal Responsibility: a sanitation success story from the southern region in Ethiopia. Water and Sanitation Program field note: sanitation and hygiene series.

STEP 5	Identification of Feasible Sanitation Concepts and Service Systems	
	Description	Input into software and/or manual
Purpose	Evaluation of the acceptance of the demonstration units after some period of usage by the population user needs and user based on their experience with the demonstration units.	

	<p>Evaluation of the common acceptance of the various units and their suitability for large scale implementation</p> <p>Elaboration of feasible sanitation system options for the planning area, based on the information gathered and compiled in the previous planning steps</p>	
Possible Tools and Methods	<p>Workshop (WS4)</p> <p>Collection and analysis of experiences on the demonstration unit in local setting</p>	<p>Workshop guidelines</p> <p>Aspects/factors to be considered when feasibility of a system is assessed</p>
Examples	<p>The goal of the workshop is to bring together reflections, concerns and priorities of community with goal of agreeing on desirable system. This of course may not happen, but based on the feedback, the options can be refined, adjusted, and re-designed to suit the user priorities and experiences and the iterative process can continue until a consensus is reached.</p>	<p>Templates showing type of information needed (to be filled locally to help in the identification process)</p> <p>Charts with possible systems and technical options, presented in a simple form, including a picture of the system, O&M, costs information, reuse possibilities etc</p>
Additional guidelines	<p>Workshop facilitator should be someone with a good knowledge of community and different sanitation options</p>	

Reference for more information:

- NETSSAF (2007). Deliverable 22&23. Evaluation of existing low-cost conventional as well as innovative sanitation systems and technologies
- IWA (2006). Sanitation 21: Steps 7-9
- Eawag (2005). Household-Centred Environmental Sanitation (HCES) Step 6. Eawag: Swiss Federal Institute of Aquatic Science and Technology

STEP 6	Consolidation and Finalization of Sustainable Sanitation Plans	
	Description	Input into software and/or

		manual
Purpose	Development of action plan where (preferably) the sanitation planning can be integrated in the overall planning for the area (solid waste etc)	
Possible Tools and Methods	Workshop (WS5) Action plan (including management system and financial model)	Workshop guidelines Assigning roles and responsibilities (provide sample diagram outlining relationships between stakeholders)
Examples	<p>This planning includes human resources, more specific calendars, and clearly defined activities. There are both technical and institutional sides to this. The technicians will need to be involved in identifying the technical needs for implementing the system (materials, trained masons, land, etc.). They will have to work closely with the managing institutions/people (Mayor, regional authorities, community leaders, etc.) in developing a plan for how to provide these needs (availability of masons, need for training workshops, and cost of supplies).</p> <p>The financing system should be laid out clearly (who pays for what), including any subsidies, household contributions, municipal funding, etc.</p> <p>A management system should also be set up to direct the implementation process and provide monitoring and evaluation afterwards. This includes identifying a local project coordinator to oversee the work and possibly a project advisory counsel.</p> <p>A document should be drafted and approved by the local government authority (likely the Mayor) so that this approach becomes the municipal sanitation policy (or at least that the proper officials know what is going on).</p>	<p>Planning posters</p> <p>Problem box</p> <p>A check-list on possible technical, management and financial requirements</p>
Additional guidelines		

Reference for more information:

- Wood, S., Sawyer, R & Simpson-Herbert, M. (1998). PHAST Step-by-step Guide. WHO. 127 p
- Traoré (1996). Manuel de formation Participative. CREPA
- Eawag (2005). Household-Centred Environmental Sanitation (HCES) Steps 7-8. Eawag: Swiss Federal Institute of Aquatic Science and Technology

STEP 7	Implementation	
	Description	Input into software and/or manual
Purpose	Application of the chosen sanitation system and its components at large scale	
Possible Tools and Methods	Construction of sustainable sanitation systems Alignment of support systems for O&M, M&E	Local contractors, producers, dealers, cost information
Examples	Training courses for technicians, masons Lobbying processes with policy decision makers Marketing of new sanitation products	Local training needs Examples of bottlenecks that may be faced
Additional guidelines		

Reference for more information:

- WEDC (2007). Infrastructure for all
<http://wedc.lboro.ac.uk/publications/details.php?book=978%201%2084380%20109%202&keyword=&subject=0&sort=TITLE>
- WEDC (2000). Services for the urban poor
<http://wedc.lboro.ac.uk/publications/details.php?book=0%20906055%2077%206&keyword=&subject=0&sort=TITLE>
- Eawag (2005). Household-Centred Environmental Sanitation (HCES) Step 10. Eawag: Swiss Federal Institute of Aquatic Science and Technology

STEP 8	Participatory Monitoring and Evaluation	
	Description	Input into software and/or manual
Purpose	Review and reflection process to govern and link project activities to stated goals	
Possible Tools and Methods	Stakeholder meetings Periodic M&E reports on outcomes in relation to objectives	Critical factors identified Monitoring & evaluation indicator set
Examples	Community consultation meetings and use of participatory assessment methodologies Situational analysis activities to provide baseline and benchmark for monitoring purposes	Examples of participatory methods
Additional guidelines		

Reference for more information:

- Zurbrugg C. & Sterkele B. (2003). Baseline Study on Water Supply, Sanitation and Solid Waste in India
- Peace Corps (2007). Participatory Analysis for Community Action (PACA) Training Manual (Revised 2007)
- Eawag (2005). Household-Centred Environmental Sanitation (HCES) Step 9. Eawag: Swiss Federal Institute of Aquatic Science and Technology
- Moriarty et al. (2005). Background paper on learning alliances
- WSP (2005). Scaling-Up Rural Sanitation in South Asia: Lessons Learned from Bangladesh, India, and Pakistan. Water and Sanitation Program – South Asia, Report #34873, May 2005.
- WSP (2002). Hygiene Promotion in Burkina Faso and Zimbabwe: New Approaches to Behaviour Change. Water and Sanitation Program field note 7: sanitation and hygiene series.