

User Acceptance and Functioning of Mobile Communal Sanitation Facilities in Informal Settlements of South Africa

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by

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Executive Summary

The provision of water and sanitation services to previously un-served communities is a South African development priority. In recent years, a strong drive from the South African government to attain basic water and sanitation throughout the country has been widely applauded and acknowledged in all communities. In order to reach this target, several sanitation technologies, including mobile communal sanitation facilities (MCSF) have been developed and implemented countrywide. However, it has been found that technical innovations often lack sustainability due to a lack of attention, provision and implementation of adequate operational requirements and community involvement.

The application of new sanitation technologies in informal settlements lacks a framework for assessing the performance and functioning based on the perspectives of end-users of the new technology despite the existence of the national Strategic Framework for Water Services (DWA, 2001 and 2003). This general framework does not clearly define “basic sanitation” in terms of technology (Mjoli, 2010; CoCT, 2008; Still et al., 2009). Therefore, the mobile communal sanitation facility (MCSF) may be incorporated in this definition according to the City of Cape Town (CoCT) Water and Sanitation Department understanding of the aforementioned framework (Grootboom, 2010; CoCT, 2008).

This study “***Application of an Evaluation Framework for Investigating User Acceptance and Functioning of Mobile Communal Sanitation Facilities in Informal Settlements of South Africa***” draws on local and international experience and investigates the approaches to evaluation in the context of the three case studies informal settlements in order to develop a framework that can be used to assess MCSF acceptance and functioning from user perspectives.

The framework for assessing users’ acceptance and functioning of mobile communal sanitation facilities in informal settlements

The framework for assessing user acceptance and functioning of MCSF in IS was intentionally developed hypothesising that “*Greater User Acceptance is achieved through user participation & influence in implementing & managing sanitation technologies*” and “*Adequate Functioning of the sanitation technology is dependent on the appropriate design specifications & is also influenced by the level of user understanding of the operational requirements & usage of the technology as well as user acceptance*”

The review of literature revealed that available frameworks and guidelines were too general, and not specific to MCSF; and their application is limited to formal settlements. The literature suggests that the assessment of any sanitation technology is a phased process that includes planning and initiation, implementation and post-implementation phases. In addition it was found that the assessment criteria and indicators for each of these phases are a function of many factors including types of settlements, level of services and level of awareness to name few.

The framework developed for this study based (presented below) comprises three phases namely the planning and initiation (preliminary investigation and feasibility assessment), the implementation

phase (physical construction and commissioning of the facility) and the post-implementation phase (operation and maintenance).

The framework for assessing user acceptance and functioning of MCSF

Phases	Users' acceptance	Functioning
Planning and Initiation	<ol style="list-style-type: none"> 1. Appropriate Technology 2. Ecological Technology 3. Sustainable Technology 	<ol style="list-style-type: none"> 1. Status of the sanitation 2. Sanitation technology selection 3. Appropriateness of the technology 4. Users' awareness programme
Implementation	<ol style="list-style-type: none"> 1. Participation 2. Users' awareness 3. Understanding of the Technology 	<ol style="list-style-type: none"> 1. Sanitation technology option 2. Infrastructure development 3. Operational requirements
Post Implementation	<ol style="list-style-type: none"> 1. Oversight & Ownership 2. Users' awareness 3. Development Opportunities 4. Monitoring & Evaluation 	<ol style="list-style-type: none"> 1. Operation and Maintenance 2. Monitoring and Evaluation 3. Users' issues

It should be noted that to each phase of the framework correspond distinct number of criteria covering respectively user acceptance and functioning of the MCSF. In addition, a number of indicators are assigned to each criterion. These indicators inform each criterion by indicating the level of user acceptance or the adequacy of the functioning of the facility by highlighting the areas of concern that requires attention. Depending on the weighting, the flagged indicators inform the criteria by highlighting whether there is a need for action or not.

The application of the framework and development of the Sanivey

This phase of the research was intended to test the developed framework at the selected case study sites Shembe, Enkanini, Pooke-se-Bos. One case study site namely Enkanini was selected to test the developed framework in order to explore its application and outcomes. Following this initial application large volume of data was collected using the developed questionnaire, then collated and analysed using SPSS software version 19. Results of the application were presented and discussed during the reference group meeting.

From the initial application, and following the discussion of results, it was suggested to refine the framework by rationalizing criteria such as user acceptance and awareness programme; and moving operational requirements to the implementation phase. Due to the large volume of data collected and difficulties experienced during the analysis using the SPSS software, it was suggested to develop a user friendly tool that can be used to analyse information collected from the interviews.

A software tool named "Sanivey" was developed using the refined framework structure. Results obtained from the interviews (at the case study sites) were loaded and survey reports highlighting the user acceptance and functioning of the MCSF generated.

➤ ***The users' acceptance of mobile communal sanitation facilities in informal settlements***

Results emerging from the application of the “Sanivey” reveal that although the level of user acceptance of MCSF across the three case study sites was generally high, there were areas that required attention. The flagged areas include the user participation and user awareness (implementation phase) and user awareness and M&E (post-implementation phase).

Comparatively across the case study sites, Shembe attained the highest level of user acceptance, followed by Pooke se Bos. Kayamandi had the lowest level of user acceptance among the three sites.

The case study results reflect a general consistency around the areas of concern for improvement to increase the levels of user acceptance of MCSF in informal settlements of South Africa. The areas of concern are indicative of attention to the elements of *user participation* and *influence* across the three phases of the sanitation cycle.

From these findings therefore it can be concluded that user acceptance of mobile communal sanitation facilities is determined by the level of user participation and influence in implementing and managing sanitation technologies.

➤ ***The functioning of communal mobile sanitation facilities in informal settlements***

Results obtained suggest that the functioning of MCSF in IS context was consistent throughout the case study sites except for the planning phase that was not adequately covered to a large extent at one of the case study sites. Despite being consistent, some areas of concern such as status of the sanitation in the settlement and causes of the sanitation problem (planning phase), types of sanitation technology provided (implementation phase) and user issues with reference to the reporting protocol, response time to address the problem were flagged.

The analysis of these results shows that the functioning of sanitation depends on the ability of users to understand and comply with the operational requirements of the technology. The functioning of MCSF depends on the operation and maintenance strategies and processes in place.

This conclusion emerging from the application of the framework and analysis of results using the Sanivey validates the initial hypothesis.

Emerging trends from the application of the framework

Throughout the application of the framework, trends emerged across the various phases of the sanitation cycle (that include planning, implementation and post-implementation) with regard to the user acceptance and functioning. These trends (reflected on the various criteria and indicators that form the backbone of the framework) highlight the areas of concern that may require attention at the case study sites.

a) User acceptance

A count of the number of criteria in total that received high and low levels of acceptance by combining all the case study sites reveal that 60% of the criteria have a high level of acceptance compared to 40% of criteria with a low level of acceptance.

Observation of trends, reveal an order of priority where attention and resources should be invested. The order of priority is as follow:

- *First Priority for Concern:*
 - Participation (implementation phase)
 - Monitoring and Evaluation (post-implementation phase)

- *Second Priority for Concern:*
 - Development Opportunities (post-implementation phase)

- *Third Priority for Concern:*
 - Appropriate Technology (planning phase)
 - User Awareness (implementation phase)
 - Oversight and Ownership (post-implementation phase)
 - User Awareness (post-implementation phase).

b) Functioning

A review of the responses to the functioning criteria from all the case study sites reveal that 69% of the criteria were flagged as adequate and 31% of indicators were as flagged inadequate. The flagged indicators, clustered according to the order of priority that may be used to improve functioning are outlined below:

- *First priority of concern*
 - Access to sanitation
 - Status of the current sanitation service within the settlement
 - Number of potential users of the proposed sanitation technology
 - Causes of the current sanitation problems
 - Awareness programme and user responsibility

- *Second priority of concern*
 - Knowledge of the type of sanitation technology
 - Impact of non-compliance with operational requirements

- *Third priority of concern*
 - User participation and responsibility for the O&M
 - User support requirements for the O&M
 - Response to reported problems
 - Reporting protocol
 - Response time to address the problem

Conclusion

This study has developed a framework for assessing user acceptance and functioning of MCSF during the planning, implementation and post-implementation phase; tested its application in the context of the three case study sites and developed an analysis tool for easy use.

The application of the framework has highlighted areas that require attention for improvement of the sanitation. As part of the study, a software which enables easy collation and analysis of results was developed. This software can be used by municipal officials, design engineers, sanitation vendors and manufacturers to assess the user acceptance and functioning of the sanitation technologies prior or after being provided to IS.

This study contributes to the sector by providing an easy to use tool in response to the lack of available evaluation framework targeting sanitation services in informal settlements.

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List of Acronyms

AB	Ablution Block
CLTS	Community Led Total Sanitation
CRA	Community Risk Assessments
DMT	Dignified Mobile Toilet
DWAF (DWA)	Department of Water Affairs and Forestry (now Department of Water Affairs)
EcoSan	Ecological Sanitation
GJMC	Greater Johannesburg Metropolitan Council
HCES	Household Centred Environmental Sanitation
IDP	Integrated Development Planning
MCSF	Mobile Communal Sanitation Facilities
MDG	Millennium Development Goal
M&E	Monitoring and Evaluation
MPA	Methodology for Participatory Assessments
NGO	Non-governmental Organisation
NMT	Nepal Mobile Toilet
O&M	Operation and Maintenance
PHAST	Participatory Hygiene and Sanitation Transformation
PRA	Participatory Rural Appraisal
RBA	Rights Based Approaches
SFWS	Strategic Framework for Water Services
SusanA	Sustainable Sanitation Alliance
UDS	Urine Diversion System
UN	United Nations
UN-HABITAT	United Nations Human Settlements Programme
VIP	Ventilated Improved Pit
WSP	Water and Sanitation Programme

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1. Introduction

1.1 Background

South Africa, like other developing countries in the world, has one problem in common identified as a lack of basic sanitation for a majority of their populations. These countries are far from meeting the UN Millennium Development Goal (MDG) for sanitation, to halve by 2015 the proportion of people without sustainable access to basic sanitation (ADC, 2008) despite recent efforts made to provide adequate sanitation to all by the year 2015. Globally, there are about 2.6 billion people living without adequate sanitation, the vast majority in India, China and Africa. Progress in provision of sanitation services is struggling to keep up with population growth (ADC, 2008).

This issue is not just about protection of natural resources and prevention of illnesses caused by insufficient sanitary facilities, but also about human dignity and the right to use a toilet without any fear and disturbance. This challenge cannot only be met by providing infrastructure, but requires a thorough approach essential for evaluating sanitation facilities with regard to planning, implementation and operational requirements needed for the improvement of people's sanitary conditions. Therefore, the approach to implementation of new sanitation technologies and evaluating their performance should be designed following a sustainable strategy, from planning, implementation and operation and maintenance to care and support after the final phase of a project (Jon, 2008).

The term "sanitation" comprises all interventions which aim to protect and promote human health by providing a clean environment and breaking the cycle of disease transmission routes. It refers to the principles and practices relating to the collection, treatment, removal or disposal of human excreta, household wastewater and refuse as they impact upon people and the environment (ADC, 2008).

A variety of sanitation technologies have been developed, tested and implemented countrywide despite the common perception which believe that only waterborne sanitation is the ultimate and acceptable sanitation technology. Due to economic constraints, water scarcity and the target for the eradication of the sanitation backlog and inadequate provision of sanitation to growing communities, sanitation other than waterborne have received attention. However, it has been found that technical innovations often lack sustainability due to a lack of attention or provision of operational requirements as well as community involvement despite the existence of the general framework (DWAF, 2001 and 2003) for introducing sanitation technologies in informal settlements.

Technologies and planning can be considered appropriate for a given situation, if they correspond to demand, the socio-cultural needs, the users' ability to afford the continued operation, to the available organisational and technical capacities and if they allow flexible expansion and adaptation possibilities ("acceptable, affordable, manageable and adaptable") (ADC, 2008).

In order to be sustainable a sanitation system has to be not only economically viable, socially acceptable, and technically and institutionally appropriate, but it should also protect the environment and the natural resources (SusanA, 2008). Thus, sustainability in the sanitation sector

refers to five interrelated dimensions: Technical, Financial, Institutional, Social and Environmental (ADC, 2008; Mukherjee and Wijk, 2003). The Sustainable Sanitation Alliance (SuSanA) links these sustainability criteria to the following aspects (SusanA, 2008): health and hygiene, environment and natural resources, technology and operation, financial and economic issues, socio-cultural and institutional aspects.

The main challenge is that sanitation systems have to consider all these aspects in order to be absolutely sustainable. Nevertheless, the concept of sustainability will be seen more as a journey rather than a stage to reach (SusanA, 2008).

This general framework does not specify the types of sanitation that need to be provided in informal settlement context, thus opening doors for alternative technologies. However, the provision of these technologies is lacking a concise framework that can be used by the service provider to ensure adequate service delivery. The lack of an adequate framework for introducing, evaluating mobile communal sanitation facilities (MCSF) in informal settlements and assessing community perceptions and acceptance (before, during and after the provision of the service) is believed to be one of the causes of the challenges faced by municipalities in the provision of sustainable sanitation facilities.

1.2 Aims of the research

The purpose of this report is to investigate and develop a framework for evaluating the mobile communal sanitation facilities in the natural setting of informal settlements in order to assess the users' acceptance and functioning of the technology with regard to planning, implementation and post-implementation.

Additional aims are:

- To develop a framework for evaluating user acceptance and adequate functioning of mobile communal sanitation facilities in informal settlement context,
- To evaluate the implementation & functioning of MCSF,
- To evaluate the user perception & acceptance of MCSF,
- To consolidated findings in a final report and develop an easy to use evaluation tools that can serve municipal officials and decision-makers.

1.3 Methodology

To achieve the aim of this research, three case studies MCSF were selected to pilot the testing of the framework. Selected case studies were namely Kayamandi (Stellenbosch), Pooke se Bos (City of Cape Town) and Shembe (eThekweni) where three different mobile communal sanitation technologies namely Kayaloo, MobiSan and CAB (communal ablution block) are respectively being used.

The basis of informing the approaches used in the evaluation of user acceptance and functioning of MCSF in this research project revolved mainly around the application of the developed framework. Subsequently, detailed field research of each case study involved site visits during which interviews with users, community leaders and municipal officials were conducted.

Within the case study area served by each technology, users were randomly selected through transect walks taking into account gender, age and racial group (where applicable). Interviews with the aforementioned were informed by a structured questionnaire that was based on each of the evaluation framework covering the user acceptance and the functioning.

The reason for a structured interview is to allow for responses to be weighted and scored. This would enable one to quantify and ascertain the level of user acceptance and functioning. Questionnaire responses were captured in the questionnaire and coded, where it was processed using the statistical package for the social sciences (SPSS) version 19. Copious data was generated from SPSS. Since data capturing into SPSS is a laborious task, a software package, modelled on the experience and lessons learnt using SPSS, was developed. This software package (named Sanivey) enabled the generation of a “dashboard” which allows for a rapid overview of problem areas.

In addition to the survey, visual inspection was conducted in order to validate the responses obtained from users during the interviews. Collected data were compiled and collated for detailed analysis. Data required to respond to research questions were generated via interviews with users in each case of study sites.

1.3.1 Research activities

1.3.1.1 Site visits

The collection of data was done in sequence during site visits. The intention was to conduct interviews with relevant stakeholders and conduct visual assessments of the facilities at each selected case study. The first site visit (in Stellenbosch) was considered as a trial used to assess the feasibility/workability of the framework, outline gaps and refine where applicable. Other site visits were conducted after the refinement of the framework and related questionnaires.

a) Interviews with users

Interviews were selected as a best approach to collect data required for the purpose of this research. To achieve this, stakeholders were involved in the sanitation provision chain were selected. Users were the key respondents as they are using the facility on a daily basis. The interviews were conducted by identifying and selecting a random sample of users according to the size and dynamics of the settlements, number of facilities within the settlement and willingness of users to speak to researchers. Communities were approached and interviewed using a structured questionnaire. Refer to appendix E for details.

b) Interviews with officials

In addition to users, municipal officials (comprising caretaker and supervisor or superintendent) and manufacturers or design engineers were interviewed separately. The interview focused mainly on aspects related to the implementation process, design and selection of the technology; the implementation process and more importantly the post-implementation phase.

Where applicable, the design engineers were interviewed focusing mainly on the drivers for the development of the sanitation technology, the design approach, the selection of the technology and specific aspects of the design such as lifespan, operational requirements and anticipated O&M.

Information collected from the service provider and manufacturer/vendor groups was meant to validate results from users. Information was also meant to generate discussion regarding the users and service providers' views that was purposely used to understand issues emerging from the provision of MCSF in IS.

1.3.1.2 Visual inspection

Facilities at the case study sites were visually inspected, looking at their condition (focusing on cleanness, visual signs such as smell, leaks, blockages and other functioning parameters) and community behaviour (in terms of use of the facility). This inspection was done to validate users' interview responses. Information from physical inspection was used to confirm whether the MCSF were functional as may be stated by user or manufacturer/vendor.

1.4 Research framework

Table 1.1: Research framework

Key elements	Themes	Pointers from the literature review
Prevalence of mobile communal sanitation facilities: - Mobile communal sanitation technologies at global and local levels - Operational requirements - Implementation challenges - Sustainability concerns - Users' acceptance in context	Prevalence of mobile communal sanitation facilities - Types of MCSF - Use of MCSF in context - Operational requirements - Implementation challenges - Sustainability concerns - Users' acceptance in context	- Types and use of MCSF - Operational requirements - Implementation challenges - Sustainability concerns - Users perceptions
Guidelines for implementation of sanitation technologies in IS: initiation, planning, policy and implementation considerations - Outline existing guidelines: planning, implementation and operational considerations - Stages of the guidelines - Relevance of the guidelines to the MCSF	Overview of the framework with regard to users' acceptance and functioning of MCSF - Focus of the framework - Key elements of the guidelines or frameworks - Relevance of the guidelines/framework to the MCSF	- List of existing framework and their outlines with regard to users acceptance and functioning of the mobile communal sanitation facilities - Relevance of the framework to the MCSF with regard to planning, implementation and operational considerations
Approaches to the implementation of new sanitation technologies in IS: challenges and sustainability concerns. - Approaches to introducing sanitation technologies in IS	- Overview of sanitation delivery approaches - Key elements of the sanitation delivery/implementation approaches and process	Approaches used to introduce new sanitation technologies in IS context with regard to planning and initiation, implementation and operational requirements
Evaluation framework - Evaluation criteria	- Approaches to the evaluation process - Evaluation criteria - Key performance indicators	Evaluation criteria to assess a) users' acceptance and b) functioning with regard to planning, implementation and post of MCSF

2. The Mobile Sanitation Concept

Developing countries are facing challenges for the provision of sanitation services. These challenges are mainly due to the high expectations coupled with limited resources and lack of knowledge about acceptable alternative technologies. The provision of sanitation facilities are and remain a challenge that needs to be addressed as cities are overpopulated. A major effort is needed to identify and develop alternative sanitation technologies appropriate to local conditions.

Mobile sanitation arises out of the need to address the challenges of a huge influx of people, the existence of a few public toilets and for servicing temporary needs (Dagerskog, 2010; Grootboom, 2010). There are several mobile communal sanitation facilities in use at global and local levels. These technologies are variable according to a number of factors such as availability of sewer line and water, topography of the area, land availability, etc. The option of choice may depend on the specific conditions of the respective locations and other social or cultural concerns.

From the reviewed literature the MCSF has been used for events, gatherings or as emergency or temporary sanitation solution in various parts of the world (Dagerskog, 2010). From this perspective, for this study Mobile Sanitation refers to a sanitation system that can be displaced from one emplacement to another. The mobility can facilitate the fast and easy insertion, transfer or replacement in case of an emergency situation, a settlement's relocation or failure of the system.

Communal sanitation refers to a sanitation system provided for a community or users' situated within acceptable distance to the facility. It is different from the shared sanitation facility which is used by a pre-determined group of people.

The occurrence of MCSF has been documented in order to understand the extent it has been used, indicate where it is being used and outline their operational requirements that may assist in improved the understanding of the technology. Further the implementation challenges and users' acceptance were outlined in order to inform potential problems that may occur while operating the facility and indicate how users' react towards the implementation and functioning of the facility.

This chapter outlines the literature review pertaining to the occurrence of mobile communal sanitation facilities at global and local levels discussing the types of MCSF, operational requirements, users acceptance and implementation challenges.

2.1 Occurrence of MCSF

There are several types of mobile communal sanitation facilities around the world varying in design and uses. The most common systems are namely wet (requiring water) and dry system (not requiring water). The intended use of each type of technology may depend on the local situation and other factors such as topography, availability of water, disposal infrastructure, cultural beliefs and customs (WSP, 2009).

2.1.1. MCSF at international level

The MCSF has been widely used in several countries for decades. The design and operational considerations may vary from one country to another but the common factor remains the ability of displacing the sanitation facility from one place to another. Depending on the situation and needs, the MCSF are installed in areas lacking adequate sanitation, where there is absence of sanitation facilities or during gatherings and events.

In some countries, MCSF are used only during events while in others it may be used as emergency or temporary sanitation. In Nepal for example the mobile sanitation system is used as emergency sanitation in areas where formal sanitation is not available. In Nigeria, the DMT (Dignified Mobile Toilet) is used in public places (such as markets) as temporary formal sanitation to compensate for the lack of public facilities. In Burkina Faso, the mobile communal sanitation (wheel driven toilet) is used during public gatherings, at public places such as markets and by groups of people in certain suburbs where access to sanitation is not existent (Dagerskog, 2010). In European countries, mobile communal sanitation systems are used for event only. In India, the mobile communal toilet Ecolooov and the tricycle are used especially in public places and dense settlements where difficulties to access the sanitation is acute.

Other existing technologies are namely Solar Powered Portable Public Toilets, Sewer Connect Mobile Toilet and Mobile Pit Toilet that are used in various parts of the world. The context of their use may vary according to the local situation.

2.1.2 MCSF in South Africa

A recent inventory of the actual state of services delivery in South Africa indicates that most of the informal settlements are severely lagging behind in sanitation coverage. The current approach of the Government aims to supply toilets in the informal settlements to be shared within five households. These toilets are in most cases locked and their maintenance relies on its users (Lagardien et al., 2009).

The types of toilet that are mostly used are container, chemical and bucket as shared facilities while VIP and UDS are considered as individual facilities. However, these options are not suitable or always available for all informal settlements. Because of the informal nature of the settlements these services are considered as emergency services that however tend to remain in those categories for a long period of time (Mels et al., 2009).

This approach reaches a better performance in small communities in peri-urban areas than in high dense settlements where the cohesion of its dwellers is much lower. Shared toilets do not consider the consistency between neighbours and do not take into account the population growth and the consequent increasing rate of households per toilet. As such newcomers are excluded from any sanitation facility. In several cases conflicts among sharing households because of, for example, unequal maintenance care have led to destruction of the sanitation facility or either change of the lock for its private use thus excluding the rest of the households. Reduced social acceptability as well as political bias and complains about the poor quality of sanitation facilities results in some

cases with the damage, vandalism and destruction of the systems (Mels, et al., 2008; Still et al., 2010).

In the City of Cape Town for example most of the settlements (75%) are located on land that is owned by the municipality and a large share (22%) is located on private lands. For private lands the Water Services Department needs to obtain the consent of the owner in order to deliver services on-site. Many land owners do not give that permission because they are afraid of making the settlement on their land even more permanent.

The density of the settlements is generally high and this is a major constraint for sanitation services provision. Around 42% of the sites have densities between 150 and 300 households per hectare while more than 10% even rise above 300 households/ha. Servicing high-density informal areas is difficult because of limited space, the unplanned layout and limited accessibility. Providing waterborne or equivalent sanitation services such as water flush systems are often not possible under these conditions.

In order to meet the sanitation demand and respond to the community's needs, alternative technologies are made available for choice. The MCSF has been introduced recently and are mainly used as temporary sanitation facilities in areas where sanitation upgrading is to take place (Gounden, 2010). The available mobile communal sanitation facility options currently in use are namely Kayaloo (in Stellenbosch) and recently the ablution block (AB) container (in eThekweni). Mobisan in Cape Town is a recent development.

2.1.3 Occurrence of MCSF in informal settlements

Despite increasing levels of unemployment and contracting economies, cities and towns continue to grow as people from the country side flock to cities in the hope of finding better life (Lagardien et al., 2010). Without shelters and living subsistence, migrants occupy lands by building shelters in an uncoordinated and unplanned manner. These spontaneous settlements are characterised by a lack of land tenure, planning and basic water and sanitation infrastructure. Local authorities are by law obliged to provide basic services to sustain lives of those living in such settlements.

Internationally, providing adequate services to informal settlements is largely dependent on the general attitude of governments towards these areas and their occupants. Depending on the context, sanitation technologies provided to informal settlements may vary according to a number of factors such as density of the settlement, status of the land or the community and authorities' perceptions of risks (Still et al., 2009; Parkinson et al., 2008).

The MCSF is a sanitation option that is currently used in various contexts as indicated previously. In informal settlements context, the review shows that in the past years this technology is used in a number of countries especially in dense settlements lacking basic sanitation infrastructure. In South Africa, MCSF has been introduced recently in eThekweni (2009) and Stellenbosch (2007) as temporary sanitation services intended for communities waiting to be served with a full level of service. The Mobisan (2009) in Cape Town's Pooke se Bos settlement is a recent development of the MCSF that was designed by a Dutch consortium and currently being piloted is a pilot project.

MCSF is still being tested in many parts of the world and results are so far encouraging showing that the technology is holding promises mainly due to the design flexibility, ease of construction and mobility. The types, uses and operational considerations may differ according to factors discussed in this report.

2.1.4 Types of MCSF

Technologies are the “physical infrastructure” that provides the means of access to water supply and sanitation services, their maintenance and the possibility to practice good hygiene (Lagardien et al., 2009). Technologies are described in specific functional terms, such as water lifting, water treatment, excreta disposal; or in terms of artifacts’ such as pumps, pipes, latrines, hand-washing water dispensers (Teun-Jan & Wells, 2007).

Table 2.1: Overview of MCSF

	Type of MCSF		
	Dry	Wet	Combined
Technology	Wheel toilet & Tricycle toilet (1) Mobile Pit toilet (2)	DMT (1) Solar Powered toilet (2) Sewer connected toilet (3) AB container (4) Kayaloo (5)	NMT (1) Ecoolov (2)
Occurrence	Used in public places Used at schools, hospitals, public services, etc.	Different design available; used as emergency or temporary solution or event sanitation facilities	Used in temporary settlements and events or gatherings
Operational requirements	Location Require a faeces container Disposal of excreta Cleaning	Require existing sewer or septic tank Require water main Require water to be available (tap or container mounted)	Existing of water and sewer Collection container Disposal Cleaning/replacement of container
Implementation challenges	Location and re- location Discharge of excreta Cleaning mechanism	Location Water availability Ownership	Threat to destroy if failing to meet need Location site problematic High cost locomotion
Users’ acceptance	(1) users dignity & privacy (2) well accepted in rural & peri-urban area	Depending on the type of technology and its location; level of O&M and cleanness of the facility	Suitable for temporary settlements Not suitable for elderly person and kids Low acceptance due to design and uses

As indicated earlier, the MCSF are varying in terms of their design, use and operational requirements. It can be classified according to their operational requirements. The common types found in practice are dry (not requiring water) and wet (requiring water). A combined system (that can be used in both scenarios) was identified as an improved solution dealing with various situations.

a) Dry system

The MCSF dry system consists of sanitation technologies that do not require water for its operation. It regroups several sanitation technologies including the wheel toilet (Burkina Faso), composting mobile toilet (France), tricycle toilet (India and Sri Lanka) and Mobile Pit Toilet (in Eastern Africa) amongst many other.

b) Wet system

The wet system is a group of MCSF that requires water for its operation. Several technologies such as DMT (dignified mobile toilet in Nigeria), solar powered toilet, and sewer connected mobile toilet, ablution block container, Kayaloo and Mobisan (in South Africa) are used in several parts of the world.

c) Combined system

This type of MCSF is a dual system that can be used as dry or wet sanitation; its use does not depend only on the availability of water or sewer. The NMT (Nepal Mobile Toilet in Nepal) and the Ecolooov (in Europe) are the commonly known and used system falling under this category.

2.1.5 Operational requirements

2.1.5.1 Dry system

The dry sanitation system is defined as a sanitation system that does not require water for its operation. Depending on the type of dry mobile sanitation, to be operational the dry mobile sanitation system requires a location where the facility needs to be installed, a container or faeces box (mixed or separated from the urine box) for the containment of human excreta, the disposal point (for discharging the excreta when the box is full) and the cleaning mechanisms.

The wheel and tricycle toilets require a location, a replaceable faeces container (covered by a superstructure), and outlet for discharge and cleaning of the box. The mobile pit toilet needs only a location, a pit, and superstructure, toilet bowl. Faeces and urine may be separated depending on the design. The pit may be emptied and reused or the superstructure can be displaced when necessary (Dagerskog, 2010).

2.1.5.2 Wet system

This type of mobile sanitation system requires a reliable water supply and a conveyance system (such as a sewer) in order to make it operational. All sanitation systems under this category are equipped with a toilet bowl connected to a conveying pipe linking to the sewer, septic tank or container. The system is water dependent and in situations where water is not available, the provision should be made for water to be available at the facility. Wastewater generated from these types of sanitation is collected into a sewer or septic tank. In situations where the sewer and septic tanks are not available, wastewater is pumped out, or the container removed and taken to a disposal site.

2.1.5.3 Combined system

The unavailability of water and sewer may affect the operation of certain type of sanitation systems. The combined system was designed to overcome the problem by being used in environments where water or sewer might not be available. This system can operate a dry system (using the same principle as described in section 2.1.4.1) or wet system (as described in section 2.1.4.2).

2.1.6 Users' perceptions

The service provision to the poor requires technologies that rely only on small subsidies or levels of support, or delivery will be self-defeating. The limited buying power of end-users has a direct influence on technology choice, which will also impact on financial efficiency for entirely external agents of change (Teun-Jan & Wells, 2007).

The users' perceptions and acceptance are key factors to the success of any sanitation technologies. It mainly rely on (but not limited to) cultural beliefs, types of MCSF, level of awareness, relation between users and service provider, type of technology and process used to provide the service. The user perceptions may vary from one region to another depending on the local contexts.

2.1.6.1 International level

The use of MCSF is perceived differently from one country to another. Given the wide range of technologies in place, the level of perception may be assessed taking into the context in which the sanitation system was brought to the community.

a) Dry system

Cultural beliefs are the main concern when providing a dry sanitation system. In Africa human excreta is considered as waste which should be forgotten after being generated. Due to the sanitation crisis particularly in developing countries, dry sanitation system was found to be of relevance given the unavailability of water and other infrastructure.

The use of MCSF such as the wheel toilet, tricycle toilet or mobile pit toilet has been differently perceived. The wheel and tricycle toilets are considered not suitable for disable persons and females. It is believed to not providing sufficient dignity and privacy for users due to the sanitation system being located at any place where people are in need.

In contrast, the mobile pit toilet is widely implemented in Eastern Africa where it is used at school, hospital, public administration. etc. Users (especially in rural and peri-urban areas) believe that this type of sanitation provides dignity and privacy for female and disabled persons.

b) Wet system

The wet sanitation system is the most preferred due to its close level to the full waterborne sanitation system. With this sanitation system, users are comfortable and dignified especially in areas not adequately covered with sanitation. The introduction of the DMT (in Nigeria) was applauded and acknowledged by all as the lack of public toilets in most of public places and the improper disposal of human waste into waterways was a major concern (Ashoka, 2007). However,

the pay-to-use price applied was not affordable to all communities given the poor economic situation of the country.

The solar powered panel was not successfully accepted despite being a green technology. The location of the facility was subject to several complaints with regard to the lack of dignity and privacy. The sewer connected was perceived as a standard level of sanitation. However, users believe that the communal status of the sanitation system is problematic in terms of operation and maintenance. Communities preferred using a bucket instead of the sewer connected for hygienic reasons as the number of users was growing uncontrolled.

c) Combined sanitation system

In Nepal for example, despite not having adequate sanitation in place, communities perceived the NMT to be an unacceptable sanitation system. They protested and threatened to burn it if installed in their area, hence forcing officials to relocate. Following the awareness campaign, officials managed to convince communities regarding the benefit of using such sanitation. Currently, this technology is perceived as the most adequate and sustainable for areas where sanitation is lacking.

2.1.6.2 South African level

The perceptions of users of mobile sanitation facilities are context based. In South Africa, the most preferred type of sanitation is the individual full waterborne flush toilet. Communities in informal settlements believe that this type of sanitation should be provided to them by any cost regardless of the type of shelters, topography of the area or the status of the land occupied (Grootboom, 2010).

Recent surveys (Taing, 2009) at Kayaloo (Kayamandi) show that a number of users believe that the levels of service is closer to the full flush toilet despite the communal status of the facility and are comfortable when using it. This sanitation is believed to provide dignity and privacy compared to other types of sanitation in the areas. However, the long waiting for the provision of individual sanitation has changed communities' perceptions recently. The majority believe that the type of technology which was brought as a temporary solution to the problem is in fact the level of service they will use permanently.

In eThekweni for instance, the ablution block container was brought in as an interim solution before upgrading of the existing sanitation system to a full waterborne. Communities in the first instance perceived it as a way of delaying the delivery of full waterborne sanitation (Gounden, 2010). Following the awareness and explanation campaigns undertaken by both councillors and municipal officials, communities accepted the interim sanitation on condition that the full level of service will be provided within an acceptable timeframe.

2.1.7 Implementation challenges

The implementation of sanitation technology is intended to provide needy communities with dignified sanitation. The process used for the implementation should be designed taking into account a number of parameters without which the success of the technology may be compromised.

While in the past attention in sanitation facility programs was going mainly to technology, in recent times there is much more attention for the implementation methods of sanitation technologies. Implementation means the process of introduction of sanitation in communities, not the specific design, but the development process of sanitation, strategy of introduction and approach towards the community.

This implementation method consists of multiple factors. Jones & Silva (2009) argue that any implementation method should have environment as first priority, then the technical requirements to meet human societal needs, and finally the economic requirements within those societies. As becomes clear from this, human societal needs are important and technology must help to achieve this.

2.1.7.1 Implementation challenges at international level

Despite growing awareness of the importance of sanitation and progress in providing sanitation facilities in urban areas, urban settlements present a unique challenge to the process of improving sanitation. The main reason for this is that the majority of such settlements are built on public land – land owned by a branch or department of national, regional or local government. As a result, almost none of the residents of poor urban settlements own the land on which they live (Kalbermaten et al., 1982).

This lack of land tenure is a major disincentive to both private and public investments in infrastructure such as sanitation facilities. Individuals and families who feel under threat of eviction are unwilling to make investments in infrastructure or facilities that they could be forced to leave behind at any moment, as are governments agencies who are reluctant to contribute to the permanency of such settlements (Still et al., 2009).

Besides public land, many informal settlements (in Cape Town for example) are located on private land and this limits the type of infrastructure and services to be provided to communities. Recent community risk assessments (CRA) have found this to be a major barrier to service delivery (Cousins and Benjamin, 2010).

Moreover, poor urban settlements are usually crowded and land for latrines or other kinds of sanitation infrastructure is scarce. This forces sanitation facilities to be shared among many families or designed as 'community toilets', both of which are highly undesirable arrangements for most residents. Community or shared toilets tend to be poorly maintained and underutilized as a result (GTZ, 2009).

The implementation of sanitation technologies may be subject to many challenges as result of the level of service provided and response to the community needs. These challenges may be classified according to the level where it occurs. According to WSP (2009) the main challenges of peri-urban sanitation are situated at four decision making levels.

a) At the national level

Challenges to implementation of sanitation faced by communities are a result of low political priorities, due to prevalent views on responsibility for sanitation at all levels of government. Sanitation needs to be higher on the political agenda if it is to get the attention it deserves, and can no longer be regarded as purely a private matter in urban areas.

The urgent need for a national urban sanitation policy that sets priorities, defines institutional and community roles and responsibilities, establishes a legal and regulatory framework, and facilitates the adoption of comprehensive city-wide sanitation strategies. Due to the lack of such policies, the implementation of the sanitation services will remain hypothetical thus delaying the service provision.

The need for an investment framework and financing strategy, both to increase the total funding available in the sector and to enable those funds to be deployed effectively. Besides this, the need for advocacy to make the sanitation crisis an issue of national concern is to be in place in order to make officials aware.

b) At the provincial level

The need to clarify the role of the provincial government in the funding of urban infrastructure investments and the planning and delivery of sanitation services is of utmost importance. Evasion of funds allocated to sanitation is affecting the service provision. A lack of capacity for sanitation promotion and progress monitoring is a major challenge.

c) At the city level

Key implementation challenges at the city or municipal levels are related to the following issues:

- A lack of mechanisms for inter-agency collaboration on planning and service delivery, bearing in mind the range of organizations that have a stake in sanitation.
- A lack of incentives and accountability for the achievement of national sanitation goals. At present, not all municipalities would accept that there is a big problem with excreta disposal.
- Limited municipal capacity for planning, infrastructure development, service delivery and sanitation promotion.
- Complicated and poorly understood mechanisms for accessing and allocating capital funds.
- An under-developed (and unregulated) role for the private sector in service delivery and maintenance (for example in the safe removal, treatment and disposal of septic tank sludge).
- Poor operation and maintenance of existing infrastructure.

d) At the community and household level

The role of the community as intended user in the implementation of sanitation facility is vital. Challenges occur at this level when limited appreciation of the need for safe disposal of wastewater, though toilet use is widely practiced. Part of this issue include that those occupying

land illegally are excluded from municipal projects and planning processes thus posing threats to the provision or implementation of sanitation services.

2.1.7.2 Implementation challenges in South Africa

The implementation of sanitation technologies (in South Africa) is guided by general principles covered by the policy framework for Government-wide monitoring and evaluation. The document outlines the 8 implementation principles amongst which the role and responsibilities of each stakeholder need to be clearly defined and related to their mandate (DWAF, 2004).

Challenges faced by municipalities for the implementation of sanitation facilities in informal settlements are variable depending on local factors. The temporary status of informal settlements is the main challenge that leads to the design of flexible sanitation system. Mobile sanitation is suitable for informal settlements due to its flexible nature. However, vandalism, misuse due to lack of responsibility and lack of understanding of the operational requirements of the technology remain the main implementation challenges (Grootboom, 2010).

The constraints faced by municipalities for the implementation of sanitation facilities are mainly due to the bureaucracy, lack of available fund and post implementation strategies. Municipalities tend to neglect sanitation facilities after implementation due to the lack of fund for O&M, users commitment and lack of ownership (ibid).

2.1.8 Conclusion

Looking at the current sanitation backlog at global and local levels, there is a need for speeding up the sanitation services in developing countries. The only means of covering the sanitation demand and meet the MDG goals is to look at alternative sanitation technologies that take into account technical, economical, social and environmental factors.

Having reviewed the occurrence of MCSF at both global and local levels, this type of sanitation technology is mostly used in areas where there is acute lack of sanitation. It is often used as emergency sanitation that can be used during events, gatherings, in public places, villages and in dense settlements. The types of MCSF varies according to the type of settlements, beliefs and culture of the communities, income level and local sanitation policy (that defines the level of service) if available. The typical MCSF for informal settlements are the ablution block container, the Kayaloo, The Nepal mobile sanitation and the DMT.

The mobile pit toilet may be used in low dense settlements where land space is available, but this option is suitable for rural settlements. Other options such as tricycle, wheel toilet, composting mobile toilet may be used in informal settlement context if provision for sufficient capacity of the excreta container is made.

In general, MCSF are classified into two broad categories namely dry and wet sanitation. The third alternative is a polyvalent option that combines the first two options and used in a scenario where the availability of water and sewer might not be a problem. The operational considerations of the

MCSF are similar to those of any typical sanitation facility. It involves knowledge of design features, use of the facility and O&M and specific requirements such as water and sewer availability. Depending on the type of MCSF, these operational requirements may slightly differ from one type to another.

The users' acceptance of a sanitation technology is important in terms of keeping the facility in workable conditions. However, it may depend on several factors ranging from the way the sanitation project was planned and implemented. Besides the users' acceptance, there are several challenges that impact on the implementation of sanitation facilities in informal settlements or peri-urban context. These challenges may be at local level where communities have preference or at provider's level where the lack of fund, lack of attention or service provision mechanisms are in place.

Having reviewed the MCSF in this context, the applicability of MCSF in informal settlements context should take into account operational requirements, implementation strategies and challenges and users' acceptance of the sanitation technology provided. These elements may affect the functioning of the facility alongside users' acceptance.

2.2 Review of sanitation frameworks and guidelines

The international and national literature reviewed all had a different focus and coverage. Some of these are discussed in this section of the report.

2.2.1 International Literature

The majority of the international literature reviewed presented guidelines and frameworks for appropriate sanitation options to achieve sustainable sanitation systems. Most of these were generic, but some were also country specific. These guidelines and frameworks included the aspects which should be considered when planning a sanitation coverage project or programme. Those that were country specific went further to present cases of success and failure.

A brochure by the Austrian Development Cooperation (ADC, 2008) for example served the purpose of presenting their approaches, strategies, priorities and direction in the area of sustainable sanitation across Africa, Asia, Latin America and Eastern Europe. It therefore addresses policy makers, programmers and implementers.

The operational guidelines for implementing rights based approaches to water and sanitation programming (COHRE, 2008) addresses ways to promote human rights based approaches (RBA) in water and sanitation programming through means other than legal and policy reform. Although designed primarily for UN-HABITAT it is also useful for water and sanitation providers, other UN agencies and NGOs implementing water and sanitation programmes. They focus on the developing country context.

A planning and design manual for appropriate sanitation alternatives (Kalbermarthen et al., 1982) considers different levels of community participation in the sanitation planning phase. It further presents how to undertake an economic analysis of sanitation technologies and how to select sanitation technology options.

The purpose of a desk study (Kvarnström and Petersen, 2004) for a capacity building project was to produce a tentative manual for the planning and implementation of sanitation projects based on sanitation system function requirements rather than sanitation technologies to achieve sustainable sanitation systems. This manual creates and supports an open and democratic sanitation planning process and is aimed at planners and implementers at project level.

Mjoli (2010) conducted a review of sanitation policy and practice in South Africa, but also included international experiences of sanitation delivery from Asia and Africa. In these case studies successes and failures of the different sanitation approaches are highlighted.

At a country-specific level, Parkinson et al., (2008) presents a guide to decision-making for technology options in Urban India. It is intended to aid decision-makers and practitioners to fully understand the roles of each stakeholder to ensure a pragmatic and holistic sanitation plan which will focus on achieving sustainable outcomes. The document is designed to provide state governments and urban local bodies with additional information on the available technologies on sanitation and to aid them with how best and when to install them.

In terms of international examples of policies around sanitation, the SACOSAN (2005) Bangladesh country paper highlights how four key policies govern sanitation in Bangladesh. These include the national policy for safe water supply and sanitation, the poverty reduction strategy, the national water management plan and the sector development framework. This example clearly illustrates that sanitation supply should consider a holistic policy environment which includes a sector specific focus (i.e. water and sanitation policy), but that also includes a developmental focus (i.e. poverty reduction strategies and integrated development planning).

The majority of the reviewed international literature was focused on sanitation technologies in general, but not specific to mobile sanitation, and especially communal facilities (i.e. MCSF). The exception here include SACOSAN (2005) highlighting an emphasis by the Bangladeshi national policy for safe water supply and sanitation on the installation of community latrines in densely populated poor communities without sufficient space for individual household latrines. This does not however specifically refer to mobile sanitation.

Bangladesh's National Sanitation Strategy (People's Republic of Bangladesh, 2005) does however recommend mobile sanitation as one option to be used during emergencies. Another exception include Dagerskog (2009) and an interview with the author (Dagerskog, 2010) on the mobile EcoSan toilets and urinals in Burkina Faso. However, this case study was focused on mobile sanitation facilities for public events and not so much for residential use (in for example informal settlements). Mobile sanitation facilities are quite widely used for public events in Europe

(Dagerskog, 2010). However, besides the examples presented in chapter 2, there are not many other examples of mobile communal sanitation facilities (ibid).

2.2.2 National Literature

In the South African context the literature review uncovered a number of papers discussing the sanitation policy and strategy environment in the country (e.g. DWAF, 2001; 2003; undated; Lagardien and Cousins, 2005; Lagardien et al., 2007; Lagardien et al., 2009; MDC, 2004; Mjoli, 2010; Ryneveld, 2003; and Still et al., 2009, etc.). These provide a useful guide to what should be considered when planning and initiating a sanitation programme, what should be considered in the implementation of the programme as well as discussing operation and maintenance issues. These however are not specific to MCSF.

Some of the above mentioned publications (e.g. Mjoli, 2010; Ryneveld, 2003 and Still et al., 2009) also present some local case studies. However, it is only Still et al. (2009) that presents a case study of mobile sanitation. Yet this is limited to shared facilities and not communal facilities. Further, the case study was not detailed enough to elicit significant information. The only local case study that focused on MCSF is an unpublished student project on the MobiSan facility in Cape Town (de Boer, 2010). This study attempted to evaluate the community perception and acceptance of the MCSF. It was however focused on how the level of community participation in the implementation process influenced the users' perception and acceptance of the facility.

It should be reemphasized that the focus from the literature is on sanitation facilities in general and not specific to MCSF. A summary of appendix 2 is presented as key points in table 3.2. These key points are discussed separately for ensuring user acceptance and functioning of sanitation facilities. To this end, an attempt was made to summarise key points emerging from the review of various guidelines and framework used to deal with the user acceptance and functioning of the sanitation facilities with regard to the planning, implementation and operational considerations.

2.2.3 Key points emerging from the review of existing frameworks and guidelines

The literature review provided an understanding of key points outlined in each of the reviewed framework and guideline. In this report, these key points are grouped into user acceptance and functioning categories respectively.

a) User acceptance

The key points are considered with regards to planning and initiation, implementation and operational requirements. These are discussed below.

➤ Planning and Initiation

An important point of note is that policy is necessary to set out how sanitation will and will not be provided as well as what will and will not be done (Ryneveld, 2003). Similarly, strategy is necessary to ground policy in priorities and timeframes (ibid). Policy refers to a general principle that is not easily departed from and therefore stable and not easily subject to change (ibid). South Africa has a strong and impressive sanitation policy environment (Mjoli, 2010; Ryneveld, 2003; Still et al., 2009). Strategy is set within the framework of the policy and refers to a plan of action that requires a

choice of timing, location, method and resources – i.e. ‘what, when, where, how and with what resources’ – and may be revised more regularly (Ryneveld, 2003).

A sound national policy and strategy environment should then facilitate the next important point, that appropriate, ecological and sustainable sanitation technologies should be selected (ADC, 2008; SusanA, 2008). For a sanitation technology to be appropriate, several other important points arise. First, it must be demand driven and should focus on people (ADC, 2008; DWAF, 2001; undated). The *White Paper on Basic Household Sanitation* (DWAF, 2001) for example places emphasis on this. Contrary to this national policy, the initial sanitation policy for Johannesburg (GJMC, 2000) is criticized for not having adequately elicited an expression of demand from the community, and did not establish a strong framework through which demand might be expressed (Ryneveld, 2003). Second, it must consider the socio-cultural-religious needs and human rights of the population (ADC, 2008; Avvanavar and Mani, 2008; COHRE, 2008; DWAF, 2001; Murphy et al., 2009; Pegram et al., 2000; Ryneveld, 2003; Still et al., 2009).

Third, it needs to be affordable for the user in order to maintain continued operation of the technology and it should be clearly indicated if the user would bear any additional water costs (ADC, 2008; COHRE, 2008; Mara et al., 2007; MDC, 2004). Fourth, it should be institutionally appropriate, where it is managed at the lowest appropriate level and it should be adaptable (ADC, 2008; Mara et al., 2007) to changing needs and circumstances.

In terms of the technology being ecological, here environmental aspects should be considered (Mara et al., 2007; Ryneveld, 2003) where the human waste does not negatively impact on the surrounding environment (soil, water and vegetation – i.e. ecosystem). Sustainable technologies refer to all of the above discussed under appropriate and ecological technologies. For Mara et al. (2007) there are four fundamental principles of sustainable sanitation that include improved human health, affordability especially to the poor, environmental sustainability and institutional appropriateness. Holistically, sustainability in the sanitation sector refers to five interrelated components that include technical, financial, institutional, social and environmental aspects (ADC, 2008; Mukherjee and Wijk, 2003).

The planning model that is used is an important factor that will determine whether appropriate and sustainable sanitation technologies are achieved. An integrated planning model is the ideal (DWAF, 2001; WSP, 2007), that takes place within the Integrated Development Planning (IDP) processes (DWAF, 2001; Lagardien and Cousins, 2004). The IDP process will demonstrate the sustainability and acceptability of the various sanitation options (ibid). Such a planning model should have a shift from top-down to bottom-up approaches (i.e. demand driven) and should be entirely people-centred, best achieved through a collective action model (Tilley, 2008).

A collective action model is inherently participatory and emancipatory where the communities themselves determine their needs and priorities and therefore shape the intervention and outsiders merely work with these suggestions (Scott and Schmitt-Boshnick, 1996; Tilley, 2008). This results in empowerment as well as ownership and therefore responsibility for the technology. It is widely recognised that participation of the recipient community is key in the planning and initiation phase

(ADC, 2008; COHRE, 2008; DWAF, 2001; Kalbermarthen et al., 1982; Lagardien and Cousins, 2005; Lagardien et al., 2009; MDC, 2004; Mjoli, 2010; SACOSAN, 2005; Tilley, 2008; WSP, 2007).

There are a number of participatory planning models that exist such as Participatory Hygiene and Sanitation Transformation (PHAST), Sanitation 21, Open Planning of Sanitation Systems, Household Centred Environmental Sanitation (HCES), Community Led Total Sanitation (CLTS), Participatory Rural Appraisal (PRA), Methodology for Participatory Assessments (MPA) (ADC, 2008) and now increasingly also Community Risk Assessments (CRA) (see Cousins and Benjamin, 2010). Mjoli (2010) for example observes that the success of the CLTS approach in South Asia demonstrated that poor people were able to solve their sanitation problems without government subsidies provided they were supported to take collective actions and had access to microfinance for funding the construction of the toilets.

A participatory model should involve the participation of women and the most vulnerable sectors of the population (COHRE, 2008; SACOSAN, 2005). All stakeholders should also be involved in the planning and initiation process where decision-making is transparent (ADC, 2008; COHRE, 2008). Local capacity should also be considered and utilised (COHRE, 2008; de Boer, 2010; Lagardien et al., 2009; WSP, 2007). It should be cautioned that participatory tools should not be too complicated, time consuming and too general (Kvarnström and Petersen, 2004).

It is claimed that participation will lead to behavioural change (SACOSAN, 2005). This was the intention with the 3-pile activity for example in Cousins and Benjamin (2010) to ensure that residents also reflect on their behavioural practices as the cause for sanitation infrastructure failure. However de Boer (2010) claims that participation is not necessary to achieve high community acceptance. He notes that other elements (regulation, support and implementation) in the community participation framework are very important to the community (even if these don't result in actual community participation –due to a lack of willingness to participate).

Ryneveld (2003) suggests that a framework through which demand can be expressed should include regulation, support and implementation. He continues that such a framework clarifies roles and responsibilities, clarifies the rules under which a community can get sanitation, clarifies the decisions that the community must make, and steers the community towards a contract between water service provider and community.

Finally, problem identification is an important component of successful project planning. If the problem and its causes are not identified, it is most probable that the project will fail down the line (Kvarnström and Petersens, 2004). This should involve a participatory approach.

➤ *Implementation*

Many of the points mentioned under planning and initiation above are also applicable to the implementation stage. Where policy and strategy is important for planning and initiation, detailed procedure is necessary for implementation (Ryneveld, 2003). Detailed procedure is set within the framework of both policy and strategy and refers to the detailed steps and techniques for implementation, which may be even more flexible than either policy or strategy. It is necessary to

establish a methodology for the provision of sanitation to low-income settlements, and to support and equip personnel responsible for provision of sanitation to low-income settlements (ibid). However, it is unclear “to what extent these procedures should have to be systemised – and converted into a formal handbook ...” (ibid: 4).

The recurring points as in section 2.2.1 above include:

- Sanitation should be demand driven
- Socio-cultural needs and human rights should be considered
- User affordability
- Stakeholder participation
- Regulation, support and implementation within the community participation framework should be considered
- Local capacity for construction should be used. An indigenous model for construction is therefore useful (WSP, 2007).
- Institutional appropriateness – managed at the lowest possible level. Added to this is that there should be an institution – community linkage (Kalbermarten et al., 1982).

Additional key points regarding implementation include that, a focus only on infrastructure is not adequate. Examples from urban India indicate that efforts where investments were heavily focused on sanitation infrastructure failed to deliver a safe sanitary environment because they lacked the comprehensiveness to address the full dimension of the sanitation challenges in the country (Parkinson et al., 2008). They particularly failed in terms of targeting the sanitation needs of all sections of urban society, to ensure usage of the facilities (ibid).

It is also important to include health and hygiene training during the implementation phase so as to ensure improved health and hygiene practice (DWAF, undated; Still et al., 2009). A question that arises is, what happens in the case where a local authority has provided such training to a community, but over time many new comers arrive into the settlement (as is the case in many informal settlements). Here it is necessary to train trainers in the community who should be responsible for constantly creating awareness in their community. However, anecdotal evidence indicates that often trained trainers from the community become ineffective without institutional support or some form of incentive (monetary or political).

Lagardien et al. (2007) note the following reasons why services tend to fail:

- Inadequate community involvement in implementation
- Low user acceptance and satisfaction
- Inappropriate use and hygiene practices
- Low priority
- Poor technical capacity to implement
- Lack of distinction between responsibilities of household, community and municipality
- Ineffective planning, monitoring, evaluation and interventions.

Finally, it is important not to move too fast from a pilot to a full-scale programme. Based on an example of a sanitation project from Johannesburg, Ryneveld (2003) cautions that by moving too fast from a pilot to full-scale implementation programme due to pressure to deliver may result in particular levels of service to be rejected by the communities before the implementers had the opportunity to perfect the system.

➤ *Operational Requirements*

Some of the important points that emerged from 2.2.1 and 2.2.2 recur under operational requirements include:

- Affordable and sustainable services
- People centred
- User participation
- Involvement of women in the management of the facilities
- Management at the lowest possible level
- Community health education is necessary.

Additional important points are highlighted as follow:

- Capacity building measures, proper technical, administrative and economical operating procedures are necessary (ADC, 2008).
- Community should bear operation and maintenance (O&M) costs (WSP, 2007). This however is not applicable to communal facilities.
- Local monitoring and support structures should be set up. Monitoring and support arrangements should be adapted to suite the requirements for local level O&M (Lagardien et al., 2007).
- Community-based O&M should be institutionally supported and funding schemes for community-based procurement should link up with related poverty reduction programmes (ibid). This is because the Strategic Framework for Water Services (DWAF, 2003) promotes sustainable livelihoods and local economic development through water and sanitation programmes.
- Development opportunities should complement sanitation services to prevent non-payment and the inability to pay for services (Ryneveld, 2003). It is encouraged that informal dwellers, especially women should have saving accounts (WSP, 2007).
- Assignment of responsibility is necessary (Lagardien et al., 2009).
- Regular qualitative and quantitative monitoring and evaluation (M&E) is essential (SACOSAN, 2005).

b) *Functioning*

The key points are considered with regards to planning and initiation, implementation and operational requirements. These are discussed below.

➤ *Planning and Initiation*

Important points that need to be considered for planning and initiation with respect to ensuring the adequate functioning of sanitation facilities are similar to those points discussed in 3.2.1.1 with

respect to user acceptance of sanitation facilities. However, there are also some unique points specific to the adequate functioning of sanitation facilities.

As indicated in section 2.2.1 above, it is noted that policy and strategy is an important consideration to facilitate the adequate functioning of sanitation facilities. Legislation and standards for urban sanitation (Parkinson et al., 2008) should be in place that would ensure that correct standards are upheld and that facilities would be functional.

A sound policy environment would ensure that appropriate, ecological and sustainable sanitation technologies are selected. It is critical therefore that the economical, financial, technical, institutional, social and environmental factors are looked at in selecting the appropriate technology (ADC, 2008; Kalbermartten et al., 1982; Mara et al., 2007; Ryneveld, 2003).

Specific emphasis for adequate functioning of the technology is placed on the environmental aspect, that local environmental and geological conditions are considered and that the technology does not adversely impact on the environment (DWAF, undated; Kalbermartten et al., 1982; Pegram et al., 2000; SACOSAN, 2005). The correct decision-making process is vital in ensuring this is achieved. Responsibility for this process rests with the local government (DWAF, undated). Parkinson et al. (2008) present a 5 stage decision-making process that would lead to a 'technically viable, affordable, and acceptable sanitation option' as follow:

- *Stage 1: Survey of settlements and services*
The objective here is to gather information about the coverage and quality of existing services to clarify the key problems to be addressed and prioritize locations for improvement.
- *Stage 2: Consultation and needs assessment*
This involves a more detailed analysis of the current situation to outline what types of improvements are needed and where they will have the most beneficial impact.
- *Stage 3: Identifying appropriate technologies*
The objective here is to eliminate technologies that are not viable from a technical perspective and thus narrow the choice of options.
- *Stage 4: Development of costed options*
The purpose here is to estimate the capital and operating costs associated with each option over its anticipated lifetime, and to consider how the new services could be operated and maintained. This should confirm whether the technologies are appropriate in terms of the human and financial resources available locally.
- *Stage 5: Reaching consensus on preferred options*
The objective here is to present each costed option to the recipient community for discussion and feedback. It is important to clearly explain the technical, managerial, and

financial implications (including proposed operation and maintenance arrangements) of each option.

The sanitation protocol to support the peri-urban sanitation provision in the City of Johannesburg by Pegram et al., (2000) also has a 5 phase process presented below:

- *Phase 1: Characterise the capacity for sanitation*
This is necessary since sustainable sanitation is only possible where the process of sanitation promotion matches the required resources for planning, implementation and operation of the sanitation option, with that of the available capacity of the local authority and community.
- *Phase 2: Evaluate the viability of waterborne sewerage*
This is necessary as full waterborne sewerage is the aspiration of most communities.
- *Phase 3: Create a settlement sanitation task team*
This is necessary because two important things need to happen: (a) local officials responsible for sanitation are brought together in one team; (b) community representatives and people who work closely with the identified community make up the other half of the team.
- *Phase 4: Conduct a rapid assessment*
This is necessary because evaluation of the appropriateness of different sanitation options for a particular settlement must be based on knowledge about the planning, social, economic, institutional and physical conditions associated with that settlement.
- *Phase 5: Identify an appropriate suite of options.*
The main aim of the protocol is to identify those sanitation options that are feasible. This phase therefore involves three steps in identifying appropriate options: (a) preliminary screening of sanitation options; (b) detailed evaluation of sanitation options; (c) specification of the suite of options and conditions.

Although Parkinson et al., (2008) is presenting a decision-making guide for urban sanitation in India and Pegram et al., (2000) doing the same for Johannesburg, both can be used generically and therefore applicable to any urban setting in the developing world. Whatever decision-making tool is selected, the important goal should be to select the appropriate technology applicable to a given local context.

An integrated planning model should be considered and this would take place within the IDP process, which will demonstrate the sustainability and acceptability of the various sanitation options (as mentioned in 2.2.1 and 2.2.2). Ryneveld (2003) notes that for a successful project, a life cycle perspective (that includes planning, design, construction, operation and maintenance) should be considered. Here it should be added that an integrated program for effective sanitation service delivery consists of five models – a general planning model and four implementation models (health and sanitation promotion, facility construction, M&E, and O&M) specific to the technology choice

(Lagardien and Cousins, 2005). Finally, there should be community involvement in selecting the sanitation choice as well as in health and hygiene training (Still et al., 2009).

➤ *Implementation*

Where implementation is concerned, some of the points mentioned in 2.2.1 are applicable here with respect to functioning. The key points include:

- Detailed procedure is necessary
- Good financial management is necessary
- Don't move too fast from pilot to full-scale programming
- Involvement of community in implementation and in health and hygiene training.

➤ *Operational Considerations*

Where operational considerations are concerned with respect to functioning, some points are previously repeated but there are also some unique points. The key points include:

- Design criteria for communal sanitation facilities should be carefully considered (Kalbermarten et al., 1982)
- Good financial management is essential – local authorities will ease the financial and maintenance burden on themselves if they build awareness of effective waste management as an integral part of health, hygiene and sanitation promotion (DWAF, undated)
- User participation – O&M as well as M&E should be community-based (Cousins and Benjamin, 2010; Lagardien et al., 2007; SACOSAN, 2005)
- It is necessary to understand O&M tasks and assignment of responsibility (Lagardien et al., 2009)
- There should be a sharing of responsibility at the interface level (ibid; Cousins and Benjamin, 2010)
- There should be institutional support for unbundling O&M tasks (ibid)
- Regular M&E is necessary (Cousins and Benjamin, 2010; SACOSAN, 2005)
- Negative environmental effects should be alleviated (DWAF, 2001; undated; Kalbermarten et al., 1982; Pegram et al., 2000; SACOSAN, 2005)
- Need to consider access roads and solid waste disposal (Still et al., 2009)

It should be noted that communal/shared sanitation facilities tends to fail because (ibid):

- People don't want to share facilities
- There is no responsibility for cleaning facilities
- Households privatize shared facilities (through placing on locks or fencing off the facility).

These 3 concerns should therefore be adequately taken into account and planned for. Interactive municipal and community planning (Cousins and Benjamin, 2010) provide an ideal tool for addressing such concerns.

Table 2.2: Data Summary of Key Points for User Acceptance & Functioning of Sanitation Facilities

	User Acceptance	Functioning of sanitation facilities
Planning and Initiation	<ul style="list-style-type: none"> • Policy & strategy is necessary • Select appropriate, ecological & sustainable technologies • Demand driven • Socially, culturally & religiously appropriate • Human rights based approaches • Affordability • Institutionally appropriate – managed at lowest possible level • Adaptability • Integrated planning model • User participation • Problem identification 	<ul style="list-style-type: none"> • Policy & strategy is necessary • Select appropriate, ecological & sustainable technologies • Life cycle perspective to be considered (planning, design, operation and maintenance)
Implementation	<ul style="list-style-type: none"> • Detailed procedure is necessary • Demand driven • Socially, culturally & religiously appropriate • Affordability • User participation • Managed at lowest level • Inadequate to focus only on infrastructure • Health & hygiene awareness necessary • Don't move too fast from pilot to full-scale implementation 	<ul style="list-style-type: none"> • Detailed procedure is necessary • Good financial management is necessary • Don't move too fast from pilot to full-scale programming • Involvement of community in implementation and in health and hygiene training.
Operational Considerations	<ul style="list-style-type: none"> • Affordable and sustainable services • People centred • User participation • Involvement of women in the management of the facilities • Management at the lowest possible level • Community health education is necessary • Capacity building measures necessary • Community to bear O&M costs • Local monitoring & support structures • Community-based O&M institutionally supported • Roles & responsibility identified • Development opportunities • Regular M&E 	<ul style="list-style-type: none"> • Design criteria for communal sanitation facilities should be carefully considered • Good financial management is essential • User participation • Necessary to understand O&M tasks and assignment of responsibility • Sharing of responsibility at the interface level • Institutional support for unbundling O&M tasks • Regular M&E is necessary • Negative environmental effects should be alleviated • Need to consider access roads and solid waste disposal

2.2.4 Relevance of Existing Sanitation Guidelines to the Mobile Communal Sanitation Facilities

The key points discussed in section 2.2.3 above with regards to issues to be considered in order to achieve user acceptance and adequate functioning of sanitation facilities provide some useful

broad criteria to be considered in assessing user acceptance and functioning of mobile communal sanitation facilities. These are summarised in table 2.3 below.

Table 2.3 Broad Criteria to be considered for User Acceptance and Functioning of MCSF

	User Acceptance	Functioning of sanitation facilities
Planning and Initiation	<ul style="list-style-type: none"> • Technology to comply with policy guidelines • Technology to be appropriate: <ul style="list-style-type: none"> - Demand driven & people centred - Socio-cultural needs & human rights considered - Affordable - Institutionally appropriate (managed at lowest level) - Adaptable • Technology to be ecologically friendly • Technology to be sustainable • Integrated planning model • Participatory • Problem identification 	<ul style="list-style-type: none"> • Correct standards & guidelines followed • Appropriate, ecological & sustainable technologies selected • Integrated planning considering life cycle perspective • Participation
Implementation	<ul style="list-style-type: none"> • Detailed procedure followed • Demand driven • Socio-cultural needs & human rights considered • Affordable • Participation • Institutional appropriateness • Health & hygiene training • Speed from pilot to full-scale 	<ul style="list-style-type: none"> • Detailed procedure followed • Good financial management • Speed from pilot to full-scale • Participation
Operational Considerations	<ul style="list-style-type: none"> • Affordable & sustainable • People centred • Participation • Management at lowest level – women involved • Health & hygiene education • Capacity building measures, proper technical, administrative and economical operating procedures • Local monitoring & support structures • Community-based O&M institutionally supported – funding • Development opportunities 	<ul style="list-style-type: none"> • Design criteria considered • Good financial management • Participation – community-based O&M & M&E • Understanding of O&M tasks & responsibility • Shared responsibility • Regular M&E • Negative environmental impacts eliminated • Access roads & solid waste disposal considered

These broad criteria across that of user acceptance and functioning of the facilities can be categorised as follow:

- Technology that is appropriate, ecological and sustainable
- Integrated planning
- Participation
- Awareness
- Ownership
- Oversight
- Development opportunities.

The literature review found that there is no specific guideline for evaluating user acceptance and functioning of mobile communal sanitation facilities available. However, the general guidelines to be considered in terms of planning and initiation, implementation and operational considerations for a sanitation programme can be adapted to suite a framework for evaluating user acceptance and functioning of MCSF.

2.3 Approaches to introducing new sanitation technologies in informal settlements

In the provision of water and sanitation the service provider should be equipped with an adequate background of relevant policies related to the provision of the intended services. The service provider should be aware of the social and organisational constraints in the provision of the services. Issues related to these constraints should be addressed keeping in mind that the sanitation arrangements are inextricably bound to the process of service delivery. The principles of sustainability, affordability and appropriateness should be upheld in supplying water and sanitation. Therefore the approach for implementing any sanitation technology needs to consider the above within the following 3 phases: i) planning; ii) implementation; iii) post-implementation.

2.3.1 Planning Considerations

All sanitation projects must be preceded by a proper feasibility study to determine what is suitable for the area and to plan properly for implementation. Effective planning will enable implementation in order to develop models that may be replicated, as appropriate to each particular context.

The planning process comprises three main components namely *a) initiation* (during which the pre-assessment is carried out to determine the need for sanitation), *b) policy* (to determine whether the community needs comply with local policy or regulation) and *c) planning* where the facility is selected and all necessary arrangements made for its implementation.

The WSDP suggests that the planning process must take into account the views of all important stakeholders, including communities, through consultative and participatory process (Martin, 2008). The draft plan must be made available for public and stakeholder comments and all comments must be considered when preparing the final plan. The Red book (CSIR, 2000) suggests that communities should be involved in the planning, implementation and maintenance phases of the project.

a) Initiation phase

The initiation process according to Mouton (2007) consists of two activities: a feasibility study and stakeholders analysis.

➤ Feasibility study

This phase of the project intends to inform if the project is feasible or not, will solve the identified problem and offer alternative solution. Here necessary questions related to settlement socio and environmental conditions should be assessed.

➤ Stakeholder selection

Identify project stakeholders: the sanitation project is intended to a category of users or communities. In order to ensure that the adequacy of service is provided, key stakeholders such as community representatives, service provider, municipal officials and other interested parties should be identified. The influence of the community representative should be considered as of utmost importance given their daily interaction with communities.

Determine stakeholders' needs and expectations: there are often expectations in the provision of the sanitation service especially in informal settlements. Stakeholders' needs are to be taken into account by listening and recording their demand. Such demands should be in turn carefully investigated, studied and attended with care taking into account socio-economical factors.

Further considerations from case-study examples during initiation can be found in Appendix 3 (see Dagerskog, 2010 and Grootboom, 2010). These include user acceptance, information and awareness, and user consultation/participation.

b) Policy considerations

According to the *White Paper on Basic Household Sanitation* (DWAF, 2001), the following are necessary when considering sanitation service delivery:

- Sanitation must be demand responsive and supported by an intensive health and hygiene programme
- Community participation is essential
- Sanitation must be integrated with the IDP process
- Sanitation must be about environment and health
- Local government must be responsible for service delivery
- Sanitation must be financially sustainable
- Environmental integrity must be protected.

The policy environment goes further to state that water and sanitation programmes should be designed to support sustainable livelihoods and that there should be a provision of free basic sanitation (DWAF, 2003).

The Water Services Act (Act No. 108 of 1997) goes further to state that sanitation must:

- Focus on people
- Technically suite local conditions
- Consider environmental impacts
- Include good financial management
- Be the responsibility of local government.

c) Planning process

The sanitation planning process as documented in a case study in Mexico suggests the following stages:

- Analysis of technical options and preparation of preliminary design materials
- Organizational meetings between service provider, municipalities and users' representative
- Regular coordination between all stakeholders.

2.3.2 Implementation Considerations

The implementation of sanitation technology is intended to provide needy communities with dignified sanitation. The process used for the implementation should be designed taking into account a number of parameters without which the success of the technology may be compromised.

While in the past attention in sanitation facility programs was mainly on technology, in recent times there is much more attention on the implementation methods of sanitation technologies. Implementation means the process of introduction of sanitation in communities; not the specific design, but the development process of sanitation, strategy of introduction and approach towards the community.

This implementation method consists of multiple factors. Jones & Silva (2009) argue that any implementation method should have environment as a first priority, then the technical requirements to meet human societal needs, and finally the economic requirements within those societies. Therefore human societal needs are important and technology must help to support this.

a) *The sanitation implementation process*

Community participation is identified as a key requirement for the success of the implementation programme. Projects are to be demand driven by the community, as demonstrated by the community's willingness to assist in project implementation. Where possible, projects are to be implemented without the use of external contractors, but with the use of local capacity to facilitate the upliftment of the local economic situation (City of Cape Town, 2008).

According to Grootboom (2010), the implementation should include physical infrastructure construction and Users education campaign. During this phase, the service provider should identify the location of the facility taking into account the local context and put in place mechanisms to deal problems such as displacement and relocation that may occur.

While the physical construction of infrastructure is taking place, *a users' education campaign should be conducted to explain the design, use and operational requirements of the facility.* To achieve this process successfully, a good communication between both stakeholders should be put in place. The implementation process should be supported by both local authorities and communities (Dagerskog, 2010). According to the policy environment, responsibility however lies primarily with local authorities.

2.3.3 Post Implementation

The post-implementation phase needs to consider three specific components. These include *a) the user's issues emerging from the daily use of the facility, b) the operation and maintenance* of the technology for ensuring the sustainability of the technology and, *c) monitoring and evaluation* of the technology to ensure the continuous adequate functioning of the technology as well as evaluating the success of it.

From the review of local and international literatures, it was found that various frameworks and guidelines are available. However, these frameworks and guidelines are not directed to the MCSF and more are context based (and specific to certain regions or countries).

Despite the lack of specific framework or guideline for MCSF, the review of existing one has provided key points of relevance to the user acceptance and functioning of any type of sanitation that can be customized to meet the specific context of MCSF.

Having identified these points, the next section of the report provides a background to the development and an overview of the framework for assessing user acceptance and functioning of MCSF in informal settlements.

3. Development of the framework for assessing users' acceptance and functioning

3.1 Rationale for the development of the framework

The burgeoning of IS has created a demand for basic infrastructure that includes housing, water and sanitation. Sanitation services present a particular problem, especially in IS where local problems are solved at the expense of the wider environment (Carden et al., 2009).

Research in many countries has shown that for sanitation programmes to be successful there must be a demand for the facilities by the communities. It has been clearly demonstrated that when services that do not address local priority or demand are implemented, they are likely to be misused, abused or even vandalized (Cairncross, 1992; Lagardien & Cousins, 2003; Lagardien et al., 2010).

This framework was intentionally developed to be a tool that could be used to determine the level of users satisfaction and functioning to a particular sanitation technology; it can also be used as part of an ongoing M&E programme for existing sanitation technologies and can be applied for the introduction of new sanitation technologies in an area provided strict observance of each criteria and associated indicators. It was developed bearing in mind that "greater users' acceptance of the technology will enhance the functioning of the sanitation technology"; and "...adequate functioning is dependent on appropriate design and compliance with operational requirements and the extent of operation and maintenance".

The framework is intended to determine the level of user participation and influence throughout the different phases of the sanitation cycle by assessing a set of indicators that was informed by the literature review. The understanding is that the level of user participation and influence would determine the level of user acceptance.

3.2 Elements of the framework

In the provision of water and sanitation the service provider should be equipped with an adequate background of relevant policies related to the provision of the intended services. The service provider should be aware of the social and organisational constraints in the provision of the services. Issues related to these constraints should be addressed keeping in mind that the sanitation arrangements are inextricably bound to the process of service delivery. The principles of sustainability, affordability and appropriateness should be upheld in supplying water and sanitation. Therefore the approach for implementing any sanitation technology needs to consider the above within the following 3 phases: i) planning; ii) implementation; iii) post-implementation.

3.2.1 Planning

The first phase of the sanitation cycle includes planning. It was noted from the literature that all sanitation projects must be preceded by a proper feasibility study to determine what is suitable for the area and to plan properly for implementation (the second phase of the cycle). Effective planning will enable implementation in order to develop models that may be replicated, as appropriate to each particular context. It was further observed that the planning process comprises three main

components namely, a) initiation (during which the pre-assessment is carried out to determine the need for sanitation), b) policy (to determine whether the community needs comply with local policy or regulation) and, c) planning (where the facility is selected and all necessary arrangements made for its implementation).

3.2.2 Implementation

The second phase of the sanitation cycle includes implementation of the technology. It has been observed in Report 1 that the process used for implementation should be designed taking into account a number of parameters without which the success of the technology may be compromised. Implementation means the process of introducing sanitation in a community; not the specific design, but the development process of sanitation, the strategy of introduction and the approach towards communities.

3.2.3 Post-implementation

The third phase of the sanitation cycle includes post-implementation of the technology. The literature review suggested that the post-implementation phase should consider three specific components. These include a) the operation and maintenance of the technology for ensuring the sustainability of the technology, b) monitoring and evaluation of the technology to ensure the continuous adequate functioning of the technology as well as evaluating the success of it and, c) users issues and awareness intended to assist in the functioning of the facility.

3.3 Framework for assessing users' acceptance of mobile communal sanitation

3.3.1 The framework

The evaluation framework is divided into 3 phases (planning; implementation; post-implementation). Each phase has a set of key criteria to be considered, and each criterion has a set of indicators that was investigated in field testing. Each criterion is categorized as either participation (green coded) or influence (red coded) based on the indicators that inform it.

Participation was distinguished to include those activities where users or other stakeholders have been directly included in decision-making processes or actively involved or included in implementation and post-implementation activities. Influence was distinguished to include those activities that were either influenced by users' needs, development priorities, legal instruments and guidelines or past lessons learnt, and user knowledge.

Table 3.1 below presents the framework with all three its phases, the associated criteria per phase and the associated indicators per criteria.

Table 3.1: The Framework for Evaluating User Acceptance of MCSF

Phase	Criteria	Indicators
Planning	Appropriate technology	- Level of Participation - Information dissemination - User Acceptance - Accommodation of specific user needs - Accessibility of location - Security - Socio-economic and cultural appropriateness
	Ecological technology	- Environmental protection - Reduced child contact with human waste
	Sustainable technology	- Improved human health - Improved environmental conditions - Economic sustainability
Implementation	Participation	- Participation in construction - Remuneration for participation - Skills training provided - Demolishment/removal of shacks
	Understanding of the technology	- Understanding of the operational requirements
	User awareness	- Provision of awareness programmes - Potential benefits of awareness programmes
Post-Implementation	Oversight and ownership	- Responsibility for managing the facility - Conflict around access
	Development opportunities	- Job opportunities
	User awareness	- Regular user awareness - Good practice
	Monitoring and evaluation	- Adequate training of community-based monitors

3.3.2 Criteria and Indicators

The user acceptance framework comprises three phases to each a number of criteria is assigned. These criteria and their purpose are outlined in table 3.2 below. Further details regarding each phase of the framework, its criteria and relevant indicators are discussed below.

Table 3.2: Function of each Criterion within the Evaluation Framework

Phase	Criteria	Function
Planning	Appropriate technology	Determine appropriateness of technology to users
	Ecological technology	Determine environmental soundness of technology
	Sustainable technology	Determine socio-economic & environmental sustainability
Implementation	Participation	Determine user participation/involvement
	Understanding of the technology	Determine whether users understand the operational requirements
	User awareness	Determine whether awareness programme was conducted
Post-Implementation	Oversight and ownership	Determine whether local management of technology is included
	Development opportunities	Determine whether there are job creation prospects
	User awareness	Determine whether awareness programme was conducted
	Monitoring and evaluation	Determine existence of local monitoring and evaluation

Legend

	Participation
	Influence

3.3.2.1 Planning

As the first phase of the sanitation cycle, the planning phase comprises initially six criteria under that would determine the level of user acceptance. After field testing however it was considered appropriate to maintain only three of the initial six criteria. Only one of the criteria is classified as an element of *participation* and two are classified as an element of *influence*. The refined criteria include:

- Appropriate Technology
- Ecological Technology
- Sustainable Technology.

Table 3.3: Indicators of each Criterion within the Evaluation Framework

Phase	Criteria	Indicators
Planning	Appropriate technology	<ul style="list-style-type: none"> - Level of Participation - Information dissemination - User Acceptance - Accommodation of specific user needs - Accessibility of location - Security - Socio-economic and cultural appropriateness
	Ecological technology	<ul style="list-style-type: none"> - Environmental protection - Reduced child contact with human waste
	Sustainable technology	<ul style="list-style-type: none"> - Improved human health - Improved environmental conditions - Economic sustainability

Each of the criteria is assessed according to a set of indicators which together makes up the specific criterion. These are discussed in detail below.

a) Appropriate Technology

The purpose of including this as a criterion is to determine whether the technology is demand driven, people centred, participatory, socio-culturally and religiously appropriate, affordable, institutionally appropriate and adaptable to changing needs and circumstances. This criterion includes indicators that have both elements of *participation* and *influence* however the element of *participation* features more strongly under this criterion and is therefore considered as such. Initially this criterion comprised of ten indicators. However after field testing it was refined to include seven indicators. The refined indicators include:

- i. Level of participation – to establish whether users were involved in selecting the technology, to what extent they were involved and what participatory methodology if any was used.
- ii. Information dissemination – to establish whether users were provided with detailed information about the pros and cons of each technology choice.
- iii. User acceptance – to establish whether users are satisfied with the technology choice.

- iv. Accommodation of specific user needs – to establish whether the technology accommodates for the socio, cultural, religious and human rights needs of the users.
- v. Accessibility of location – to establish whether the facilities are accessible in terms of time and space for all users.
- vi. Security – to establish whether the toilets are safe to use. This indicator is collected from users.
- vii. Socio-economic and cultural appropriateness – to establish whether the toilets are affordable for the users given their economic situation.

b) Ecological Technology

The purpose of including this as a criterion is to determine whether the technology is environmentally sound. It is therefore seen as an element of *influence*. Initially this criterion included three indicators but after field testing was reduced to two indicators as follows:

- i. Environmental protection – to establish whether the technology offers protection to the environment.
- ii. Reduced child contact with human waste – to establish whether the technology safely disposes of the human excreta so that children would not be able to come in contact therewith.

c) Sustainable Technology

The purpose of including this as a criterion is to determine whether the technology considers the financial, social and environmental aspects of sustainable sanitation. It is therefore seen as an element of *influence*. Initially this criterion comprised of four indicators but after field testing was refined to the following two indicators:

- i. Improved human health – to establish whether the technology leads to improved human health.
- ii. Improved environmental conditions – to establish whether the technology leads to a cleaner and safer environment.
- iii. Economic sustainability – to establish whether the technology is economically feasible for the medium to long-term.

3.3.2.2 Implementation

This phase of the framework comprises four criteria against which user acceptance of the sanitation assessed. However after field testing and refinement, there are now three criteria. Two of the criteria are considered an element of *influence* and one is considered an element of *participation*.

The criteria include:

- Participation
- Understanding of the Technology
- User Awareness.

Table 3.4: Indicators of each Criterion within the Evaluation Framework

Phase	Criteria	Indicators
Implementation	Participation	<ul style="list-style-type: none"> - Participation in construction - Remuneration for participation - Skills training provided - Demolishment/removal of shacks
	Understanding of the technology	<ul style="list-style-type: none"> - Understanding of the operational requirements
	User awareness	<ul style="list-style-type: none"> - Provision of awareness programmes - Potential benefits of awareness programmes

Each of the criteria is assessed according to a set of indicators which together makes up the specific criterion. These are discussed in detail below.

a) Participation

The purpose of including this as a criterion is to determine whether local capacity and resources were used in the management and construction during the implementation phase. As evident by the name of the criterion, it is considered an element of *participation*. Initially this criterion comprised six indicators, but following refinement includes four indicators:

- i. Participation in construction – to establish whether the users were involved in the construction of the technology during the implementation phase.
- ii. Remuneration for participation – to establish whether those users who were involved in construction were remunerated for their efforts.
- iii. Skills training provided – to establish whether those users who were involved were equipped with the necessary skills through training.
- iv. Demolishment/removal of shacks – to establish whether it was necessary to demolish or remove any shacks in order to construct the facilities.

b) Understanding of Technology

The purpose of including this criterion was based on the reference group feedback that anything pertaining to user understanding should be moved from the functioning framework (Report 3) to the user acceptance framework. This criterion was therefore initially part of the functioning framework where it served the purpose of establishing whether users understood how to use the technology. Such an understanding would have a direct consequence on the adequate functioning of the technology. This criterion is considered an element of *influence* and only has one indicator:

- i. Understanding of the operational requirements.

c) *User Awareness*

The purpose of including this as a criterion is to determine whether health and hygiene awareness of users was part of/ or undertaken during the implementation phase. It is important to include health and hygiene training during the implementation phase so as to ensure improved health and hygiene practice (DWAF, undated; Still et al., 2009).

This criterion is considered an element of *influence* as awareness would influence how users accept and use the facility. Initially the criterion comprised three indicators, but after refinement includes two indicators:

- i. Provision of awareness programmes – to establish whether users were trained on good health and hygiene behaviour as well as awareness on how to use and manage the facility.
- ii. Potential benefits of awareness training – to establish whether the provided training materialised into improved behaviour and whether users were provided with the necessary support to do so. A further benefit includes whether users were trained to such a level where they are able to train other users or new comers. This indicator is only applicable if the first one was positive. However, experience has shown that even though users were not provided with training in some cases, they still indicated that they have practiced improved behaviour based on their own insight.

3.3.2.3 *Post-Implementation*

This last phase of the framework is considered is the most important as it provides an indication of the level of user acceptance after the first two phases have been achieved. There are four criteria against which user acceptance during the post-implementation phase is assessed. Two of these criteria are considered an element of *participation* and two are considered an element of *influence*.

The criteria include:

- Oversight and Ownership
- Development Opportunities
- User Awareness
- Monitoring and Evaluation

Table 3.5: Indicators of each Criterion within the Evaluation Framework

Phase	Criteria	Indicators
Post-Implementation	Oversight and ownership	- Responsibility for managing the facility - Conflict around access
	Development opportunities	- Job opportunities
	User awareness	- Regular user awareness - Good practice
	Monitoring and evaluation	- Adequate training of community-based monitors

Each of the criteria is assessed according to a set of indicators which together makes up the specific criterion. These are discussed in detail below.

a) Oversight and ownership

The purpose of including this as a criterion is to determine whether users have a degree of ownership of the technology which would ensure responsibility. This criterion is an element of *influence*. Initially it comprised of four indicators, but after refinement includes two indicators as follow:

- i. Responsibility for managing the facility – to determine whether there is a partnership or shared responsibility for O&M between the local municipality and community.
- ii. Conflict around access – to determine whether there is any conflict among users in accessing the facilities.

b) Development opportunities

The purpose of including this as a criterion is to determine whether the technology enables local economic development and sustainable livelihoods. This criterion is considered an element of *participation*. This criterion initially comprised of two indicators, but since refinement only consists of one indicator:

- i. Job opportunities – to determine whether the sanitation technology enables job opportunities.

c) User awareness

The purpose of including this as a criterion is to determine whether there is continuous health and hygiene training, awareness of using the facilities and improved practice. This criterion is considered an element of *influence*. This criterion initially comprised three indicators, but after refinement includes two indicators as follow:

- i. Provision of awareness programmes – to determine whether there is regular health & hygiene awareness programmes as well as awareness programmes around using the facility.
- ii. Good practice – to determine whether the health and hygiene awareness has lead to good practice by users of the facility.

d) *Monitoring and evaluation*

The purpose of including this as a criterion is to determine whether regular, community-based monitoring and evaluation of the technology exists. This criterion is considered an element of *participation*. This criterion initially comprised of five indicators, but since refinement only includes one indicator as follows:

- i. Adequate training of community-based monitors – to determine whether community-based monitors are adequately trained.

3.4 Framework for assessing the functioning of mobile sanitation facilities

3.4.1 *The framework*

The evaluation framework (table 3.6) is divided into 3 phases (planning; implementation; post-implementation) that are described and explained below. Analysing the framework from functioning perspectives, it emerged that key criteria conducive to adequate functioning of the MCSF were found to be either categorised as status/access to sanitation, compliance with operational requirements or operation and maintenance. These categories are aligned with the phase of the framework and should not be seen as part of it.

Table 3.6: The framework for investigating the functioning of MCSF

Phase	Criteria	Indicators
Planning	Status of the Sanitation	Status of the land
		Access to sanitation
		Status of sanitation in settlement
		Causes of sanitation problems
		Consequences of inadequate sanitation practice
	Sanitation Technology Selection	User participation in the technology choice
		Presentation of the sanitation information
		User reaction to the selected technology
		Knowledge of number potential users
		Alternative suggestions from users
	Appropriate Technology	Consideration of user suggestions
		Suitability of location
	User Awareness	Ease of O&M (technical appropriateness)
		Inclusion of user awareness programme
Responsibility of awareness programme		
Users responsibility of awareness programme		
Implementation	Sanitation Technology Option	User suggestions
	Infrastructure Development	Knowledge of type of technology provided
		Location of Facility
		Suitability to all user groups
	Operational Requirements	Robustness of Technology
		Ease of Use
		Impact of Non-Compliance on Functioning
Suggestions for Enhancing Compliance		
Post-Implementation	Operation & Maintenance	Ease of Operation & Maintenance
		Knowledge of O&M tasks
		Strategies for ensuring adequate functioning
		User Participation in the O&M

Phase	Criteria	Indicators
	M&E	User contribution in O&M
		User responsibility for the O&M
		Manageability of the facility
		Ease of Monitoring
		Knowledge of M&E Criteria
		Local Management of the facility
	User Issues	M&E Protocol
		Problems Encountered
		Reporting Protocol
		Response Time to Address Problems

To each of these categories are attached a series of criteria with the purposes to inform the phase of the framework. The purpose of each criterion is outlined below (table 3.7). Each criterion has a set of indicators that would be investigated through field testing.

Table 3.7: The purpose of the framework criteria

Phases	Purpose of criterion used for assessing the Functioning of MCSF	
	Criteria	Purpose
Planning and Initiation	Status of the sanitation Sanitation technology selection Appropriateness of the technology Users' education programme	Determine the sanitation habit in the IS Outline selection procedures Determine the appropriateness of the technology Propose the education programme to users
Implementation	Sanitation technology option Infrastructure development Operational requirements	Present the selected sanitation option to users Determine how construction was undertaken Assess the impacts of operational requirements
Post Implementation	Operation and Maintenance Monitoring and Evaluation Users' issues	Evaluate the O&M impacts on the functioning Evaluate the M&E impacts of the functioning Outline issues emerging from the use of the facility

a) Planning and initiation

This category includes mainly an assessment of community need for sanitation, evaluation of available sanitation technologies and evaluates their appropriateness as well as the awareness programme to be in place to ensure adequate functioning. It includes status of the sanitation, sanitation technology selection (design specifications), appropriateness of the technologies and users' education programme. The set of criterion will assist mainly by tracking the problem and related causes, types, design and impacts of existing sanitation and social issues. These indicators are believed to assist municipal officials and design engineers in the selection or design of appropriate sanitation technology that will suit the users' needs.

b) Implementation

This category concerns mainly users who attempt to demonstrate their ability to understand fully the operational requirements as presented by the officials and design engineers. This category includes the sanitation technology option (for the settlement), infrastructure development and mainly the operational requirements. Criteria under this category provide the municipal officials and design engineers a feedback on the selected sanitation technology and will inform beforehand

functioning problems that may occur. Based on information collected at this stage, municipal officials and design engineers may refine or review their design in order to meet the users' needs.

c) Post-implementation

This category includes activities of importance mainly to municipal officials and users. Municipal officials will be involved in the evaluation of the technology while users will be more involved in reporting or presenting feedback needed for improving the service. In this category are operational requirements, operation and maintenance, monitoring and evaluation, users' issues (related to design) and (evaluation of) users' education. Information collected using indicators under this category will provide municipal officials with an understanding of the operational problem occurring at the facility and assist them in putting a mechanism in place for enhancing the functioning of the facility.

3.4.2 Criteria and indicators

In order to respond to the requirements of criteria under each phase of the framework, a series of indicators were designed and attached. The purpose of each indicator was to determine the output of each criterion on the functioning of the MCSF.

Each indicator under each of the criterion was looked at by way of a structured questionnaire. The questionnaire was different for design engineer, municipal official and users; although there may be overlapping questions which might concern all stakeholders but with different emphases. An attempt was made to cluster the questionnaire and categorise it according to the role played by each stakeholder in the implementation and functioning of the MCSF (as shown in table 4 to 6 below). The purpose of each indicator is to determine the impact of the criteria on the functioning of the mobile communal sanitation facility.

3.4.2.1 Planning phase criteria and indicators

All sanitation projects must be preceded by a proper feasibility study to determine what is suitable for the area and to plan properly for implementation. Effective planning will enable implementation in order to develop models that may be replicated, as appropriate to each particular context.

The planning and initiation phase is a primary stage to the provision of sanitation services. It involves several criteria that need to be met. As core to the decision making process with regard to the provision of sanitation, questions related to the planning and initiation were addressed to all stakeholders in different context (as indicated in table 3.8 below).

Table 3.8: Criteria and Indicators of the planning phase

Phase	Criteria	Indicators
Planning	Status of the Sanitation	Status of the land
		Access to sanitation
		Status of sanitation in settlement
		Causes of sanitation problems
		Consequences of inadequate sanitation practice
	Sanitation Technology	User participation in the technology choice
		Presentation of the sanitation information

Phase	Criteria	Indicators
	Selection	User reaction to the selected technology
		Knowledge of number potential users
		Alternative suggestions from users
		Consideration of user suggestions
	Appropriate Technology	Suitability of location
		Ease of O&M (technical appropriateness)
	User Awareness	Inclusion of user awareness programme
		Responsibility of awareness programme
		Users responsibility of awareness programme
		User suggestions

The involvement of the municipal officials and design engineers is vital to get a buy in of users with regard to the proposed sanitation services. The municipal officials (MO) should have an understanding of the sanitation problem, social considerations and aspirations of the community within the settlements. The MO should also ensure that design specifications meet the need and comply with minimum standards. Most importantly, the MO should ensure that the proposed technology is understood by users, the technology is appropriate to the settlement condition and have in mind a users' education programme and plan to ensure the sustainability of the sanitation.

a) Status of the sanitation

To ensure the adequate service provision, the service provider should undertake a pre-assessment survey to determine the status of the land (in terms of land tenure), the current status of the sanitation (in terms of availability, access and condition) and identify other related problems of importance to the service being provided.

It was therefore found important that the framework should the following indicators which will assist the pre-assessment survey for the provision of sanitation service:

- *Status of the land:* the provision of service should consider the status of the land prior to decide on the type of service to be provided. Land tenure and temporary nature of IS are considered as major issues that slows the provision of sanitation; municipalities should not invest in infrastructure that will be destroyed later when communities are to be relocated.
- *Access to sanitation:* this criterion will assist the service provider to assess whether there is a need for sanitation and assist in the prioritisation of service delivery.
- *Status of sanitation in settlement:* the condition of sanitation in the settlement may be used as rationale to determine the need for sanitation and stimulate demand.
- *Causes of sanitation problems:* will assist to trace the problems and find mitigation action for the future. It will further assist the decision making regarding the level of service to be provided.

- *Consequences of inadequate sanitation practice:* this indicator will be used to understand the level of awareness amongst users and will assist the setting of an awareness programme meant to enhance adequate functioning of the facility.

b) Sanitation technology selection

According to Kalbermatten et al.,(1982) the identification of an appropriate sanitation technology rests with the intended beneficiaries, selected alternatives should be presented to community with attached price tags and explain the cost implication of each technology. It should be borne in mind that sanitation technology usually fails technically if the users' social preferences militate against its proper maintenance. Therefore, to ensure the sustainability of the sanitation to be provided and prevent vandalism, the service provider should ensure that the following indicators are covered during the pre-assessment survey:

- *User participation in the technology choice:* as indicated previously, the sanitation service is provided to community and they should have a say regarding the intended service. Users should be involved in the selection process in order to make them entirely part of the decision making. Failing to do so often result in refusal or vandalism that exacerbates the problem.
- *Presentation of the sanitation information:* selected options should be presented and discussed with users. As users, they are entitled to know the types of sanitation available, the way it works and eventually the structure.
- *User reaction to the selected technology:* the reaction of community is used as a precursor indicator of their acceptance or refusal; it should be considered as important for the functioning of the facility.
- *Knowledge of the number of potential users:* due to the nature of IS and problems related to the access, users should be made aware of eventual number of users per facility or the way the facility will be installed throughout the settlement.
- *Alternative suggestions from users:* the service provider should listen to users' suggestions as it will provide an idea regarding their needs. So suggestions made by users should be carefully assessed and attended prior to the provision of the planned service.
- *Consideration of user suggestions:* the service provider should respond to users' suggestions by providing clear explanation. Failing to do so may mislead users to think that they are not important and not considered. Reasons for not accepting their suggestions should be provided.

c) Appropriate technology

The process of selecting a sanitation technology begins with the examination of all alternatives available. The most appropriate sanitation technology to select should be the option that provides

the most socially and environmentally acceptable level of service at least economic cost (Kallbarmarten et al., 1982). The service provider should therefore ensure (in the context of IS) that the selected technology is meeting the following indicators:

- *Suitability of the proposed location*: the sanitation facility should be located to ensure equal access to all user groups. The indicator was used to assess whether the proposed location of the facility would be suitable for user groups that include children, disabled and elderly people.
- *Ease of O&M (technical appropriateness)*: the facility should be technically sound, reliable and easy to operate and maintain. The service provider must ensure that the design specifications are conducive to easy O&M.

d) *User's awareness*

According to the Red Book (CSIR, 2001), the provision of sanitation services should be accompanied by a users' awareness programme meant to ensure sustainability and adequate functioning of the facility. The service provider should ensure that the awareness programme will be in place and establish responsibilities. To achieve this, the following indicator will confirm whether the programme is in place:

- *Inclusion of user awareness programme*: this will assist to understand the need of users, their behaviour and awareness level that will be used as baseline for developing awareness programme.
- *Responsibility of awareness programme*: the responsibility for the programme should be established in order to ensure that it is running as planned.
- *Users' responsibility of awareness programme*: the programme should not be run only by the service provider; users' groups should be involved as well due to their impact on local communities.
- *User suggestions*: the planned awareness programme should be presented and discussed with users. Suggestions made should be assessed and discussed in order to determine the real programme needed by users.

3.4.2.2 *Implementation phase criteria and indicators*

The implementation of sanitation technology is intended to provide needy communities with dignified sanitation. The process used for the implementation should be designed taking into account a number of parameters without which the success of the technology may be compromised.

The success of any sanitation technology lies on the strict compliance with operational requirements. As indicated in the previous section, during the planning and initiation phases the service providers (municipal officials and design engineers) are entitled to present the planned

sanitation technology to users. The presentation should be done in such a way that design specifications and use of technology are demonstrated. In return, users should show an understanding of the sanitation and suggest alternatives or improvements that need to be made to meet their needs.

Users' understanding and compliance with the operational requirements of the technology is the main criterion of the implementation phase. As indicated in table 3.9 below, users are entitled to take cognisance of selected sanitation technology, demonstrate an understanding, and provide opinion on the location, suitability and robustness of the facility.

Table 3.9: Criteria and Indicators of the implementation phase

Phase	Criteria	Indicators
Implementation	Sanitation Technology Option	Knowledge of type of technology provided
	Infrastructure Development	Location of Facility
		Suitability to all user groups
		Robustness of Technology
	Operational Requirements	Ease of Use
		Impact of Non-Compliance on Functioning
		Suggestions for Enhancing Compliance
Ease of Operation & Maintenance		

a) Sanitation technology option

The choice of sanitation technology option should be made according to a number of factors. Due to the sensitive nature of the sanitation delivery, technology options should be presented and discussed with users prior to making the final decision. Doing so was believed to improve confidence of users and enhance adequate functioning.

- *Knowledge of type of technology provided:* Users are entitled to have knowledge of the type of sanitation technology that will be provided and have a rough idea of how it will look like. This indicator was used to ensure whether users have knowledge of the type of sanitation provided or being provided.

b) Infrastructure development

The choice of the sanitation technology should be followed by the physical implementation consisting of building the facility on site. The service provider should therefore have a better knowledge of the site in order to determine the location of the facility, assess the safety of the facility and capacity or robustness to deal with demand.

The purpose of this criterion is to ensure that proposed sanitation facility was implemented in accordance with basic regulations with the intention to ensure adequate functioning. Indicators under this criterion are mainly:

- *Location of the facility:* According to the White Paper for Sanitation (2001), sanitation should be located within a safe walking distance not exceeding 200 m radius from the household. Several researches have indicated that in areas where sanitation facilities

are distant from users, the likelihood for not being used is high. Therefore, respondents were asked to indicate if the proposed location of the facility is adequately convenient for them. This indicator is used to assess the impact of the location of the facility on its functioning.

- *Suitability of the technology for all users groups*: this indicator is used to determine whether the facility can accommodate all types of users (including children, elderly people and disabled).
- *Robustness of the facility*: this indicator is used to determine the capability of the facility to handle large number of users without posing major operational problems.

c) *Operational requirements*

The sanitation facility is intended to operate adequately, in order to ensure full operation and achieve adequate functioning the operational requirements have to be known and well understood. Depending on the type of technology, design features and specifications, the operational requirements may differ substantially. The compliance with operational requirements is believed to improve the functioning of the facility and enhance its reliability.

To achieve this, the following indicators were developed to assist the service provider to understand the extent of operational requirements and its impacts on the functioning of the facility:

- *Ease of use*: the use of the sanitation facility should not be complicated; this indicator used to determine the users views regarding the ease of use of the facility.
- *Impact of non-compliance on functioning*: the compliance with operational requirements is key to adequate functioning and reliability of the sanitation system. The impact of non-compliance is used as an indicator to assess the level of awareness amongst users, as it will assist in them understanding the use of the facility and enhance its functioning.
- *Suggestions for enhancing compliance*: where non-compliance with operational requirements was reported, users should have a way of dealing with the situation. This indicator is used to assess whether users have measures in place to ensure compliance with operational requirements that is intended to improve the functioning of the sanitation.
- *Ease of operation & maintenance*: as any other infrastructure, the O&M sanitation system should be easy and affordable. The indicator is used to determine user's views regarding the easiness of the O&M.

3.4.2.3 *Post-implementation phase and criteria*

The post-implementation is a crucial phase of the sanitation provision as it implies operation and maintenance, monitoring and evaluation and responses to users' issues emerging from the daily use of the facility. Criteria in this phase are developed to inform the sustainability and reliability of the sanitation service provided.

This stage of the framework (presented in table 3.10 below) comprises two key criteria namely operation and maintenance (O&M) and monitoring and evaluation (M&E). The third criterion covers users' issues and comprises feedback from users' groups with regard to the daily use of the sanitation facility.

Table 3.10: Criteria and Indicators of the post implementation phase

Phase	Criteria	Indicators
Post-Implementation	Operation & Maintenance	Knowledge of O&M tasks
		Strategies for ensuring adequate functioning
		User Participation in the O&M
		User contribution in O&M
		User responsibility for the O&M
		Support Requirements for Participation
	M&E	Manageability of the facility
		Ease of Monitoring
		Knowledge of M&E Criteria
		Local Management of the facility
		M&E Protocol
	User Issues	Problems Encountered
		Reporting Protocol
		Response Time to Address Problems

a) Operation & Maintenance

The O&M is key to the success of any sanitation technology. The level and extent of O&M impacts on the functioning of the sanitation facility; it may lead to greater user' acceptance or rejection, misuse or vandalism. The O&M is undertaken to keep the facility in good working condition. In order to do this, tasks and responsibility need to be unbundled and way of undertaking these tasks known beforehand.

This criterion is used to understand the functioning of the sanitation facility with regard to the following indicators:

- *Knowledge of O&M tasks*: indicator used to determine whether users have knowledge of O&M tasks that need to be undertaken in order to ensure adequate functioning of the facility.
- *Strategies for ensuring adequate functioning*: used to determine whether users have strategies in place to ensure that the facility is and remain in good working condition at all times and way to enforce the compliance with operational requirements.
- *User participation in the O&M*: indicator used to determine the willingness of users to participate in the O&M and the sense of ownership of the facility.
- *User contribution in O&M*: this indicator was used to understand whether users are willing to contribute by any good mean in the O&M of the facility. It also provides an understanding of the sense of ownership and care for the facility.

- *User responsibility for the O&M:* this indicator was used to assess the level and sense of ownership amongst users. This will provide evidence of the importance users are giving to the facility in ensuring that it is adequately used as per operational requirements.
- *Support requirements for participation:* as users may express a high sense of ownership, they may lack basic materials or equipment needed for the O&M of the facility. This indicator is used to determine the level and nature of support required by users to participate in the O&M of the facility.

b) Monitoring and Evaluation

Monitoring and evaluation (M&E) imply physical inspection that is performed as a way to identify problems that may affect the functioning of the facility. To achieve this, the service provider should ensure that users have a clear understanding of the following indicators:

- *Manageability of the facility:* this indicator is used to assess users view regarding the easiness of managing the facility due the nature of communities in IS.
- *Ease of Monitoring:* the design of certain facilities may not allow for easy monitoring. The indicator is used to understand whether the facility can be easily managed in IS context.
- *Knowledge of M&E criteria:* to ensure adequate functioning of the facility, M&E criteria should be known in advance. This indicator is used to assess whether users have adequate knowledge of M&E criteria that should be used as benchmark for ensuring adequate functioning.
- *Local management of the facility:* users as beneficiaries should be primary responsible of the facility provided. Due to the nature of sanitation in IS and job opportunity that it may generate, this criteria is used to assess users willingness and readiness to manage the facility. It is believed that local management will increase the sense of ownership, create jobs and enhance the functioning of the facility.
- *M&E Protocol:* the protocol is amongst problems affecting the operation of sanitation in IS. This indicator is used to outline the process followed to report problems identified during the M&E of the facility.

These indicators inform the M&E process intended to ensure adequate functioning, knowledge of this criterion will assist in the preventative maintenance of the facility.

c) User Issues

The users' issues are of utmost importance despite being considered as soft issues. These are difficult to evaluate due to the multiple facets of the communities served by the facility. Indicators covering this criterion are used to inform the service provider potential problems emerging from the daily use of the facility that may impact the functioning. It includes:

- *Problems encountered:* the daily use of the facility provides a real idea and view of the nature of the technology. This indicator is used to assess challenges and problems faced by users when using the facility. Knowledge of the outcomes of this indicator is believed to assist the service provider to refine design or improve the service.
- *Reporting protocol:* bureaucracy and long ceremonial protocols to solve users' issues are amongst problem faced by sanitation in IS. This indicator is used to determine the protocol used to report problems or other issues emerging from the daily use of the facility.
- *Response time to address problems:* It is understood that the sanitation facility must be reliable and available at all times, issues reported by users should be given due attention. Failing to do so may result in further problems that will impact on the functioning of the facility. This indicator is used to assess the response time taken to respond to issues reported by users.

3.5 The amalgamated framework

Having distinctively discussed the two frameworks (user acceptance and functioning respectively), the amalgamated framework (table 3.11) emerged from the alignment of criteria and indicators of each phase of the framework.

It should be noted that these two frameworks are complementing one another as per the research hypothesis that suggested that greater user acceptance of the sanitation technology enhance the functioning.

Table 3.11: Phases of the framework and associated criteria

Phases	Users' acceptance	Functioning
Planning and Initiation	<ol style="list-style-type: none"> 1. Appropriate Technology 2. Ecological Technology 3. Sustainable Technology 	<ol style="list-style-type: none"> 1. Status of the sanitation 2. Sanitation technology selection 3. Appropriateness of the technology 4. Users' awareness programme
Implementation	<ol style="list-style-type: none"> 1. Participation 2. Users' awareness 3. Understanding of the Technology 	<ol style="list-style-type: none"> 1. Sanitation technology option 2. Infrastructure development 3. Operational requirements
Post Implementation	<ol style="list-style-type: none"> 1. Oversight & Ownership 2. Users' awareness 3. Development Opportunities 4. Monitoring & Evaluation 	<ol style="list-style-type: none"> 1. Operation and Maintenance 2. Monitoring and Evaluation 3. Users' issues

Based on the initial testing of the framework, it was found that the investigation of the user acceptance and functioning of the MCSF can be achieved by using both frameworks' (criteria) in the following priority order:

- a) *Preliminary investigation that includes planning and initiation*
 - Status of the sanitation
 - Sanitation technology selection
 - Appropriateness of the technology (from user and functioning perspectives)
 - Sustainability of the sanitation technology (in terms of reliability)
 - User awareness programme
- b) *Implementation*
 - Sanitation technology option(s)
 - Participation (of user in the selection of the sanitation technology)
 - Infrastructure development (referred as physical construction of the facility)
 - Operational requirements of the facility
 - Understanding of the technology (in terms of its operational requirements)
 - User awareness programme (setting the scene)
- c) *Post-implementation*
 - Operation and maintenance
 - Monitoring and evaluation (in terms user behavior and functioning)
 - Oversight and ownership
 - Development opportunities
 - User issues (arising from the daily use of the facility)
 - User awareness programme (status quo)

Each element of the framework outlined above was found to be informing the both the level of user acceptance and the functioning of the sanitation facility. Having developed and conducted an initial test of the framework, the next phase of the research aimed at applying the refined framework in the context of the case study sites.

4. Application of the framework

4.1 Case study context

The research was conducted in three informal settlements all in different municipalities. These informal settlements include Pooke se Bos (in Cape Town), Kayamandi (in Stellenbosch), and Shembe (in eThekweni). Each informal settlement has a unique profile and these are detailed in Appendix D.

4.1.1 City of Cape Town Case Study: Pooke se Bos

This is a fairly recent settlement formally recognised in the year 2000. An overview of its location, population, housing and sanitation services are presented below.

a) Location

The settlement is located 15 km from the CBD in the Athlone area. It is located on private land in an industrial area which limits service provision such as sanitation. It is bordered by a road, a graveyard and a wetland to the back. Given the wetland, the settlement has a high water table which is particularly problematic during the winter rainy season. It is ironically juxtaposed adjacent to the wealthy Indian suburb of Rylands.

b) Population

The population is estimated between 350 to 400 dwellers based on recent counts by the community leader and community members. There are more females (66%) than male (34%) residents. Over 28% of the population are children under 12 years of age and only 3.5% are older than 60 years of age. Only 1% of residents are African the rest are all Coloured. The predominant language spoken is Afrikaans.

c) Housing

All the housing in the settlement comprises informal dwellings constructed from corrugated iron, supported with a wooden frame. Plastic sheets may also be found on some roofs to provide extra protection from the rain. In total, there are reports of between 94 and 116 informal dwellings.

d) Sanitation Services

The level of services in the settlement is very poor. There exists no sewerage connection, stormwater drainage or electricity. The previous sanitation systems implemented in Pooke se Bos were container toilets, chemical toilets and bucket latrines. Currently the MobiSan technology, a MCSF, is in use and services the entire population.

The MobiSan facility consists of a stand-alone (no water supply, sewerage and/or electricity needed) sanitation unit equipped with 13 toilets and 12 urinals as well as hand washing facilities and a night soil disposal access. Toilets are based on urine diversion and faecal matter dehydration. Urine is collected in storage tanks for potential reuse. Faecal matter is dehydrated 8 within the MobiSan resulting in a reusable product. It also provides a small caretaker room and the facility is open from 5am until 9pm. The facility is able to serve about 500 people.

4.1.2 Stellenbosch Case Study: Kayamandi

This is a well-established settlement that existed during the apartheid years already. An overview of its location, population, housing and sanitation services are presented below.

a) Location

Kayamandi is a township situated in Stellenbosch which is 48 kilometres from Cape Town. It is located across the railway lines on the northwest edge of town. The township is located on the outskirts of Stellenbosch. The township was designated a “black area” during the apartheid years.

b) Population

The population is estimated at about 40 000 people with the majority of people being migrants from the former homelands. The vast majority of the population is therefore Xhosa speaking. Ten percent of the population is children under the age of 10 years and more than 50% of these children are from single mothers. Almost half of the population (46%) is unemployed.

c) Housing

In 2007 there were a total of 3700 households in Kayamandi of which approximately 16.6% lived in formal houses and 83.4% lived in informal dwellings (prefabricated hostels and informal shacks). The informal dwellings are constructed entirely or partially of wood, corrugated iron, plastic and other low-cost building material.

d) Sanitation Services

Kayaloo is a type of mobile communal sanitation facility used in Kayamandi informal settlement. The design includes one mobile sanitation unit with 10 toilets which can accommodate 15 to 20 people with flush water inside of each unit. Due to drastic increase in the informal settlements, the available facilities are inadequate to cater for the growing population and thus leading to the available facilities being inefficient to accommodate for the communities' needs as the maintenance are not improved.

Kayaloo mobile toilet facility is separated with metal compartments where each compartment toilet has a plastic seat without a cover lid to keep out flies and one push button to flush the toilet after use. Flushing was facilitated by a Flush Master Junior flush valve and non-recyclable PVC flush pipe, securely protected behind a metal screen to discourage vandalism. The flush master push button is only visible from the cubicle. The Kayaloo mobile sanitation is connected to one main sewerage system.

4.1.3 eThekweni Case Study: Inanda, Shembe

Shembe is a sub-township of Inanda, the largest township in eThekweni in Kwazulu-Natal. An overview of its location, population, housing and sanitation services are presented below.

a) Location

Geographically, Shembe is situated in Inanda, an old township near KwaMashu and Ntuzuma, situated adjacent to each other. These three informal settlements are combined into a single area, referred to as INK. The physical boundaries between them are blurred. eThekweni Municipality

manages INK through a single administrative unit, and local councillors are responsible for wards that cut across all three areas. The area is situated in a hilly landscape, which reflects the landscape of Kwazulu-Natal in general.

b) Population

The current population of Shembe informal settlement is about 3 150 people occupying shacks of the area. This was obtained to the ratio number of each unit which was accommodated for 75 households multiplied by the number of the toilet facilities (including male and female). About 55% of households in the area have one to three members, and a further 35% accommodate four to seven people.

Over 65% of the population is younger than 29 years of age, indicating that youth development is a priority. The female to male ratio is almost on a par, with 51% of the population female and 49% male. Despite this, male-headed households are in the majority at 57%. Around 95% of the population speaks Zulu as a first language. The limited level of English instruction inhibits opportunities for employment within eThekweni's knowledge economy.

c) Housing

In total, the Shembe area comprises predominantly formal and informal housing, but the area is largely dominated by formal housing 52%; while informal housing accounts for 43% and traditional housing made from mud accounts for 5% of the area.

d) Sanitation Services

Previously people used pit latrines or the bush for open defecation. The current sanitation used at Shembe Informal Settlement is the CAB (container ablution facility), a mobile communal sanitation facility. Although some residents still use the pit latrines especially after hours when the CAB facilities are closed or if the facilities are too far.

The eThekweni municipality has a quota whereby they try and cater for enough ablution blocks so that each facility consists of 2 units (one for male and another for female).

➤ The male block generally contains:

- 2 urinals;
- 3 toilets;
- 2 showers and 2 washbasins.

➤ The female block includes:

- 4 toilets;
- 2 showers;
- Hand washbasin and Laundry basins outside the facility.

The dwellings should be within a radius of 150 to 200 m from the toilet block. Lighting at night is provided via translucent roof sheeting and external mast mounted floodlighting. Each unit can accommodate up to 75 households, and a typical household consists of 5 people meaning that a unit can accommodate for about 375 users.

4.2 Assessment of Users' acceptance

4.2.1 The application of the framework

Each indicator under each of the criterion across all three phases was applied by way of a structured questionnaire. The complete user questionnaire is presented in Appendix E1. The reason for a structured questionnaire is to assist in quantifying the results. Although it is a structured questionnaire it may be relevant to allow for respondents to discuss the questions more openly in order to gain further insight beyond which a structured answer allows for.

With social research it is more useful to gain a "thick description" of the context and experience of respondents in order to better contextualize the results. A strictly structured questionnaire does not allow for this. The skilled researcher would know when and how to probe. It is not expected that probing take place with every user and to every question. However where a particular user displays signs of insight then such a user should be targeted for probing.

The ensuing discussion seeks to illustrate how each indicator of each criterion across each of the three phases translates into a question to be directed to the user.

4.2.1.1 Planning Phase Questions

The bulk of the research questions are to be found occurring in the planning phase. The majority of these questions inform the criteria of appropriate technology. There are a total of 27 questions in this phase. Table 4.1 below links each indicator of the planning phase's three criteria to the questions informing it. Some indicators only comprises of one question whereas others comprise of two or more questions.

Table 4.1: Linking each indicator of the planning phase to its questions

Planning Phase		
Criteria	Indicators	Questions
Appropriate Technology	a. Level of Participation	1. Were you involved in selecting the toilet?
		2. How were you involved?
	b. Information Dissemination	3. Was enough information provided about each type of toilet?
		4. Do you understand how to use the facility?
		5. Do you believe that all user groups (children, disabled and others) will understand the use?
	c. User Acceptance	6. How satisfied are you with the toilet?
		7. How frequently do you use the toilet?
	d. Accommodation of Specific User Needs	8. Does the toilet offer you privacy?
		9. Does the toilet offer you dignity?
		10. Is the toilet appropriate for women?
		11. Is the toilet appropriate for children?
		12. Is the toilet appropriate for the elders?
		13. Is the toilet appropriate for the disabled?
		14. Are there separate facilities for male and female users?
	e. Accessibility of Location	15. Is the toilet facility close to you?

	f. Security	16. Is it safe to use the toilet?
		17. Are you able to use the toilet at night/after hours?
		18. Are there locks on the toilets?
	g. Socio-economic & Cultural Appropriateness	19. Does the toilet cater for your special religious needs?
		20. Does the toilet cater for your special cultural needs?
21. Can you afford to use the toilet?		
Ecological Technology	a. Environmental Protection	22. Will the toilet protect or pollute the environment?
	b. Reduced Child Contact with Human Waste	23. Will children have easy access in coming to contact with the human waste?
Sustainable Technology	a. Improved Human Health	24. Has the toilets resulted in less illnesses?
	b. Improved Environmental Conditions	25. Has the toilets resulted in a cleaner environment?
		26. Has the toilets resulted in less flies?
c. Economic Sustainability	27. Does using the toilets impact negatively on your income?	

4.2.1.2 Implementation Phase Questions

There are total of ten questions in the implementation phase. The majority of these questions are to be found under the criterion of participation. Table 4.2 below links each indicator of the implementation phase's three criteria to the questions informing it. The majority of the indicators comprise of one question with only a few comprising of two or three questions.

Table 4.2: Linking each indicator of the implementation phase to its questions

Implementation Phase		
Criteria	Indicators	Questions
Participation	a. Participation in Construction	28. Were you involved in the construction of the toilets?
	b. Remuneration for Participation	29. Were you paid for your involvement?
	c. Skills Training Provided	30. Were you trained in management/ construction of the facility?
	d. Demolishment/ Removal of Shacks	31. Was your shack of those that had to be removed?
32. Were you satisfied with that?		
33. Were you provided with assistance in reconstructing your shack?		
Understanding of Technology	a. Understanding of the Operational Requirements	34. Do you understand the operational requirements or how to use the facility?
User Awareness	a. Provision of Awareness Programmes	35. Did you receive training on good health and hygiene behaviour?
	b. Potential Benefits of Awareness Programmes	36. Are you able to train others on good health and hygiene behaviour?
		37. Do you practice what you have learnt in the training?

4.2.1.3 Post-implementation Phase Questions

There are total of seven questions in the post-implementation phase. All the questions are spread more or less equally across all criteria. Table 4.3 below links each indicator of the post-

implementation phase's four criteria to the questions informing it. The majority of the indicators comprise of one question with only one comprising of two questions.

Table 4.3: Linking each indicator of the post-implementation phase to its questions

Post-Implementation Phase		
Criteria	Indicators	Questions
Oversight and Ownership	a. Responsibility for Monitoring the Facility	38. Are you responsible for looking after and managing the toilets? 39. Can you manage the toilets if given the opportunity?
	b. Conflict Around Access	40. Is there conflict among the residents around access to the toilets?
Development Opportunities	a. Job Opportunities	41. Do the toilets provide a source of income for you?
User Awareness	a. Regular User Awareness	42. Are there regular user awareness programmes?
	b. Good Practice	43. Does the user awareness training lead to good practice?
Monitoring & Evaluation	a. Adequate Training of Community-based Monitors	44. Were you trained to do monitoring and evaluation?

4.2.1.4 Scoring and Weighting

a) Scoring

Each indicator is given a score between 0 and 10. This enables each response to each question to be scored and weighted. Thus a scale of 0 to 10 (figure 4.1) is used where a score of 0 would indicate no acceptance and a score of 10 would indicate absolute acceptance.

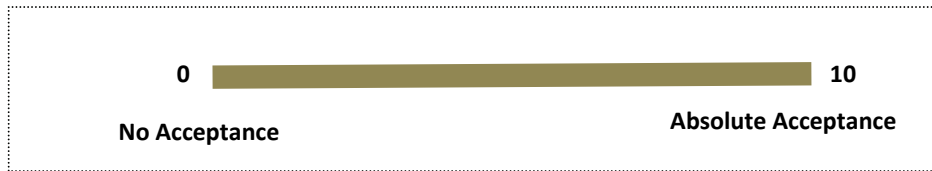


Figure 4.1: Scoring Scale

Initially the scoring scale was classified into three levels (low, medium, high). However, after testing in SPSS it was agreed that the scoring scale be classified into two levels of user acceptance as either *Low* (red-coded) or *High* (green-coded). Table 4.4 below indicates the level of user acceptance per score. The colour coding for low and high enables flagging of areas requiring attention.

Table 4.4: Levels of user acceptance

Low User Acceptance	0-5.99
High User Acceptance	6-10

The score for each indicator is a reflection of the statistical mean of its questions. The score for each criterion is a reflection of the statistical mean of its indicators. The score of each phase is a reflection of the statistical mean of its criteria. This approach is statistically valid as confirmed by a qualified statistician.

Having divided the framework into the three specific phases with its specific criteria and respective indicators allows for the assessor to detect exactly where the scoring was low. This would then allow for targeting specific areas for improvements in an on-going sanitation project in order to ensure greater user acceptance.

b) Weighting

The following is a breakdown of the weighting (in %) of each phase's criteria, and each criterion's indicator/s. The basis for determining the weighting of each criteria and indicators is a reflection of the literature review as well as field experience.

The explanation of the weighting is that all the criteria under a phase are weighted according to its importance to that phase. This is presented as a percentage of importance. Similarly, each indicator under each criterion is weighted according to its importance to that criterion. This is presented as a percentage of importance.

❖ *Phase 1: Planning*

- *Criteria A: Appropriate Technology* – This is weighted at **60%**, and comprises of the following indicators:
 - Indicator a: *Level of Participation* – This is weighted at **20%**
 - Indicator b: *Information Dissemination* – This is weighted at **5%**
 - Indicator c: *User Acceptance* – This is weighted at **30%**
 - Indicator d: *Accommodation of specific user needs* – This is weighted at **20%**
 - Indicator e: *Accessibility of location* – This is weighted at **10%**
 - Indicator f: *Security* – This is weighted at **10%**
 - Indicator g: *Socio-economic and cultural appropriateness* – This is weighted at **5%**

- *Criteria B: Ecological Technology* – This is weighted at **20%** and comprises of the following indicators:
 - Indicator a: *Environmental Protection* – This is weighted at **50%**
 - Indicator b: *Reduced child contact with human waste* – This is weighted at **50%**

- *Criteria C: Sustainable Technology* – This is weighted at **20%** and comprises of the following indicators:
 - Indicator a: *Improved human health* – This is weighted at **33.33%**
 - Indicator b: *Improved environmental conditions* – This is weighted at **33.33%**
 - Indicator c: *Economic sustainability* – This is weighted at **33.33%**.

❖ *Phase 2: Implementation*

- *Criteria A: Participation* – This is weighted at **20%** and comprises of the following indicators:
 - Indicator a: *Participation in construction* – This is weighted at **80%**
 - Indicator b: *Remuneration for participation* – This is weighted at **5%**
 - Indicator c: *Skills training provided* – This is weighted at **10%**
 - Indicator d: *Demolishment/ removal of shacks* – This is weighted at **5%**

- Criteria B: *Understanding of Technology* – This is weighted at **40%** and comprises of the following indicator:
 - Indicator a: *Understanding of the operational requirements* – This is weighted at **100%**

- Criteria C: *User Awareness* – This is weighted at **40%** and comprises of the following indicators:
 - Indicator a: *Provision of awareness programmes* – This is weighted at **70%**
 - Indicator b: *Potential benefits of awareness programmes* – This is weighted at **30%**.

- ❖ *Phase 3: Post-Implementation*
- Criteria A: *Oversight and Ownership* – This is weighted at **30%** and comprises of the following indicators:
 - Indicator a: *Responsibility for managing the facility* – This is weighted at **60%**
 - Indicator b: *Conflict around access* – This is weighted at **40%**

- Criteria B: *Development Opportunities* – This is weighted at **5%** and comprises of the following indicator:
 - Indicator a: *Job opportunities* – This is weighted at **100%**

- Criteria C: *User Awareness* – This is weighted at **30%** and comprises of the following indicators:
 - Indicator a: *Regular user awareness* – This is weighted at **70%**
 - Indicator b: *Good practice* – This is weighted at **30%**

- Criteria D: *Monitoring and Evaluation* – This is weighted at **35%** and comprises of the following indicator:
 - Indicator a: *Adequate training of community-based monitors* – This is weighted at **100%**.

4.2.2 Outcomes of the application of the framework

The questionnaires provided a rich data set, particularly if probing was allowed. Importantly, the questionnaires provided a degree of insight into the level of user acceptance of the MCSF. Further, the data output as produced through the Sanivey software enables a “dashboard” through a tree view of the three phases where problem phases are flagged. Further the tree view allows for identifying the problem criteria and problem indicators.

It is this dashboard which would be critically important for monitoring purposes of existing mobile communal sanitation facilities. Addressing the problem areas is important as user acceptance will influence the adequate functioning of the technology as based on the hypothesis of this study.

The following discussion presents the results generated from Sanivey for assessing user acceptance levels in the three case study sites. The general tree view (not the detailed tree view) as well as the grid view is presented for each case study site.

4.2.2.1 Cape Town: Pooke se Bos

The majority of the respondents from Pooke se Bos were male (73.33%). Figure 4.2 presents the tree view report for user acceptance in Pooke se Bos based on the field data collected. A quick glance at this view suggests that for the planning and implementation phases the level of user acceptance is high, but for the post-implementation phase there is a poor level of acceptance. However further anomalies occur if the individual phases are further expanded. This is possible to do in Sanivey itself, but for reproducing here becomes problematic. Instead the grid view is presented in table 4.5 in order to show the various anomalies.

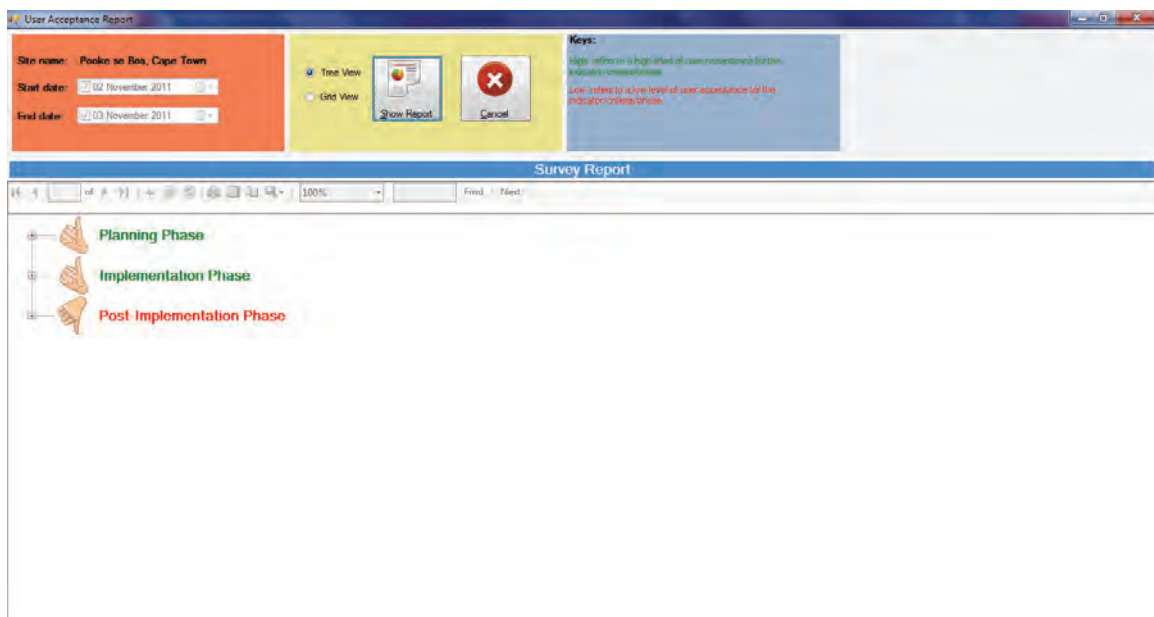


Figure 4.2: Tree View Report of Pooke se Bos

Table 4.5 reveal that all three criteria in the planning phase has a high level of acceptance. Similarly all indicators in this phase, except one (an indicator under the appropriate technology criteria), have a high level of acceptance. Strangely, although the implementation phase was not flagged in the tree view as problematic, two of the three criteria in this phase have a low user acceptance. Four of the seven indicators in this phase are flagged as having a low level of user acceptance. Although the post-implementation phase is flagged as having a low level of user acceptance there is a 50/50 distribution of high and low user acceptance between the phase's criteria. However, five of the phase's seven indicators are flagged as low.

Table 4.5: Grid view report of user acceptance in Pooke se Bos

Phase	Criteria	Indicator	Low Level	High Level
Planning	Appropriate Technology	Level of participation	93.33334	6.666664
		Information dissemination	33.33334	66.66666
		User Acceptance	26.66667	73.33333
		Accommodation of specific user needs	13.33333	86.66666
		Accessibility of location	16.66667	83.33333
		Security	10	90
		Socio-economic and cultural appropriateness	36.66667	63.33333
	Ecological Technology	Environmental protection	43.33333	56.66667
		Reduced child contact with human waste	33.33334	66.66666
	Sustainable Technology	Improved human health	23.33333	76.66666
		Improved environmental conditions	40	60
		Economic sustainability	3.333333	96.66666
Implementation	Participation	Participation in construction	90	10
		Remuneration for participation	66.66667	33.33333
		Skills training provided	93.33334	6.666664
		Demolishment/Removal of shacks	16.66667	83.33333
	Understanding of Technology	Understanding of the operational requirements	46.66667	53.33333
	User Awareness	Provision of awareness programmes	43.33333	56.66667
		Potential benefits of awareness programmes	73.33334	26.66666
Post-Implementation	Oversight and Ownership	Responsibility for managing the facility	10	90
		Conflict around access	100	0
	Development Opportunities	Job opportunities	26.66667	73.33333
	User Awareness	Regular user awareness	100	0
		Good practice	86.66666	13.33334
	Monitoring and Evaluation	Adequate training of community-based monitors	53.33334	46.66666

4.2.2.2 Stellenbosch: Kayamandi

The majority of the respondents from Kayamandi were also male (55.32%), and the majority were youth. This is a reflection of the high unemployment (74.47% of respondents) in the area. Figure 4.3 presents the tree view report for user acceptance in Kayamandi based on the field data collected. A quick glance at this view suggests that for the planning and implementation phases the level of user acceptance is high, but for the post-implementation phase there is a poor level of acceptance. However further anomalies occur if the individual phases are further expanded, which is reflected in table 4.6.

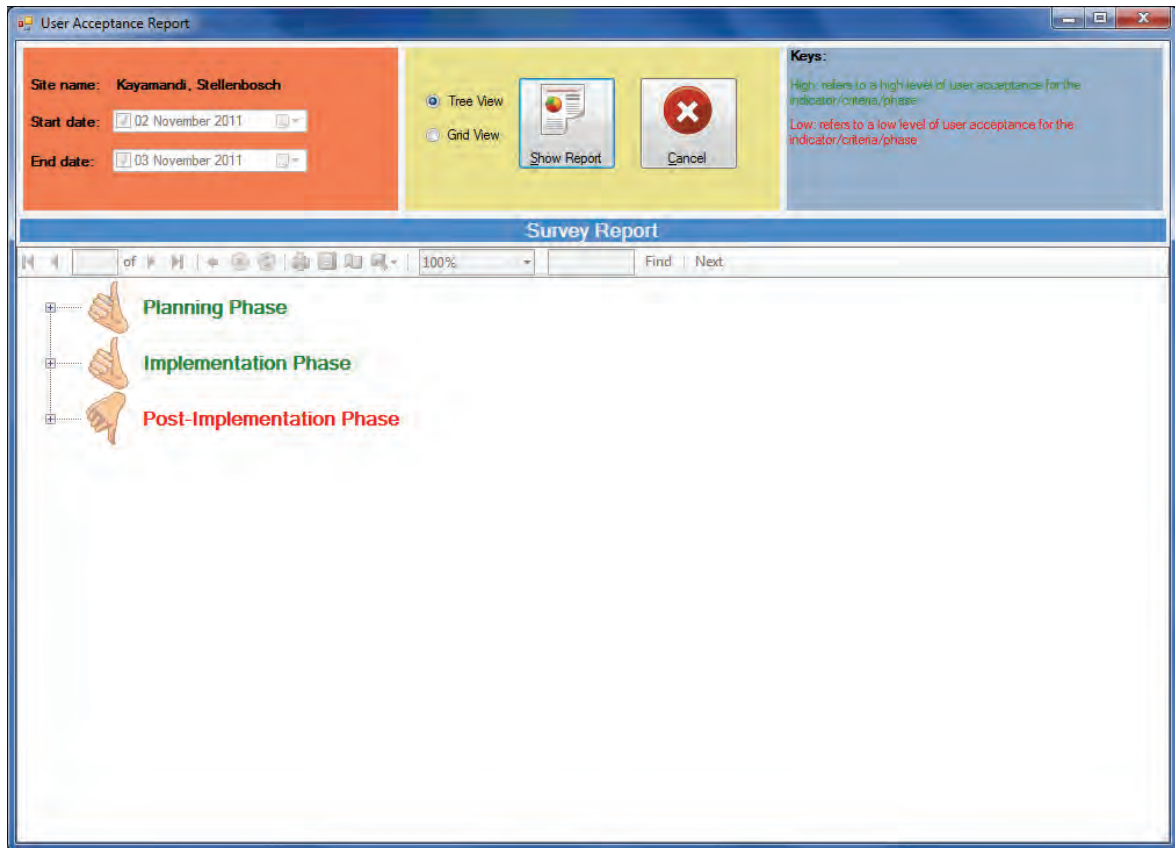


Figure 4.3: Tree View Report of Kayamandi

Table 4.6 reveal that two of the three criteria in the planning phase have a high level of acceptance. The eleven indicators in this phase are very closely split between high (7 indicators) and low (5 indicators). Similarly in the implementation phase two of the three criteria in this phase have a high user acceptance. However, four of the seven indicators in this phase are flagged as having a low level of user acceptance. The criteria and indicators in the post-implementation are reflective of the phase's red flag. Interestingly however, the one criterion which has a high level of acceptance has both its indicators flagged as red.

Table 4.6: Grid View Report of user acceptance in Kayamandi

Phase	Criteria	Indicator	Low Level	High Level
Planning	Appropriate Technology	Level of participation	96	4
		Information dissemination	74	26
		User Acceptance	50	50
		Accommodation of specific user needs	34	66
		Accessibility of location	24	76
		Security	48	52
		Socio-economic and cultural appropriateness	30	70
	Ecological Technology	Environmental protection	42	58
		Reduced child contact with human waste	40	60
	Sustainable Technology	Improved human health	50	50
		Improved environmental conditions	60	40
		Economic sustainability	2	98
Implementation	Participation	Participation in construction	92	8
		Remuneration for participation	50	50
		Skills training provided	94	6
		Demolishment/Removal of shacks	0	100
	Understanding of Technology	Understanding of the operational requirements	0	100
	User Awareness	Provision of awareness programmes	0	100
Potential benefits of awareness programmes		92	8	
Post-Implementation	Oversight and Ownership	Responsibility for managing the facility	56	44
		Conflict around access	44	56
	Development Opportunities	Job opportunities	64	36
	User Awareness	Regular user awareness	94	6
		Good practice	90	10
	Monitoring and Evaluation	Adequate training of community-based monitors	90	10

4.2.2.3 eThekweni, Shembe: Inanda

The majority of the respondents from Shembe are female (60%) and the majority were youth. Figure 4.4 presents the tree view report for user acceptance in Kayamandi based on the field data collected.

A quick glance at this view suggests that for the planning and implementation phases the level of user acceptance is high, but for the post-implementation phase there is a poor level of acceptance. However further anomalies occur if the individual phases are further expanded, which is reflected in table 4.7.

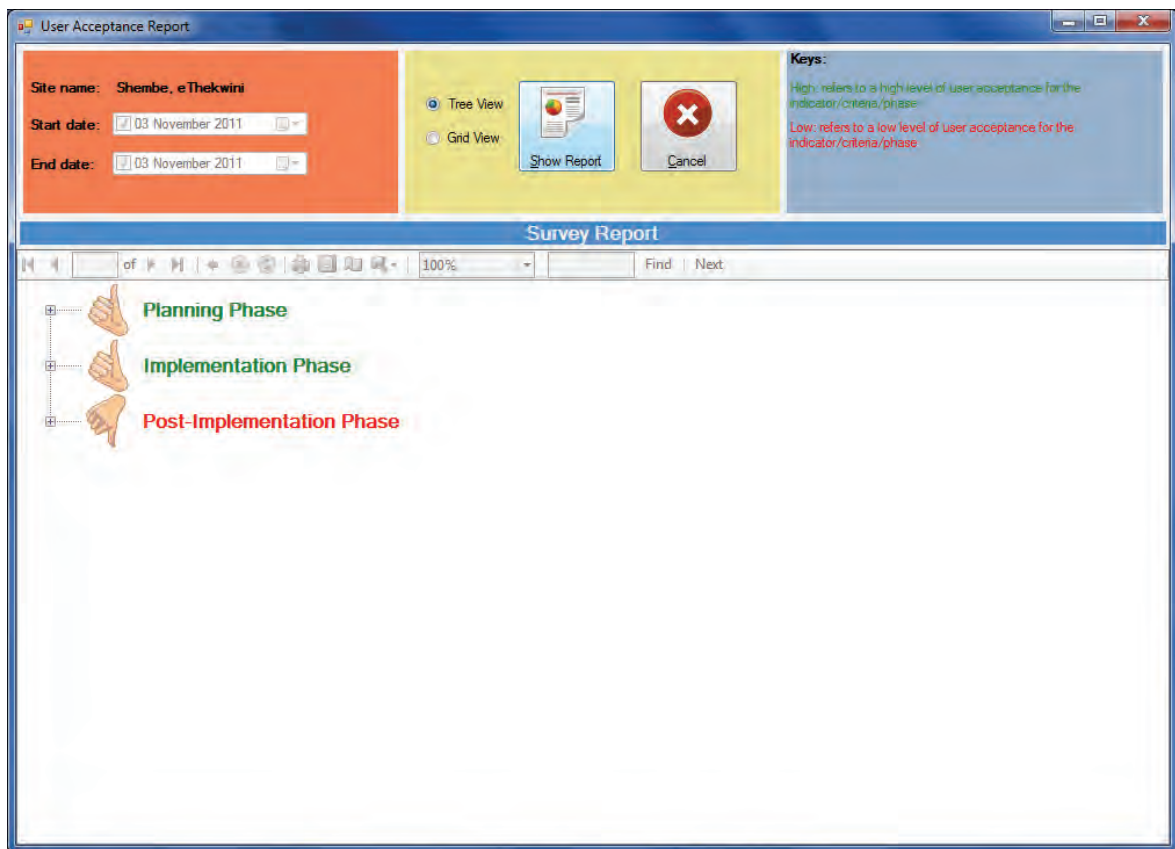


Figure 4.4: Tree View Report of Shembe

Table 4.7 reveal that all of the three criteria in the planning phase have a high level of acceptance. Only three of the eleven indicators in this phase have a low level of acceptance. In the implementation phase two of the three criteria have a high user acceptance, with one having a low level of acceptance. However, four of the seven indicators in this phase have a high level of user acceptance, with three indicators having a low level of user acceptance. In the post-implementation phase the criteria are equally split between high (2) and low (2) user acceptance. Similarly, the indicators in this phase are equally split between high (3) and low (3) user acceptance.

Table 4.7: Grid view report of user acceptance in Shembe

Phase	Criteria	Indicator	Low Level	High Level
Planning	Appropriate Technology	Level of participation	92	8
		Information dissemination	8	92
		User Acceptance	32	68
		Accommodation of specific user needs	12	88
		Accessibility of location	68	32
		Security	92	8
		Socio-economic and cultural appropriateness	12	88
	Ecological Technology	Environmental protection	12	88
		Reduced child contact with human waste	28	72
	Sustainable Technology	Improved human health	36	64
		Improved environmental conditions	40	60
		Economic sustainability	4	96
Implementation	Participation	Participation in construction	76	24
		Remuneration for participation	33.34	66.66
		Skills training provided	92	8
		Demolishment/Removal of shacks	4	96
	Understanding of Technology	Understanding of the operational requirements	0	100
	User Awareness	Provision of awareness programmes	0	100
		Potential benefits of awareness programmes	64	36
Post-Implementation	Oversight and Ownership	Responsibility for managing the facility	72	28
		Conflict around access	12	88
	Development Opportunities	Job opportunities	84	16
	User Awareness	Regular user awareness	48	52
		Good practice	40	60
	Monitoring and Evaluation	Adequate training of community-based monitors	76	24

4.3 Assessment of the Functioning

4.3.1 The application of the framework

Similar to the user acceptance, the framework was applied in the context of the three case study IS by mean of interviews with users. A questionnaire (covering each phase of the framework) was developed (refer to appendix E for details) and administered to users in order to collect their opinion regarding the functioning of the MCSF in their respective settlements. During the interview, questions were explained to the respondent before asking to answer. Users were requested to respond by yes or no or don't know.

A “yes” answer was considered as an indication of user’s knowledge or understanding of the situation of the facility and what need to be done to enhance functioning. The “no” answer was considered as lack of knowledge or understanding, while “don't know” was considered as missing information, and thus assimilated to no answer. These answers were later translated into adequate, inadequate or not applicable (when the user was uncertain or unable to express any opinion in this regard).

The adequate and inadequate answers (in this context of functioning) refer respectively to positive practice or attitude leading towards adequate functioning of the facility and bad practice and negative issues or attitudes that may lead to the inadequate functioning of the facility.

4.3.1.1 The planning phase questions

This phase of the framework entitles an assessment of the sanitation situation in the settlement, outline problem and more importantly the status of the land prior to design of a sanitation technology. Once these aspects are covered, a situational analysis should be done in order to decide on potential sanitation technology features. Effective planning enables the implementation phase during which the selected option is implemented or piloted in order to develop appropriate models for each particular context that may be replicated.

This first phase of the framework was intended to assess the sanitation problem in IS, evaluate and select available options and discuss this with stakeholders. To achieve this, a questionnaire (table 1 below) was developed and administered to users.

Table 4.8: Linking each indicator of the planning phase to its questions

Criteria	Indicators	Questions
<i>Status of the sanitation</i>	1. Status of the land	1. Do you know to whom this land belong to?
	2. Access to sanitation	2. Did you have access to sanitation prior to the provision of the current sanitation?
	3. Status of sanitation in settlement	3. Was the condition of previous sanitation facility conducive for proper use?
	4. Causes of sanitation problems	4. Do you have any knowledge regarding possible causes of failures of the sanitation facility?
	5. Consequences of inadequate sanitation practice	5. Did the lack or inadequacy of the sanitation system have an impact on you?
<i>Sanitation</i>	6. User Participation in the technology	6. Did you participate in the selection of the

<i>technology selection</i>	choice	sanitation technology options for your settlement?
	7. Presentation of the sanitation information	7. Did the municipality reveals or presents the design of selected technology to users?
	8. User reaction to the selected technology	8. Did the community shows happiness when the sanitation facility was presented?
	9. Knowledge of number potential users	9. Do you have knowledge of number of users the sanitation is designed for?
	10. Alternative suggestions from users	10. Did you suggest any alternative to the proposed sanitation?
	11. Consideration of User Suggestions	11. Did the municipality consider your advices and preferences?
<i>Appropriateness</i>	12. Suitability of location	12. Is the location of the facility suitable for all users groups?
	13. Ease of O&M (technical appropriateness)	13. Following the presentation, do you think the facility will be easy to operate and maintain?
<i>Users Awareness</i>	14. Inclusion of User Awareness Programme	14. Did the municipality propose a users' education programme?
	15. Responsibility of Awareness Programme	15. Do you believe that the municipality should take of the awareness programme?
	16. Users responsibility of Awareness Programme	16. Can community be responsibility of the awareness programme if municipality not available?
	17. User Suggestions	17. Did you suggest any other programme intended to enhance the functioning of the facility to the municipality?

4.3.1.2 *The implementation phase*

This phase of the framework includes the sanitation technology option, the infrastructure development, and the most importantly the operational requirements. For assessing the functioning of the MCSF, respondents were requested to respond to the questions outlined in table 3 (below) by indicating whether:

- They know the type of sanitation provided
- If the proposed location of the sanitation facility is adequate
- If the facility can accommodate all user' groups
- If the facility is solid enough to handle large number of users
- If the facility is easy to use
- How can the non-compliance with operational requirements impact on the functioning
- They can suggest measures to be instated to ensure compliance with operational requirements
- If the facility is easy to operate and maintain

Table 4.9: Linking each indicator of the implementation phase to its questions

<i>Sanitation technology option</i>	18. Knowledge of the type of technology provided	18. Do you know what type of sanitation technology is being used in the settlement?
<i>Infrastructure development</i>	19. Location of the facility	19. Are you satisfied with the current location of the facility?
	20. Suitability to all user groups	20. Is the selected location suitable for all users groups?
	21. Robustness of technology	21. Is the sanitation facility solid enough to handle large number of users?
<i>Operational requirements</i>	22. Ease of use	22. Following the use of the facility, do you understand now the operational requirements?
	23. Impact on non-compliance on functioning	23. Does the non-compliance with operational requirements impact on the functioning of the facility?
	24. Suggestions for enhancing compliance	24. Can something be done to ensure compliance with operational requirements if these affect the functioning of the sanitation?
	25. Ease of operation and maintenance	25. Are the operational requirements of the sanitation making the O&M easy for the caretaker?

4.3.1.3 The post-implementation phase

This phase of the framework was intended to assess whether the provided technology works as intended. Hence, this phase was found to be the most important as it may provide an indication of success or failure of the technology.

During the exploration of the MCSF at the three case study sites, users were requested to respond to the questions presented in the table below. As indicated in previous sections (planning and implementation), users were requested to indicate whether they have knowledge or understanding of the indicator believed to impact on the functioning of the facility.

Table 4.10: Linking each indicator of the post-implementation phase to its questions

Criteria		Questions
<i>Operation and Maintenance</i>	26. Knowledge of operation and maintenance tasks	26. Do you believe that cleaning, sweeping, unblocking, disinfecting and fixing leaks are to be performed to keep the facility in good and serviceable condition?
	27. Strategies for ensuring adequate functioning	27. Do you think that regular maintenance can ensure adequate functioning of the facility?
	28. User participation in the operation and maintenance	28. Do you think that the users should participate in the O&M of the facility?
	29. User contribution in operation and maintenance	29. Can users offer any contribution in the O&M of the facility?
	30. User responsibility for the operation and maintenance	30. Can users take responsibility for the O&M of the facility?
	31. Support requirements for	31. If users will take responsibility for O&M,

	participation	may you need support from the municipality for achieving the O&M tasks?
<i>Monitoring and Evaluation</i>	32. Manageability of the facility	32. Is the sanitation facility easy to manage?
	33. Ease of monitoring	33. Is the sanitation facility easy to monitor?
	34. Knowledge of monitoring and evaluation criteria	34. Do you have idea of criteria that can be used to monitor and evaluate the condition of the facility?
	35. Local management of the facility	35. Can users manage the facility on their own?
	36. Monitoring and evaluation protocol	36. Is the M&E protocol in place at the facility?
<i>Users issues</i>	37. Problems encountered	37. Have you ever encounter problems related to the design of the facility?
	38. Reporting protocol	38. Did you report any problem? To whom and how?
	39. Response time to address problems	39. Did the municipality respond to the problems reported?

4.3.1.4 Scoring and weighing

The framework comprises three phases' namely planning, implementation and post-implementation. To each phase correspond a number of criteria and to each criterion number of indicators (from the original questionnaire) are assigned. Indicators under each criterion are provided in order of priority and weighted according to its importance on informing the functioning of the facility. The weighing for each criterion and indicator are presented in the table below.

a) Planning

The planning phase include in order of priority the status of sanitation followed by other three criteria of equal weight namely sanitation technology selection, appropriate sanitation technology and user awareness.

Table 4.11: Prioritisation and weighing of the planning phase criterion and indicators

Criteria	Functioning Indicators	Weighting	
		Priority	(%)
Status of the Sanitation (40%)	Status of the land	3	10
	Access to sanitation	1	30
	Status of sanitation in settlement	2	30
	Causes of sanitation problems	4	20
	Consequences of inadequate sanitation practice	5	10
Sanitation Technology Selection (20%)	User Participation in the technology choice	1	30
	Presentation of the sanitation information	2	25
	User reaction to the selected technology	6	15
	Knowledge of number potential users	5	5
	Alternative suggestions from users	3	15
	Consideration of User Suggestions	4	10
Appropriate Technology (20%)	Suitability of location	2	30
	Ease of O&M (technical appropriateness)	1	70
User Awareness (20%)	Inclusion of User Awareness Programme	1	40
	Responsibility of Awareness Programme	3	30
	Users responsibility of Awareness Programme	4	15
	User Suggestions	2	15

b) Implementation

The implementation phase comprises 3 criteria that cover about 8 indicators. The most important criterion for this phase was found to be the operational requirements, followed by the infrastructure development and lastly the sanitation technology option.

Table 4.12: Prioritisation and weighing of the implementation phase criterion and indicators

Criteria	Functioning Indicators	Weighting	
		Priority	(%)
Sanitation Technology Option (15%)	Knowledge of type of technology provided	1	100
Infrastructure Development (35%)	Location of Facility	2	30
	Suitability to all user groups	3	30
	Robustness of Technology	1	40
Operational Requirements (50%)	Ease of Use	1	30
	Impact of Non-Compliance on Functioning	3	15
	Suggestions for Enhancing Compliance	4	25
	Ease of Operation & Maintenance	2	30

c) Post-implementation

This phase is intended to provide information to the service provide regarding the status of the facility by highlighting areas of concern. The priority driver was found to be the operation and maintenance, followed by the monitoring and evaluation and lastly the user issues that emerge from the daily use and operation of the facility.

Table 4.13: Prioritisation and weighing of the post-implementation phase criterion and indicators

Criteria	Functioning Indicators	Weighting	
		Priority	(%)
Operation & Maintenance (60%)	Knowledge of O&M tasks	1	35
	Strategies for ensuring adequate functioning	2	15
	User Participation in the O&M	4	15
	User contribution in O&M	5	10
	User responsibility for the O&M	3	15
	Support Requirements for Participation	6	10
M & E 5 (25%)	Manageability of the facility	2	15
	Ease of Monitoring	3	20
	Knowledge of M&E Criteria	1	35
	Local Management of the facility	5	15
	M&E Protocol	4	15
User Issues (15%)	Problems Encountered	1	40
	Reporting Protocol	2	30
	Response Time to Address Problems	3	30

4.3.2 Outcomes of the application of the framework

The application of the framework was a challenging experience that requires an understanding and respect of users' views and perceptions. Through the application of the framework, it was expected users' outputs that can be used as evidence of their knowledge or understanding of the sanitation problem, root causes, solutions to the problem and strategies to deal with the problem.

The assessment of users' knowledge and understanding of issues outlined below were intended to enhance the functioning of the MCSF in context. For instance, users' were expected to provide answers that show their attitudes or behaviour of contributing nature towards adequate functioning.

Similar to the user acceptance, the questionnaires (that was developed) provide a rich data set that highlight the functioning of the MCSF in the context of the case study sites. Importantly, the questionnaires provide a degree of insight into the level of functioning of the MCSF. Further, the data output as produced through the Sanivey software enables a "dashboard" through a tree view of the three phases where problem phases are flagged. Further the tree view allows for identifying the problem criteria and problem indicators that can be used for monitoring purposes while addressing the problem areas with the intention of ensuring adequate functioning of the MCSF,

The following discussion presents the results generated from Sanivey for assessing the functioning of MCSF in the three case study sites. The general tree view (not the detailed tree view) as well as the grid view is presented for each case study site.

4.3.2.1 Cape Town: Pooke se Bos

The use of the Sanivey to analyse the functioning of the MCSF (from user perspectives) has provided details of issues that requires attention. A quick look at the table 4.14 below provides an indication of the real issues happening in this particular settlement.

a) Planning phase

From the planning phase, results obtained indicate that users are lacking sufficient knowledge regarding the status of the sanitation within the settlement, the knowledge of the number of potential user of the facility; whether their suggestions were considered.

Table 4.14: Grid view report of the planning phase of the MCSF in Pooke se Bos

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
Planning	Status of the Sanitation	Status of the land	70	20	10
		Access to sanitation	90	10	0
		Status of sanitation in settlement	3.3	93.4	3.3
		Causes of sanitation problems	93.3	0	6.7
		Consequences of inadequate sanitation practice	100	0	0
	Sanitation Technology Selection	User participation in the technology choice	80	10.3	6.67
		Presentation of the sanitation information	53.3	36.7	10
		User reaction to the selected technology	86.7	6.6	6.7
		Knowledge of the number of potential users	33.3	66.7	0
		Alternative suggestions from users	23.3	66.7	10
		Consideration of the user suggestions	0	86.7	13.3
	Appropriate Technology	Suitability of the location	63.3	23.3	13.4
		Ease of operation and maintenance	40	30	30

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
		(technical appropriateness)			
	User Awareness	Inclusion of a user awareness programme	53.3	30	16.7
		Responsibility of the awareness programme	80	13.3	6.7
		User's responsibility for the awareness programme	26.6	66.7	6.7
		User suggestions	0	100	0

b) Implementation phase

In the implementation phase, results (in table 4.15 below) show that several users don't have adequate knowledge regarding the impacts of non-compliance with the operational requirements on the functioning of the facility. Results show adequate functioning throughout this phase of the sanitation cycle. However, one indicator (under the operational requirements criterion) was flagged inadequate as most of respondents indicated not being aware of the impact on non-compliance with the operational requirements on the functioning of the MCSF.

Table 4.15: Grid view report of the implementation phase of the MCSF in Pooke se Bos

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
Implementation	Sanitation Technology Option	Knowledge of the type of technology provided	46.7	10	43.3
		Location of the facility	56.7	36.6	6.7
	Infrastructure Development	Suitability to all user groups	53.3	30	16.7
		Robustness of technology	90	0	10
		Ease of use	96.7	3.3	0
	Operational Requirements	Impact on non-compliance on functioning	6.7	0	93.3
		Suggestions for enhancing compliance	93.3	6.7	0
Ease of operation and maintenance		90	0	10	

c) Post-implementation phase

The post-implementation phase results show the lack of user support for the O&M of the facility and lack of considerations of user issues emerging (that include the problem encountered while using the facility, reporting protocol and response time to address the problem) from the daily operation of the facility.

Results (presented in table 4.16 below) show that one criterion and 13 indicators being flagged as problem areas that require attention. Despite these issues, the overall perception emerging from the analysis of the results (using Sanivey) indicate adequate functioning of the MCSF throughout the 3 phases of the framework; and suggest that issues flagged should be addressed in order to prevent breakdown that may lead to the dysfunction of the facility.

Table 4.16: Grid view report of the post-implementation phase of the MCSF in Pooke se Bos

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
Post-Implementation	Operation Maintenance	Knowledge of operation and maintenance tasks	90	0	1
		Strategies for ensuring adequate functioning	66.7	0	33.3
		User participation in the operation and maintenance	60	40	0
		User contribution in operation and maintenance	23.3	66.7	10
		User responsibility for the operation and maintenance	13.3	73.4	13.3
		Support requirements for participation	36.7	50	13.3
	Monitoring and Evaluation	Manageability of the facility	93.3	0	6.7
		Ease of monitoring	80	13.3	6.67
		Knowledge of monitoring and evaluation criteria	80	16.7	3.3
		Local management of the facility	66.7	3.3	30
		Monitoring and evaluation protocol	93.3	0	6.67
	User Issues	Problems encountered	40	50	10
		Reporting protocol	16.7	83.3	0
		Response time to address problems	0	13.3	86.7

4.3.2.2 Stellenbosch: Kayamandi

The table 4.4 below suggests that the planning phase was inadequate due to several issues that have been flagged as of concern for the adequate functioning of the MCSF in this settlement. Looking closely at this phase, results suggest that the status of the sanitation (referring to access, status of the MCSF and causes of the sanitation problem), sanitation technology selection (with regard to presentation of the sanitation technologies options to users and considerations of alternatives suggestions) were not adequately covered, thus not conducive to the adequate functioning of the MCSF in this context.

In contrast (to the planning phase), the implementation phase results show that the process of adequately followed and covered, thus conducive to the appropriate functioning of the facility. The post-implementation phase was also adequate despite certain issues that have been flagged. Flagged issues are related to the O&M (in terms user responsibility and support requirements), M&E (easiness of monitoring the facility) and user issues (in terms of problem encountered and response time to address the problem).

In total 2 criteria and 13 indicators are flagged up as areas of concern that require attention. These results suggest that the planning phase should be taken seriously and certain indicators of the post implementation phase should be addressed if the adequate functioning of the MCSF need to be achieved to meet user needs.

Table 4.17: Grid view report of the functioning of the MCSF in Kayamandi

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
Planning	Status of the Sanitation	Status of the land	54	30	16
		Access to sanitation	12	76	12
		Status of sanitation in settlement	0	84	16
		Causes of sanitation problems	0	100	0
		Consequences of inadequate sanitation practice	70	5	28
	Sanitation Technology Selection	User participation in the technology choice	52	34	14
		Presentation of the sanitation information	18	72	10
		User reaction to the selected technology	86	14	0
		Knowledge of the number of potential users	52	48	0
		Alternative suggestions from users	4	90	6
		Consideration of the user suggestions	2	0	98
	Appropriate Technology	Suitability of the location	64	30	6
		Ease of operation and maintenance (technical appropriateness)	92	0	8
	User Awareness	Inclusion of a user awareness programme	76	0	24
		Responsibility of the awareness programme	90	8	2
		User's responsibility of the awareness programme	6	92	2
		User suggestions	2	98	0
Implementation	Sanitation Technology Option	Knowledge of the type of technology provided	100	0	0
	Infrastructure Development	Location of the facility	62	26	12
		Suitability to all user groups	68	24	8
		Robustness of technology	92	6	2
	Operational Requirements	Ease of use	98	0	2
		Impact on non-compliance on functioning	70	0	30
		Suggestions for enhancing compliance	84	14	2
Ease of operation and maintenance		90	6	4	
Post-Implementation	Operation Maintenance	Knowledge of operation and maintenance tasks	66	28	6
		Strategies for ensuring adequate functioning	90	6	4
		User participation in the operation and maintenance	54	22	24
		User contribution in operation and maintenance	56	0	44

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
		User responsibility for the operation and maintenance	28	70	2
		Support requirements for participation	32	6	62
	Monitoring and Evaluation	Manageability of the facility	50	42	8
		Ease of monitoring	46	46	8
		Knowledge of monitoring and evaluation criteria	86	0	14
		Local management of the facility	54	26	20
		Monitoring and evaluation protocol	92	0	8
	User Issues	Problems encountered	46	48	6
		Reporting protocol	60	20	20
		Response time to address problems	20	0	80

4.3.2.3 eThekweni: Shembe – Inanda

The analysis of results obtained for this particular settlement show that all phases of the framework were adequately covered despite some criteria or indicators that were flagged up. In general, only two criteria namely the sanitation technology option (in the implementation phase) and the user issues (in the post-implementation phase) were flagged. A total number of 10 indicators (across various criteria) were flagged up as well.

a) Planning phase

The planning phase was characterized by adequate functioning in general as all criteria were flagged adequate. The detail analysis of each phase, however, indicates that some indicators under the status of the sanitation and sanitation technology selection criteria were flagged as areas of concern that need attention.

b) Implementation phase

The implementation phase has three criteria, two of which were flagged adequate while the third was flagged inadequate. Further analysis shows that 52% of respondents don't have knowledge of the type of sanitation being provided. The lack of knowledge amongst user was found to be one of the causes for his criterion being flagged inadequate.

c) Post-implementation phase

Like other phases, the post-implementation phase was also flagged as adequate despite having one indicator under the operation and maintenance criteria and the entire user issue criterion being flagged inadequate. The analysis of the user issue criterion shows that all indicators are flagged inadequate; this shows the lack of consideration from the service provide and the extent of the service being provided.

In view of results presented in table 4.18 below, it can be seen that the case study site was the most consistent one in term of the implementation and functioning of the MCSF given that all phases of the framework were adequately covered despite few indicators that need attention.

Table 4.18: Grid view report of the functioning of the MCSF in Shembe – Inanda

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
Planning	Status of the Sanitation	Status of the land	100	0	0
		Access to sanitation	100	0	0
		Status of sanitation in settlement	4	96	0
		Causes of sanitation problems	24	72	4
		Consequences of inadequate sanitation practice	100	0	0
	Sanitation Technology Selection	User participation in the technology choice	52	8	40
		Presentation of the sanitation information	52	4	44
		User reaction to the selected technology	88	8	4
		Knowledge of the number of potential users	56	40	4
		Alternative suggestions from users	24	60	16
		Consideration of the user suggestions	0	20	80
	Appropriate Technology	Suitability of the location	92	0	8
		Ease of operation and maintenance (technical appropriateness)	100	0	0
	User Awareness	Inclusion of a user awareness programme	64	20	16
		Responsibility of the awareness programme	40	32	28
		User's responsibility of the awareness programme	60	32	8
		User suggestions	0	100	0
Implementation	Sanitation Technology Option	Knowledge of the type of technology provided	44	52	4
	Infrastructure Development	Location of the facility	80	12	8
		Suitability to all user groups	56	40	4
		Robustness of technology	88	8	2
	Operational Requirements	Ease of use	100	0	0
		Impact on non-compliance on functioning	52	44	4
		Suggestions for enhancing compliance	100	0	0
		Ease of operation and maintenance	100	0	0
Post-Implementation	Operation Maintenance	Knowledge of operation and maintenance tasks	88	8	4
		Strategies for ensuring adequate functioning	56	16	28
		User participation in the operation and maintenance	68	4	28
		User contribution in operation and maintenance	80	4	16
		User responsibility for the operation and maintenance	48	48	4
		Support requirements for participation	68	12	20

Phase	Criteria	Indicator	Adequate	Inadequate	Missing
	Monitoring and Evaluation	Manageability of the facility	96	4	0
		Ease of monitoring	100	0	0
		Knowledge of monitoring and evaluation criteria	84	0	16
		Local management of the facility	68	4	28
		Monitoring and evaluation protocol	84	0	16
	User Issues	Problems encountered	12	88	0
		Reporting protocol	20	80	0
		Response time to address problems	8	92	0

4.4. Findings of the application of the framework

4.4.1 Results of the application of the framework

The reports generated by Sanivey provide a quick and easy overview of the site specific situation around user acceptance of MCSF. It enables researchers, municipal officials, NGO practitioners as well as community leaders and members to track which areas in the user acceptance or functioning framework for MCSF require urgent attention.

4.4.1.1 User acceptance

The tree views for the case studies under study reveal that for all three case study areas, the planning and implementation phases received an overall high (or acceptable) level of user acceptance. However, for all case study areas, the post-implementation phase was flagged as problematic with an overall low (or unacceptable) level of user acceptance.

However, although the planning and implementation phases received a “thumbs up” across all case study sites, a closer investigation (either by expanding the tree view or by viewing the grid view) reveal that within the planning and implementation phases there are certain criteria and indicators which require attention. A further detailed analysis therefore becomes possible.

By comparing the tree and grid views of the three different case study sites, certain patterns emerge that allows for some generalization around User Acceptance of MCSF. These are discussed later under emerging trends.

4.4.1.2 Functioning

From functioning perspective, the overall view emerging from the application of the Sanivey software shows that all phases of the framework were adequately covered except the planning phase (in Kayamandi) that was flagged as inadequate due to various criteria and indicators that were not adequately covered.

The implementation and post-implementation phases receive thumb up across all case study sites while the planning receive thumb down in Kayamandi.

Looking the overall results across the case study sites, the following issues (under each phase) emerge:

a) Planning

From the planning phase, it was found that the access and status of the sanitation in the settlement, knowledge of the number of potential users, alternative suggestions from users, consideration of the user suggestions, user's responsibility of the awareness programme and user suggestions were recurrent at all case study sites. In addition to these, the causes of sanitation problems and the presentation of the sanitation information to the user group were flagged as secondary issues that emerged as well.

b) Implementation

Despite several issues flagged in the planning phase, the implementation phase was found generally to be adequate across all case study sites. Recurring issues that were found are related to the impact of non-compliance with operational requirements on the functioning and the knowledge of the type of technology provided. These issues are specific to certain case studies but the extent of its occurrence was variable.

c) Post-implementation

The post-implementation phase was characterised by several recurrent issues across the case study sites; these include the user contribution and responsibility in operation and maintenance, support requirements, problem encountered, reporting protocol and response time to address reported problems.

4.4.2 Comparison of case study results

4.4.2.1 User acceptance

In general, the level of user acceptance of MCSF across the three case study sites was satisfactorily high. Comparatively across the case study sites, eThekweni attained the highest level of user acceptance, followed by Pooke se Bos, Cape Town. Kayamandi in Stellenbosch had the lowest level of user acceptance among the three sites.

The case study results reflect a general consistency around the areas of concern for improvement to increase the levels of user acceptance of MCSF in informal settlements of South Africa. The areas of concern are indicative of attention to the elements of user participation and influence. This displays itself across the various phases of the sanitation cycle as follow:

a) Planning

Problem areas (based on the indicators and/or criteria flagged – tables 6.1 and 6.2) occur at the criteria of Appropriate Technology (user participation) and Sustainable Technology (user influence);

b) Implementation

Problem areas (based on the indicators and/or criteria flagged – tables 6.1 and 6.2) occur at the criteria of Participation (user participation) and User Awareness (user influence);

c) Post-Implementation

Problem areas (based on the indicators and/or criteria flagged – tables 6.1 and 6.2) occur at the criteria of Oversight and Ownership (user influence), Development Opportunities (user participation), and User Awareness (user influence).

4.4.2.2 Functioning

a) Planning

Looking across the case study sites, the planning phase was characterized by several issues that were flagged up. According to analysis, throughout the three case study site the status of the sanitation and access were inadequate, the number of potential user of the sanitation was not known and the causes of the sanitation problems were known by users but no action was taken. In addition, alternative suggestions from users were not considered, the lack of user responsibility for the awareness programme are amongst key issues that emerge.

The large number of issues flagged in this phase outline the sanitation problems faced IS dwellers and difficulties municipalities are facing in providing adequate services. Hence, considering these issues will ensure the adequate functioning of the MCSF if deployed within these settlements.

b) Implementation

The implementation phase was found to be the least problematic as few issues were flagged by the Sanivey. In Cape Town (Pooke se Bos) for example, the impact of non-compliance with operational requirements on the functioning of the facility was flagged as weakest point of this phase that should be carefully considered if the facility needs to be adequately functioning.

In contrast, the knowledge of the type of technology provided was found to be a key issue of concern flagged by the Sanivey. A thorough analysis of this issue indicates that the lack of knowledge regarding the type of sanitation technology may impact the adequate use of the facility, thus impact on the general functioning. Hence, this concern was flagged and suggested to be taken into account.

c) Post-implementation

As one of the most important phase of the sanitation cycle, several issues emerged through the analysis generated by the Sanivey. These issues include the user responsibility for the O&M of the facility, lack of support requirements for user participation and responsibility in the O&M of the facility, lack of attention to reported problems, reporting protocol, response time to address the problems reported.

From this analysis, it can be said that the lack of user involvement in the O&M, bottle neck protocol and lack of attention to user issues may affect the functioning of the MCSF or any other sanitation technology. Therefore, attending to these issues will ensure adequate functioning the MCSF and increase user acceptance.

4.4.3 Interpretation of the results

The Sanivey was intentionally developed to provide an easy reading of the results obtained from the application of the framework. Upon the completion of the survey, the Sanivey will summarise the results into two views namely grid view and three view. Each of these view highlighted red or green that represents respectively area of concern and non-problem areas.

4.4.3.1 User acceptance

For user acceptance, the high score (in term of percentage) represent the high level of user acceptance for a particular phase, criteria or indicator and is often flagged green. This means that the high level of user acceptance can be read by the highest score obtained by a given indicator, and criterion.

4.4.3.2 Functioning

The adequate functioning of the MCSF is achieved (from user perspectives) through behaviour and attitudes with regard to their use of the facility, level of awareness and consideration of the facility in general. Results emerging from the Sanivey should be interpreted in terms of percentage of user who show an understanding or attitude towards adequate functioning of the facility and those showing attitudes and behavior that may impact on the functioning of the facility.

The “adequate” functioning is interpreted for instance as a percentage of user showing attitude or good practices leading towards adequate functioning of the facility; and “inadequate” functioning refers to attitudes or practices leading towards inadequate functioning of the facility. “Missing” is assimilated to inadequate as users are uncertain regarding the functioning of the facility.

More users show attitude and practices conducive to a good working condition of the facility, adequate is the functioning; and in contrast less more user show attitude and practices that may impact of the daily running of the facility, inadequate is the functioning.

4.4.3.3 Concurrent reading

As indicated in section 3.5 above, the framework for investigating user acceptance and functioning of MCSF in IS should be read concurrently in a particular way. Since the three phases of the framework are the same for both user acceptance and functioning, the criteria and indicators are different but complementing according to order of priority outlined in section 3.5.

Results should be read in this particular order as per the research hypothesis that suggested that “...greater user acceptance is achieved through user’s participation and influence in implementing and managing sanitation technologies” and ... “*adequate functioning of the sanitation is dependent on the appropriate design specifications, and is also influenced by the level of user understanding of the operational requirements of the technology and the extent of the O&M*”.

Bearing this in mind it should be noted that generally if, for a given phase of the framework the level of user acceptance is low, the functioning of the sanitation facility should be expected to be inadequate; and where the user acceptance is high we should expect an adequate functioning of the facility.

Drawing from the three case study sites experience (where the framework was tested), results suggested that the level of user acceptance was high throughout the three phases of the framework and the functioning was adequate as well except for the planning phase of one of the case study sites.

The analysis of these results reveals that the level of user acceptance for the planning phase (in that particular case study site) was not as high as possible; and in terms of percentage it was found to be in the range of 50 to 60% while the functioning was close to 40%. Learning from this experience, it can be said that the user acceptance impacts on the functioning of the facility and the functioning may be subject to the user acceptance only if the level of acceptance is much lower or slightly higher than the average.

5. Emerging trends from the application of the framework

Throughout the application of the framework, trends emerged across the various phases of the sanitation cycle (that include planning, implementation and post-implementation) with regard to the user acceptance and functioning. Further, these trends reflected on the various criteria and indicators that form the backbone of the framework to highlight the areas of concern that need urgent attention.

5.1 Emerging Trends for User Acceptance across the Various Phases of the Sanitation Cycle

It has already been mentioned above that the Planning and Implementation phases across all three case study sites received a “thumbs up” (high or acceptable level of user acceptance), while the Post-Implementation phase across all three case study sites received a “thumbs down” (low or unacceptable level of user acceptance).

It can therefore be generalized that the MCSF in the informal settlements of South Africa receive acceptable levels of user acceptance during the *planning* and *implementation* phases. However the *post-implementation* phase requires specific attention as this phase receives unacceptable levels of user acceptance.

5.1.1 Emerging Trends across the various Criteria

A count of the number of criteria in total that received high and low levels of acceptance by combining all the case study sites reveal that 60% of the criteria have a high level of acceptance compared to 40% of criteria with a low level of acceptance. Table 5.1 below indicate the criteria which have been flagged as low at least once in any of the case study sites.

Table 5.1: User Acceptance Criteria Flagged across Case Studies

Phase	Criteria
Planning	Appropriate Technology
Implementation	Participation
	User Awareness
Post-Implementation	Oversight and Ownership
	Development Opportunities
	User Awareness
	Monitoring and Evaluation

Legend

Flagged 1 x	Flagged 2 x	Flagged 3 x
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From table 5.1 it is observed that under the planning phase, some due care should be given to the criteria around appropriate technology in order to increase the levels of user acceptance. In the implementation phase, some due care should be given to the criteria of participation and user awareness. However in the post-implementation phase, all the criteria there require attention for improvement. A further observation of trends by noting the number of occurrences, reveal an order of priority where urgent attention and resources should be invested. The order of priority is as follow:

a) *First Priority for Concern:*

- Participation (implementation phase)
- Monitoring and Evaluation (post-implementation phase)

b) *Second Priority for Concern:*

- Development Opportunities (post-implementation phase)

c) *Third Priority for Concern:*

- Appropriate Technology (planning phase)
- User Awareness (implementation phase)
- Oversight and Ownership (post-implementation phase)
- User Awareness (post-implementation phase).

5.1.2 *Emerging Trends across the various Indicators*

A count of the number of indicators in total that received high and low levels of acceptance by combining all the case study sites reveal that 57.33% of the indicators have a high level of acceptance compared to 42.67% of indicators with a low level of acceptance. Table 5.2 below indicate the indicators which have been flagged as low at least once in any of the case study sites.

Table 5.2: User Acceptance Indicators Flagged across Case Studies

Phase	Criteria	Indicator
Planning	Appropriate Technology	Level of participation
		Information dissemination
		User Acceptance
		Accessibility of location
		Security
	Sustainable Technology	Improved human health
		Improved environmental conditions
Implementation	Participation	Participation in construction
		Remuneration for participation
		Skills training provided
	User Awareness	Potential benefits of awareness programmes
Post-Implementation	Oversight and Ownership	Responsibility for managing the facility
		Conflict around access
	Development Opportunities	Job opportunities
	User Awareness	Regular user awareness
		Good practice
	Monitoring and Evaluation	Adequate training of community-based monitors

Legend

Flagged 1 x	Flagged 2 x	Flagged 3 x
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From table 5.2 it is observed that due care should be given to the indicators of 'level of participation', 'information dissemination', 'user acceptance', 'accessibility of location' and 'security' under the criteria of appropriate technology in the planning phase. Also attention should be given to

'improved human health' and 'improved environmental conditions' under the criteria of sustainable technology in the planning phase. In the implementation phase, attention should be given to the indicators of 'participation in construction', 'remuneration for participation' and 'skills training provided' under the criteria of participation; as well as the indicator of 'potential benefits of awareness programmes' under the criteria of user awareness.

Finally in the post-implementation phase, attention should be given to the indicators of 'responsibility for managing the facility' and 'conflict around access' under the criteria of oversight and ownership; the indicator of 'job opportunities' under the criteria of development opportunities; and the indicators of 'regular user awareness' and 'good practice' under the criteria of user awareness; and 'adequate training of community-based monitors' under the criteria of monitoring and evaluation.

A further observation of trends by noting the number of occurrences, reveal an order of priority where urgent attention and resources should be invested. The order of priority is as follow:

a) First Priority for Concern:

- Level of participation (appropriate technology criteria in planning phase)
- Participation in construction (participation criteria in implementation phase)
- Skills training provided (participation criteria in implementation phase)
- Potential benefits of awareness programmes (user awareness criteria in implementation phase)
- Adequate training of community-based monitors (user awareness criteria in post-implementation phase)

b) Second Priority for Concern:

- Remuneration for participation (participation criteria in implementation phase)
- Responsibility for managing the facility (oversight and ownership criteria in post-implementation phase)
- Job opportunities (development opportunities criteria in post-implementation phase)
- Regular user awareness (user awareness criteria in post-implementation phase)
- Good practice (user awareness criteria in post-implementation phase).

c) Third Priority for Concern:

- Information dissemination (appropriate technology criteria in planning phase)
- User Acceptance (appropriate technology criteria in planning phase)
- Accessibility of location (appropriate technology criteria in planning phase)
- Security (appropriate technology criteria in planning phase)
- Improved human health (sustainable technology criteria in planning phase)
- Improved environmental conditions (sustainable technology criteria in planning phase)
- Conflict around access (oversight and ownership criteria in post-implementation phase).

5.2 Emerging Trends for the functioning across the Various Phases of the Sanitation Cycle

5.2.1 Emerging Trends across the various Criteria

Looking at the overall results emerging from the three case studies, four criteria were flagged as it receive thumb down which refers to inadequate functioning of the facility.

The main concerns flagged on these three phases of the framework are related to the following criteria:

- Status of the sanitation and Sanitation technology option (at the planning phase): the status of the sanitation was flagged to be inadequate throughout all case studies; while the sanitation technology option found was also inadequate (as it could not be used).
- User responsibility (at the implementation phase): this criterion was flagged inadequate due to the lack of the sense of ownership commitment amongst user to take responsibility of their own facility; such attitude was expected to impact on the functioning of the facility.
- User issues (post-implementation phase): flagged as key issue of concern as number of issues emerging from the daily use and operation of the facility remains unresolved due to long bureaucratic process and protocol.

Table 5.3: Functioning Criteria Flagged across Case Studies

Phase	Criteria
Planning	Status of the sanitation
	Sanitation technology option
Implementation	User responsibility
Post-implementation	User issues

5.2.2 Emerging Trends across the various Indicators

Looking across indicators, results indicate that 31% of indicators are being flagged inadequate against 69% that are flagged as adequate. These indicators are presented in table 5.4 below that shows that the planning, the implementation and the post-implementation phase have respectively has 2, 5 and 5 indicators flagged inadequate.

Being flagged inadequate, actions are required to ensure the adequate functioning of the facility and the reliability of the service; therefore these indicators are clustered according to the order of priority that can be used to deal with the problem:

➤ *First priority of concern*

- Access to sanitation
- Status of the current sanitation service within the settlement
- Number of potential user of the proposed sanitation technology
- Causes of the current sanitation problems
- Awareness programme and user responsibility

- *Second priority of concern*
 - Knowledge of the type of sanitation technology
 - Impact of non-compliance with operational requirements

- *Third priority of concern*
 - User participation and responsibility for the O&M
 - User support requirements for the O&M
 - Response to reported problems
 - Reporting protocol
 - Response time to address the problem

Table 5.4: Functioning Indicators Flagged across Case Studies

Phase	Criteria	Indicators
Planning	Status of the sanitation	Access to sanitation
		Status of the sanitation
	Sanitation technology option	Number of potential user
		Causes of the sanitation problem(s)
User responsibility	Awareness programme and user responsibility	
Implementation	Sanitation technology option	Knowledge of the type of sanitation technology
	Operational requirements	Impact of non-compliance with operational requirements
Post-implementation	O&M	User participation and responsibility for the O&M
		User support requirements for the O&M
	User issues	Response to reported problems
		Reporting protocol
		Response time to address the problem

6. Conclusions

Sanitation facilities are provided to communities to sustain their lives and ensure the environmental protection. To achieve these goals, provided facilities should meet certain criteria set by the White paper on basic household sanitation (DWAF, 2001) in order to ensure their reliability. Austin et al., (2005) defines adequate sanitation as a type of sanitation that is judged by criteria such as promotion of health and safety, socially, economically, environmentally and technically attainable.

The user acceptance (as hypothesized in this research) is a key to the success of the sanitation technology; it strongly impact on the functioning of the facility. The functioning of the facility in contrast is factor of the user acceptance of the sanitation technology, which is achieved through the level of understanding and compliance with the operational requirements, the level of awareness and the extent of the O&M.

The following conclusions emerge for the application of the framework at the three case study sites:

6.1 User acceptance of MCSF

From the findings it can be concluded that user acceptance of mobile communal sanitation facilities is determined by the level of user participation and influence in planning, implementing and managing sanitation technologies. This conclusion therefore validates the initial hypothesis.

6.2 Functioning of MCSF

The site surveys have provided a large overview of the sanitation provision and conditions in IS and have highlighted the trends emerging from the application of the framework with regard to the implementation and functioning of MCSF, the surveys have revealed that the framework is a useful tool that provides an understanding of the sanitation problem in IS by flagging indicators that require attention or urgent action.

Issues that were investigated throughout the research were whether:

- The planning phase has influence on the functioning of the MCSF
- The compliance with operational requirements impact on the functioning of MCSF
- The extent of the O&M on the functioning of MCSF.

Most of respondents interviewed have a broad understanding of the sanitation problem in IS and believed that the planning, compliance with operational requirements and O&M are key to adequate functioning of MCSF. With reference to the research hypothesis the results from the application of the framework indicate that good planning is a precursor to adequate functioning of MCSF instead of design specifications as previously thought. The compliance with operational requirements impacts on the extent of O&M and ensure reliability and the extent of O&M impacts the functioning of the MCSF if users' issues are not dealt with accordingly.

➤ *Planning*

The study shows that the social dynamic and behavioural patterns have huge influence on the demand for sanitation. Findings of this research suggest that the access and status of the

sanitation influence the demand for sanitation; and the level of sanitation services depends on the land tenure and suitability of technology in context and available fund. For a successful sanitation planning, all these factors should be carefully considered and end-users associated in the entire process.

➤ *Compliance with operational requirements*

The compliance with operational requirements is key to adequate functioning. Sanitation technologies are manufactured for specific use that is achieved through compliance with the manufacturer guide. To achieve this, users should be informed about the operational principles and at some extent demonstration made to enhance their understanding of the use of technology. In addition the strategies to enhance the compliance with operational requirements should be in place to ensure that each facility is adequately used as intended.

It was evident from the survey' results that the functioning of sanitation depends on the ability of users to understand and comply with the operational requirements of the technology that is key to a successful implementation process. The functioning of MCSF depends on the operation and maintenance strategies and processes in place. Further, the study found that:

- It is important to note that the level of functioning of the MCSF is case specific and depends on design specifications. Where the design specifications were user friendly, less problems were recorded and the functioning of the facility was optimal.
- The adequate functioning of the facility depends on the level of users' awareness programme and the management structure in place at the facility. At facilities where caretakers were in place, the level of functioning was optimal compared to facilities without a caretaker.

➤ *The extent of the O&M*

The O&M is a key function towards achieving adequate functioning of any sanitation technology. It includes attending to user reported) issues regarding the state and functioning of the facility. Looking at the results of the framework, the O&M was flagged as a serious concern that requires more attention. One of the criteria flagged throughout all case study sites was the user issues that required attention.

Users' issues were found to be a common problem to all case studies; as indicated by Lagardien et al., (2010), the daily use of the facility should be monitored in order to ensure the reliability of the service. Failing to respond to users issues and bureaucratic reporting protocol may impact the functioning of the facility and increase the O&M cost.

Responding to the key question addressed by the study, results and analysis suggest that:

- ✓ The acceptance of MCSF can be achieved through user participation and influence at all phases of the sanitation cycle (that includes planning, implementation and post-implementation).

- ✓ The MCSF can adequately function in IS context provided strict observance of each phase of the framework's criteria and associated indicators. The functioning of MCSF is context based and depends on user's demand for sanitation, compliance with operational requirements and the extent of O&M (with regard to the way reported issues are responded to). Through the application of the framework, it emerged that adequate functioning of the MCSF is factor of adequate planning, understanding and compliance with operational requirements and the extent of the O&M.

It is therefore essential to ensure that the framework is applied strictly as per guidance, taking into consideration each criterion and related indicators as key informants that provide an overview of the functioning of sanitation in IS context. Whilst it is important that users should be educated and empowered with respect to the use of the facility, it is the responsibility of the local authority to act promptly and respond to reported problems in order to ensure that the facility is in good working condition. Doing so will increase the reliability of the facility, increase user's confidence and enhance the functioning of the facility.

The high level of user's acceptance of the facilities registered through the application of the framework (report 2) and the adequate functioning of the facilities (report 3) are aligned with the research hypothesis except for the planning phase of the functioning. For this phase of the framework, the research has shown that adequate functioning of the facility is influenced by the demand for sanitation and appropriate design is only a secondary issue.

Hence, the framework is a useful tool that can be used to determine the level of user's satisfaction and the functioning of the MCSF. It can be used as part of ongoing M&E programme for existing sanitation technologies; and can be used for the introduction of new sanitation technologies in an area, where strict observance of each phase's criteria and associated indicators would ensure greater user's acceptance and adequate functioning of the facility.

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Appendix A: Prevalence of MCSF

1. Prevalence of Mobile Communal Sanitation facilities (MCSF)

Mobile sanitation arises out of the need to address the challenges of a huge influx of people, the existence of a few public toilets and for servicing temporary needs in especially peri-urban areas (Chadwick, 2009; Dakgerskog, 2010). There are several mobile communal sanitation facilities in use at local and global levels. These technologies are variable according to number of factors such as availability of sewer line and water, topographical situation of the area, land availability, etc. The option of choice may depend on the specific conditions of the respective locations and other social or cultural preferences.

- **Mobile sanitation** refers to a sanitation system that can be displaced from one emplacement to another; the mobility can facilitate the fast and easy insertion, transfer or replacement in case of an emergency situation, a settlement's relocation or failure of the system.
- **Communal sanitation** is defined as sanitation system provided for a community or users situated within acceptable distance to the facility. It is different from the shared sanitation facility which is used by a determined group of people.

1.1 International level

1.1.1 Overview of Mobile sanitation toilets

There are several types of mobile communal sanitation facilities around the world. The most common system is wet (requiring water) and dry system (not requiring water). The intended use of each type of technology may depend on the local situation and other factors such as topography, availability of water, disposal infrastructure, cultural beliefs and customs.

In some countries, mobile communal sanitations are used only during events while others may be used as emergency or temporary sanitation. In Nepal, mobile sanitation is used as emergency sanitation in areas where formal sanitation is not available. In Nigeria, the DMT (dignified mobile toilet) is used in public places (such as markets) as temporary formal sanitation to compensate for the lack of public facilities. In Burkina Faso, the communal mobile sanitation (wheel-driven toilet) is used during public gatherings, at public places such as markets and by groups of people in certain suburbs where access to sanitation is not existent (Dakgerskog, 2010). In European countries, communal mobile sanitation systems are used for events only. In India, the communal mobile toilet Ecolooov is used especially in public places and dense settlements where difficulties to access to sanitation are acute.

Other existing technologies are namely Solar Powered Portable Public Toilets, Sewer Connect Mobile Toilet and Mobile Pit Toilet

1.1.2 Operational requirements and Sustainability concerns

Depending on design, each type of sanitation has its own operational requirements and sustainability concerns. The operational requirements are mainly subject to the use, behaviour of users, location of the facility and maintenance strategies in place.

a) Nepal mobile toilets

The mobile sanitation unit (in figure 2.3 below) is a truck mounted urine diversion system consisting of nine toilets blocks. Each toilet is equipped with a pedestal, urinal and hand wash basin. The truck carries about 2000l of water or may be connected to a water supply outlet (depending on water availability) or existing sewer. Where infrastructure are not available, the truck is equipped with two containers underneath where urine and faeces are collected separately and discharged at nearest treatment works or sold to farmers. Each tank has a capacity of 500l and may fill up in two days or less depending on the use.

Mobile toilet is a transportable and eco-friendly toilet with facilities for separate storage of urine and excreta. Mobile toilets don't occupy permanent spots and can be moved around wherever crowds are. It occupies an area of nearly 13.4 m² and is being used by nearly 800 people are using the mobile toilet daily.



Figure 1: The Mobile communal sanitation facility (in Nepal)

b) DMT (Dignified mobile toilet)

In Nigeria, most public places have no toilet facilities, worsening the already heavily polluted waters, as the improper disposal of human waste filters directly into the waterways, rivers, and seas. As many Nigerians rely directly on unfiltered water for cooking, drinking, and washing, the waterways only add to the spread of infectious diseases such as dysentery, and cholera. Contaminated drinking water and unsanitary means of waste disposal are closely associated with diarrhoeal diseases – the second biggest cause of childhood death in Nigeria (Ashoka, 2007).



Figure 2: View of single DMT

DMT designs, builds, and distributes safe, sanitary mobile toilets for outdoor and indoor use at large public gatherings and for wider deployment as public toilet facilities where public sanitation systems are absent or inadequate.

The DMT is a dry sanitation system that consists of a block of 2 to 5 toilets housed in a plastic container; equipped with 500l water tank, urinal, hand wash basin and disposal bin for anal cleansing materials. The vault or faeces container has a capacity of up to 500l depending on the type of DMT and can handle faecal matters of about 100 users a day. The DMT can be connected to an existing sewer, soak away/septic tank or an improvised ring culvet soak away.



Figure 3: Internal view of a DMT

c) *Wheel toilets (Burkina Faso)*

According to Dakgerskog, (2010), the wheel toilet is a dry type of mobile sanitation system consisting of a block of 2 to 3 toilets mounted on a special wheelbarrow or trailer and carted by man or vehicle. The wheel toilet is equipped with a vault and bin for discarding anal cleansing materials.

The toilet is used in public places such as markets, informal settlements and areas where access to sanitation is lacking. The toilet is similar to a container toilet; excreta discharged are discharged based on the number of users or when the volume of excreta reach the limit indicated at the container. The full container may be discharged to a near sewerage or sold to farmers.

d) *Solar powered mobile toilets*

The unit includes a self-standing public restroom facility requiring only sewer and water at the installation site. The facility is a functional, low-cost, easy-to-maintain, low-power-consumer, safe, accessible public restroom facility available to all citizens. The facility comprises a plurality of wall panels that bolt to a slab and to each other to enable rapid, low cost, off-site, modular construction and easy assembly on-site (James, 2008). This unit is equipped with a toilet, hand wash and anal cleansing disposal bin.

The toilet unit operates as a normal flush toilet and requires a connection to an existing water and sewer main in order to be functional. Solar panels are providing ventilation and light at night. The unit's hand-washing station is placed on the exterior to promote shorter use times and to serve the general pedestrian population.

The only concern with this technology is during snows, the flushing mechanism loo turns stiff and the solar panels, covered with frozen snow and ice, leaves the battery weak. The battery not only keeps the lights on, but makes sure the pipes are warm and water is flowing.

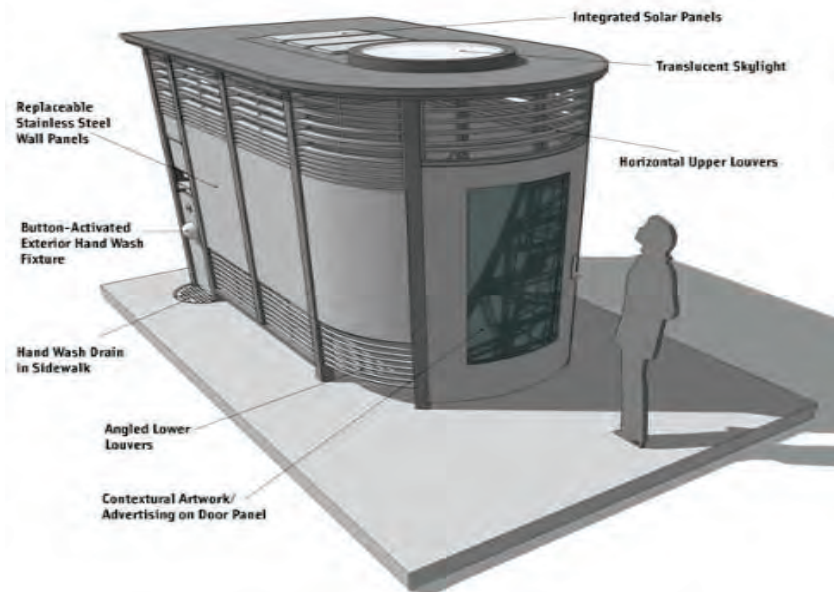


Figure 4: Solar Powered Portable Public Toilet

e) Sewer connect mobile toilets

Sewer connect portable toilets are supplied fully plumbed and equipped to connect to sewerage and fresh water. These portable toilets feature double skin walls and a translucent roof to provide natural lighting. The plastic flooring is easy to clean and maintain and a stainless steel basin fitted with tap as standard is also easy to maintain. Portable toilet is owned privately and may be used communally during events, at public places and camping.



Figure 5: Sewer connected portable toilet

The sewer connect portable toilets measure 1.12 m x 1.12 m x 2.34 m and feature lifting hooks to assist when moving the units. Sewer connect mobile toilets have a dual flush cistern with a ceramic waste bowl and water stop valves to facilitate connection to fresh water and sewerage. It is also equipped with liquid spray soap dispenser fitted as standard, 2 roll toilet paper dispenser and a full plastic floor for easy maintenance.

In order to be operational, the toilet needs to be connected to sewer and water main. Units are supplied fully plumbed ready to connect to sewerage and fresh water. Urine can be diverted for economical use as fertilizer

f) Mobile pit toilets

The mobile pit toilet is a urine diversion sanitation system that can be used in various circumstances and environment such as public institutions (schools, hospitals and clinics). This technology is widely used in countries such as Kenya, Uganda, Tanzania, Rwanda, and Ethiopia.



Figure 6: Mobile Pit Toilet

The mobile pit toilet consists of a block of five to 10 toilets (depending on the demand); the toilets comprise of both a self-supporting slab and superstructure that are assembled together using nuts and bolts. It is equipped with a vault (such as VIP) but with urine diversion pipe, an external hand washes facility, a washroom and disabled toilet. This toilet is mobile and can be moved when the pit is full and relocated.

The toilet design of the urine diversion toilet enables a natural separation of urine from faeces. The faeces fall into the pit while urine is diverted into a soak pit or into a field.



Figure 7: View of external hand washing post

1.1.3 Users' perceptions

The literature review shows that users are generally unsure and undecided regarding the MCSF especially when provided to IS. The general trends emerging from the users assessment shows that 80 to 90% of users believe that the facility can be removed any time without notifying them or its implementation may delay the provision of permanent infrastructure.

These general perceptions have brought various challenges for the implementation of the MCSF at both local and international levels. To date, many believe that this technical sanitation solution is suitable for temporary settlements; can be used as temporary facility during disaster, unforeseen

circumstances such as disaster. In general, MCSF cannot be used as sanitation solution in well-established settlements.

1.1.4 Implementation Challenges

The implementation of sanitation technologies may be subject to many challenges as result of the level of service provided and response to the community needs. These challenges may be classified according to the level where it occurs.

In Indonesia, according to WSP (2009) the main challenges of urban sanitation are of four aspects:

➤ **At national level**

- Low political priorities, due to prevalent views on responsibility for sanitation at all levels of government. Sanitation needs to be higher on the political agenda if it is to get the attention it deserves, and can no longer be regarded as purely a private matter in urban areas.
- The urgent need for a national urban sanitation policy that sets priorities, defines institutional and community roles and responsibilities, establishes a legal and regulatory framework, and facilitates the adoption of comprehensive city-wide sanitation strategies.
- The need for an investment framework and financing strategy, both to increase the total funding available in the sector and to enable those funds to be deployed effectively.
- The need for advocacy to make the sanitation crisis an issue of national concern.

➤ **At provincial level**

- The need to clarify the role of the provincial government in the funding of urban infrastructure investments and the planning and delivery of sanitation services.
- A lack of capacity for sanitation promotion and progress monitoring.

➤ **At city level**

- A lack of mechanisms for inter-agency collaboration on planning and service delivery, bearing in mind the range of organizations that have a stake in sanitation.
- A lack of incentives and accountability for the achievement of national sanitation goals. At present, not all municipalities would accept that there is a big problem with excreta disposal.
- Limited municipal capacity for planning, infrastructure development, service delivery and sanitation promotion.
- Complicated and poorly understood mechanisms for accessing and allocating capital funds.
- An under-developed (and unregulated) role for the private sector in service delivery and maintenance (for example in the safe removal, treatment and disposal of septic tank sludge).
- Poor operation and maintenance of existing infrastructure.

➤ **At community and household level**

- Limited appreciation of the need for safe disposal of wastewater, though toilet use is widely practiced.
- Many people occupy land illegally and are excluded from municipal projects and planning processes.

1.2 South Africa level

During the last decade, South Africa has experienced a huge increase in the number of informal settlements. Urban areas are growing rapidly as they are perceived as a potential area of income and the only way to take advantage of the limited developments in the country (Mels et al., 2008).

A recent inventory of the actual state of services delivery in South Africa indicates that most of the informal settlements are severely lagging behind in sanitation coverage. The current approach of the Government aims to supply toilets in the informal settlements to be shared within five households. These toilets are in most of cases locked and their maintenance relies on its users.

The toilet types that are mostly used are container, chemical and bucket as shared facilities while VIP and UDS are considered as individual facilities. However, these options are not suitable or available for all informal settlements. Because of the non-formalised situation of the settlements these services are considered as emergency services that however tend to remain in those categories for a long period of time.

This approach reaches a better performance in small communities in peri-urban areas than in high dense settlements where the cohesion of its dwellers is much lower. Shared toilets do not consider the consistency between neighbours and do not take into account the population growth and the consequent increasing rate of households per toilet. As such newcomers are excluded from any sanitation facility; in several cases conflicts among sharing households such as unequal maintenance care have led to destruction of the sanitation facility or either change of the lock for its private use thus excluding the rest of the households. Reduced social acceptability as well as political bias and complains for the poor quality of sanitation facilities results in some cases with the damage, vandalism and destruction of the systems (Mels, et al., 2008).

In the City of Cape Town for example most of the settlements (75%) are located on land that is owned by the municipality and a large share (22%) is located on private lands. For private lands the Water Services Department needs to obtain the consent of the owner in order to deliver services on-site. Many land owners do not give that permission because they are afraid of making the settlement on their land even more permanent.

The density of the settlements is generally high and this is a major constraint for sanitation services provision. Around 42% of the sites have densities between 150 and 300 households per hectare while more than 10% even rise above the 300 households/ha. Servicing high-density informal areas is difficult because of limited space, the unplanned layout and limited accessibility. Providing waterborne or equivalent sanitation services such as water flush systems are often not possible under these conditions.

In order to meet the demand, alternative technologies are made available for choice. For instance, In South Africa the mobile sanitation facility still not widely used compared to other countries. The available mobile sanitation options are namely Kayaloo (in Stellenbosch) and recently ablution block container (in eThekweni).

1.2.1 MCST and intended used

a) Kayaloo

Kayaloo is a prefabricated ablution block unit for informal settlements; it was first installed and used in Stellenbosch. Each unit has 10 plastic toilets and 4 basins located on the external sides of the facility. Each cubicle measures 1200 mm x 900mm with own lockable outside door. The base structure is manufactured of 100mm x 50mm x 2 mm steel tubing with a 3 mm galvanized vastrap floor.

The main structure is constructed from 38 mm tubing bolted and welded together, including the roof structure. The 1 mm galvanized sheeting is spot welded and/or bolted to the main frame and supporting braces, discouraging removal. All steelwork galvanized and sheeting painted on the outside. Each door is fitted with both internal and external latches and safety chain. The units come standard with lifting points for easy pick up and positioning and re-location if and when required.



Figure 8: View of the installation of the Kayaloo unit

The plastic toilets are bolted to the steel floor, flushing facilitated by a flush master junior flush valve, securely protected behind a metal screen. Although the flush master valves will not only save water in the long run, but also maintenance costs. It is also much easier to protect from tampering and vandalism than the conventional cistern installation. The 110 mm PVC wastewater runs to a central point for connection to the mains. Plumbing of the valves is done with either 40 mm PVC tubing.

In order to be operational, the sewer and water main are required as well as strainer to protect flush master valves.



Figure 9: Internal view of the Kayaloo unit

b) Ablution block container

The ablution blocks container is a temporary sanitation system used in informal settlements that are ready for being upgraded (Gounden, 2010). It serves as a temporary measure while waiting for being relocated to new RDP houses or development. Sewer and water links will be installed for informal settlements, which have been selected for future developments by the Human Settlement Department.

The Prefabricated Ablution Block is easy upgradable sanitation system and suitable for short-term use. The sanitation system consists of a container in which a block of full flush toilets and hand wash basin are installed and connected to an existing sewer and water supply main.

The facility is operated as typical full flush toilet which is equipped with a toilet bowl, connected to water supply system and sewer. Wastewater is flushed away into the drain and collected into the sewer.



Figure 10: View of an ablution block container

The facility consists of two containers, one for males and the other for females, and a tap. Each container has three toilets, a storeroom, two hand washing basins and a laundry facility beside the three showers and urinal cubicles in males' toilets.



Figure 11: Internal view of the AB container

In order to be operational, an existing sewer and a water distribution pipes where connections are to be made need to be identified. Once identified, the location should be within accessible distance to all users. Once these issues resolved, a platform where the container will be posed need to be constructed taking into account the position of sewer and water main.

1.2.2 Implementation Challenges

The main constraining factors are settlement density, water table depth and the anal cleansing method. Settlement density is the main constraint and is based on practical experiences of WSD and on various literature sources that indicate that individual (household-based) solutions are not feasible for informal settlements with a high density. There is simply no place for toilets for each dwelling in these areas. The only way to overcome this constraint is the provision of community-based toilets. A water table depth of <5 m is taken as a constraint for systems that ultimately discharge liquids to the subsoil.

As for the anal cleansing method, we assumed that bulky material may clog the discharge pipes of flush and poor flush toilets. This problem could be overcome by collecting the cleansing material in a separate bucket.

The main barriers to the implementation of proper sanitation systems are the non-permanent status of the informal settlements, high service and maintenance costs, unsuitable location of the settlements (more than 40% of the sites) such as on private land, servitudes, wetlands and flooding prone areas, high settlement densities (55%) and distance to existing sewerage networks (WSP, 2009).

a) *Planning process:*

The development of a city-wide strategy begins with an assessment of existing infrastructure and services in each sub district of the city. This involves three discrete steps:

Step One: Secondary data analysis

This entails an examination of available data for each *district* while recognizing that it may not be complete or reliable. Three broad types of information are examined:

- The number of households formally designated as poor, since poverty affects access to sanitation facilities, bearing in mind that most services are self-provided.
- Population density. This can have a strong influence on the severity of sanitary problems and consequently the health risks.
- Technical data on the coverage of water and sanitation services, and the level of service provided (shared or household taps, on-site sanitation or sewerage, etc.)

A weighting factor is assigned to each of these parameters.

Step Two: Primary data collection

A participatory survey known as an environmental health risk assessment (EHRA) is conducted. The survey and observations involve groups of women from these locations, who make a health risk assessment of their neighbourhood, with assistance from municipal and program staff. The assessment considers the condition of, and access to, water and sanitation facilities, and establishes a baseline on hygiene behaviour in key areas such as hand washing with soap, handling of child waste, and solid waste management in the home. The findings enable more accurate targeting of priority areas and provide insights into both the impact of poor sanitation at the household level and potential improvement strategies.

Step Three: Professional assessment

Members of the city sanitation working group add their own perception of public health risk areas based on their knowledge of the town and their professional expertise.

- Investigate/survey the existing situation: it starts from an analysis of what already exists, and then considers how this could be improved in incremental steps as funds become available and municipal capacity grows. Implicit in this is the recognition that planning cannot be a one-off event; that plans must be regularly reviewed and updated, and approaches modified in the light of experience.
- pays attention to the institutional and financial aspects of service delivery, and to the need for effective communication with service users;
- Addressing long-standing deficiencies in sanitation services
- The process recognizes the need both for strategic, city-wide decision making by local government, and for active support and engagement at community level. It thereby optimizes both aspects in a 'top-down meets bottom-up' approach to planning.

Appendix B: Summary of available guidelines and framework

Through the review of various literatures, it was found the existence of guidelines and framework that are being used in various contexts for monitoring and evaluation of water and sanitation infrastructure at local and international levels.

An attempt was made in this report to summary findings emerging from the review of each guideline or framework with the view to select important elements of these guidelines or framework that can be used.

B1. International Level

Internationally, it was found that several authors suggested guidelines and framework that can be used in various contexts including planning and initiation, implementation and post-implementation. These include:

a) ADC. 2008. *Solutions in Sanitation: Planning Principles*

➤ **Users acceptance**

- Planning and initiation:
 - The sanitation factors: appropriate, ecological, sustainable Participatory planning approaches
 - Transparent decision making framework
- Implementation
 - Technology should consider demand, socio-cultural needs, users' ability to afford the continued operation, to the available organisational and technical capacities and if they allow flexible expansion and adaptation possibilities
- Operational requirements
 - Special attention to the selection of appropriate technologies to ensure sustainability through capacity building measures, proper technical, administrative and economical operating procedures

➤ **Functioning:**

- Implementation: Framework and conditions to achieve sustainable sanitation solutions

b) COHRE. 2008. *Operational Guidelines for Implementing Rights Based Approaches to Water and Sanitation Programming*. Draft provided to UN-HABITAT for comment, 8 April 2008. <http://www.cohre.org/attachments/RWP%20-%20Operational%20Guidelines%20RBA%2004%2008.pdf>

➤ **Users acceptance**

- Planning and initiation
 - ✓ 15 Questions provided for cross-cutting aspects of rights based programming. These questions are relevant for planning and implementation. They cover:
 - Participation
 - Empowerment

- Human rights consideration
 - Including the most vulnerable
 - Local capacity
 - Inclusive stakeholders
 - M & E of outcomes and processes
- ✓ The RBA emphasizes:
- Equality & non-discrimination
 - Participation & inclusion
 - Water availability
 - Water quality & hygiene
 - Physical accessibility of water & sanitation
 - Affordability of water & sanitation
- c) *Dagerskog, L. 2009. Positive spin-offs using mobile urinals and UD toilets in Burkina Faso.* Paper presented at the 3rd International Dry Toilet Conference, Tampere/Finland, 12-15 August 2009 <http://www.susana.org/images/documents/07-cap-dev/b-conferences/09-dry-toilet/26-en-dagerskog-positive-spin-offs-using-mobile-urinals-2009.pdf> (15 April 2010)
- **User acceptance**
- Implementation
 - caretakers formed association to respond to demand
 - more training and knowledge was needed by different actors
 - job opportunities created
 - opportunity to sensitize public to EcoSan
 - Operational requirements: mixed responses to using human waste as fertilizers
- d) *Kalbermartten et al. 1982. Appropriate Sanitation Alternatives: A Planning and Design Manual*
- **User acceptance**
- Planning and initiation: community participation in the sanitation planning
 - Implementation: institution-community linkage
- **Functioning**
- Planning and initiation
 - Sanitation technologies options
 - Choice of sanitation technology (environmental factors affecting the choice and institutional constraints)
 - Selection of sanitation technologies (algorithms, information required, post selection questions)
 - Operational requirements
 - Communal sanitation facility (design criteria)

e) *Kvarnström, E and Petersens, E. 2004. Open Planning of Sanitation Systems. The EcoSanRes Programme and the Stockholm Environment Institute.*

➤ **Users acceptance**

- Planning and initiation: Problem identification is an important component of successful project planning. If the problem and its causes are not identified, it is most probable that the project will down the line
- Implementation: Tool components aimed at facilitating stakeholder involvement were seen positively; Project implementation is facilitated by stakeholder workshops; the possibility to compare ecosan technologies to other sanitation alternatives, thereby providing the stakeholders a new perspective on sanitation and a good planning will benefit the post-implementation phase, such as project evaluation.
- Operational requirements: With an ecosan perspective, the weaknesses of the planning/implementation tool for this stage were:
 - Risk of projects being over-planned;
 - Risk of planning tools being too complicated, too time consuming and too general in their approach;
 - Need for project manager to dare to move beyond the planning tool, if necessary;
 - Risk of professionals planning for themselves and not for the people.

f) *Mara et al. 2007. 'Selection of sustainable arrangements', Water Policy (9): 305-318*

➤ **Users acceptance**

- Planning and initiation:
 - Human health
 - Affordability
 - Environmental sustainability
 - Institutional appropriateness
- Implementation: to be managed at the lowest appropriate level
- Operational requirements: to be managed at the lowest appropriate level

g) *Parkinson, J. et al. 2008. Technology Options for Urban Sanitation in India*

➤ **Users acceptance**

- Planning and initiation:
 - Traditionally public policy on basic urban services focused on water supply, while sanitation has lagged behind.
 - Initiations process
- Implementation
 - Significant investment in sanitation infrastructure; these efforts have failed to deliver a safe sanitary environment because they lacked the comprehensiveness to address the full dimension of the sanitation challenge existing in the country.

- In particular, these efforts have failed in terms of targeting the sanitation needs of all sections of urban society, to ensure usage of the facilities created or their proper operation and maintenance.
- Challenges facing urban sanitation
- Operational requirements: future efforts consider a range of technical options ranging from on-site to traditional centralized sewerage and treatment systems, on techno economic considerations, so as to draw up plans that are comprehensive and inclusive enough to cover all geographical locations and all sections of society.

➤ **Functioning:**

- Planning and initiation:
 - Legislation and standard for urban sanitation
 - Sanitation options for different types of settlements
 - Decision making process (sanitation initiation and planning)
- Operational requirements: description of communal sanitation facility

h) SACOSAN. 2005. 'Bangladesh Country Paper', Second South Asian Conference on Sanitation (SACOSAN), 21-23 November 2005. Islamabad, Pakistan. <http://www.sanitation-bd.org/downloads/BDCP10Sep05.pdf>

➤ **Users acceptance**

- Planning and initiation:
 - Behavioural changes and sustainability through user participation
 - Involve women in planning and decision-making
- Implementation: behavioural changes and sustainability through user participation
- Operational requirements:
 - Behavioural changes and sustainability through user participation
 - Involve women in management
 - Regular monitoring and evaluation

➤ **Functioning:**

- Planning and initiation: appropriate sanitation technologies to be adapted to specific:
 - Geological situations
 - Social groups
- Operational requirements
 - Behavioural changes and sustainability through user participation
 - Involve women in management
 - Regular monitoring and evaluation

i) *Tilley. 2008. Planning for Sanitation*

➤ **Users acceptance**

- Planning and initiation: principal planning framework (planning model)
- Implementation: sanitation challenges
- Operational requirements

j) *WSP. 2007. Taking Water and Sanitation to the Urban Poor*

➤ **Users acceptance**

- Planning and initiation:
 - Stages of the planning process (to meet community needs and create acceptance)
 - Integrated planning model involving communities
 - Comprehensive communication strategy to:
 - Create willingness to participate
 - Raise necessary contributions from people
- Implementation:
 - Slum Networking Project
 - Indigenous model for construction
- Operational requirements
 - Slum dwellers, especially women encouraged to have saving accounts
 - Community health education and other interventions related to mother and child care
 - Community bear O&M costs

B2. Local Level

a) *Mjoli, N. 2010. Review of Sanitation Policy and Practice in South Africa from 2001-2008. Water Research Commission: Pretoria*

➤ **Users acceptance**

- Planning and initiation: poor people can address their own sanitation problems if provided with support for collective action and access to microfinance

b) *De Boer, T. 2010. Evaluation of the Community Perception and Acceptance of Sanitation as a Consequence of the Community Participation in the Implementation – a Case Study in Cape Town. A research project submitted in partial fulfilment of the requirements for the degree of Bachelor of Science, University of Twente.*

➤ **Users acceptance**

- Planning and initiation:
 - Participation is not necessary to achieve high community acceptance
 - Other elements (support, regulation, implementation) in the community participation framework are very important to the community (even if these don't result in actual community participation)
- Implementation:
 - Participation is not necessary to achieve high community acceptance
 - Other elements (support, regulation, implementation) in the community participation framework are very important to the community (even if these don't result in actual community participation)
 - Important issues include psychology, gender, religion and economic well-being (Avvanavar & Mani, 2008). Social & cultural dimensions should be considered (Murphy et al, 2009).

c) *DWAF, 2001. White Paper on Basic Household Sanitation. September 2001. Department of Water Affairs and Forestry, Republic of South Africa*

➤ **Users acceptance**

- Planning and initiation:
 - The Policy Principles state that:
 - Sanitation improvement must be demand responsive
 - The programme should ensure community participation and integrated planning and development
 - The following strategic interventions will be considered: facilitating the participation of communities in the conceptualization, selection, planning, design stages;
- Implementation: the following strategic interventions will be considered: facilitating the participation of communities in the implementation stage
- Operational considerations:
 - The Policy Principles state that:

- Services provided should be affordable and sustainable to the household and to local government
- The following strategic interventions will be considered: facilitating the participation of communities in the operation and maintenance stage

➤ **Functioning:**

- Operational considerations: the policy focused on alleviating the negative effects, such as environmental impacts and contamination, of poor sanitation

d) DWAF. Undated. *Water Services Guide for Sanitation: Discussion Document*. <http://www.dwa.gov.za/Documents/default.aspx?type=policy> (28 May 2010)

➤ Users acceptance

- Planning and initiation: principle 2: Sanitation must focus on people

➤ **Functioning:**

- Planning and initiation:
 - Principle 3: Technical choices must be suited to local conditions.
 - Principle 4: Environmental impacts must be considered carefully.
 - Principle 6: Local government has core sanitation responsibilities.
- Implementation: principle 5: Good financial management is key:
 - Grant finance for infrastructure only covers installation costs, which has critical implications for addressing long term institutional, technical and managerial requirements of a given system;
- Operational requirements: principle 5: Good financial management is key:
 - Local authorities will ease the financial and maintenance burden on themselves if they build awareness of effective waste management as an integral part of health, hygiene and sanitation promotion. This should include information on the limited tolerance

e) Lagardien, A and Cousins, D. 2004. *A Framework for Delivery of Basic Sanitation Services to Informal Settlements: Developing Consensus on Planning for Implementation at Local Level*

➤ **Users acceptance**

- Planning and initiation: assisting people to work together towards taking action was based on formative research that focused on the lack of alignment at the planning stages, particularly between local government departments and a range of key stakeholders.
- Implementation: building consensus among the various stakeholders on the way forward by identifying and validating key elements of sanitation service delivery that can form the basis of planning for the alignment of programmes and the basis of an implementation framework.

- Operational requirements: the framework proposed in the reviewed literature suggested that a strategic approach to service delivery can overcome the institutional constraints, the problems of co-production and develop a consensus on programmes for health and sanitation promotion and social sustainability.
- **Functioning:**
- Planning and initiation: integrated planning takes place within the Integrated Development Planning and strategy processes. The process will demonstrate the sustainability and acceptability of the various sanitation technical options.
- f) *Lagardien, A and Cousins, D. 2005. Strategic Approaches in the Provision of Sanitation Services to Informal Unserviced Areas.*
- **Users acceptance**
- Planning and initiation:
 - Sustainability and community partnership
 - Strategic elements for planning and implementation of sanitation services
- **Functioning:**
- Planning and initiation:
 - Alignment at the planning stage
 - Technology choice
- g) *Lagardien, A., Muanda, C., Cousins, D. and Zindoga, C. 2007. The integration of Community-Based Procurement in the Operation & Maintenance of Basic Services. WRC Project K5/1714*
- **Users acceptance**
- Planning and initiation: services due to inadequate community involvement in planning
 - Implementation: services fail due to:
 - Inadequate community involvement in implementation
 - Low user acceptance and satisfaction
 - Inappropriate use and hygiene practices
 - Low priority
 - Poor technical capacity to implement
 - Lack of distinction between responsibilities of household, community and municipality
 - Ineffective planning, monitoring, evaluation and interventions
 - Operational requirements
 - Local monitoring & support structures
 - Facilitate institutional support for community-based O&M
 - Link up with related poverty reduction focused programmes
 - Services fail due to inadequate O&M capacity at municipal level

➤ **Functioning:**

- Operational requirements: Services fail due to inadequate O & M capacity at municipal level

h) *Lagardien, A., Muanda, C., Cousins, D., and Zindoga, C., 2009. Guidelines for the Operation and maintenance of water and sanitation services provided by municipalities. WRC Project K5/1714*

➤ **Users acceptance**

- Planning and initiation:
 - Community involvement in the decision making regarding the choice of the sanitation;
 - Community to determine the support required;
 - Community to be part of the overall management.
- Implementation: assignment of responsibility

➤ **Functioning:**

- Operational requirements
 - Understanding of the O&M tasks and assignment of responsibility and support required
 - Sharing responsibility at the interface level
 - Institutional support Unbundling O&M tasks; Institutional support

i) *MDC. 2004. National Sanitation Strategy: Accelerating Sanitation Sector Delivery. Final Draft. Prepared for Department of Water Affairs and Forestry National Sanitation Task Team.*

➤ **Users acceptance**

- Planning and initiation: the participation of the recipient communities in the construction, management and maintenance of the facilities and the making of decisions regarding their affordability is important.

j) *Pegram, G., Hartley, S., Coulsen, N., Wall, K. and Otterman, A. 2000. A Protocol to Support Peri-Urban Sanitation Provision in the GJMC, prepared for the Greater Johannesburg Metropolitan Council (GJMC). Funded by the Eastern Metro Local Council (EMLC) and the British Department for International Development Southern Africa (DfIDSA) through the National Sanitation Coordination Office (NaSCO), February.*

➤ **Users acceptance**

- Planning and initiation:
- Operational requirements
 - Phase 1: Characterise the capacity for sanitation:
 - Assess community capacity
 - Phase 3: Create a settlement sanitation task team.
 - Phase 5: Identify appropriate sanitation options:

- Social considerations for implementation planning
- Evaluation guidelines for different technologies:
- Temporary interventions

➤ **Functioning:**

- Planning and initiation:
 - Phase 2: Evaluate the viability of full waterborne sewerage.
 - Phase 3: Create a settlement sanitation task team.
 - Phase 4: Conduct a rapid assessment.
 - Phase 5: Identify appropriate sanitation options:
 - Evaluation guidelines for different technologies:
 - Temporary interventions

k) *Ryneveld, MB. 2003. Towards Policy, Strategy and Detailed Procedures for the Provision of Sanitation to Low-Income Settlements in Johannesburg, WRC Report No. 1192/1/03*

➤ **Users acceptance**

- Planning and initiation:
 - Policy is necessary to set out how sanitation will and will not be provided as well as what will and will not be done.
 - Strategy is necessary to ground policy in priorities and timeframes.
 - The initial CoJ Sanitation policy (GJMC, 2000) is criticized for not adequately eliciting an expression of demand from the community, and did not establish a strong framework through which demand might be expressed. It was strong advocacy, but did not pursue the establishment of a strong framework through which demand might be expressed.
 - The eThekweni Protocol (2002?) appears to have resolved many of the conflicts between different parties by setting out a flow chart of decisions and responsibilities.
 - The lack of development at the stage of a clear framework through which demand can be expressed carries the risk of not being able to mobilise community capacity, and of not being able to reverse the matter of non-payment.
 - For a project to be successful, the social and environmental aspects should be considered. It should also consider how local capacity is utilised through the use of local skills and resources for construction.
 - A framework through which demand can be expressed should include:
 - Regulation
 - Support
 - Implementation
 - Such a framework:
 - Clarifies roles and responsibilities
 - Clarifies the rules under which a community can get sanitation
 - Clarifies the decisions that the community must make
 - Steers the community towards a contract between water service provider and community.

- Implementation:
 - Detailed procedure is necessary to establish a methodology for the provision of sanitation to low-income settlements as well as to support and equip personnel responsible for provision of sanitation to low-income settlements.
 - Moving too fast from pilot to full scale implementation programme due to pressure to deliver may result in particular levels of service to be rejected by the communities before the implementers had the opportunity to perfect the system.
 - Local capacity (labour and resources) should be used for construction.

- Operational requirements: a longer term risk is that without development occurring in the low-income communities, it would be impossible to resolve the problems of non-payment and the inability to pay

➤ **Functioning:**

- Planning and initiation:
 - Policy is necessary to set out how sanitation will and will not be provided as well as what will and will not be done.
 - Strategy is necessary to ground policy in priorities and timeframes.
 - For a project to be successful, it needs to be successful in all of the following aspects:
 - Economic
 - Financial
 - Technical
 - Institutional
 - Social
 - Environmental
 - A successful project should also consider a life cycle perspective: planning, design, construction, operation and maintenance all need to be considered.

- **Implementation**
 - Detailed procedure is necessary to establish a methodology for the provision of sanitation to low-income settlements as well as to support and equip personnel responsible for provision of sanitation to low-income settlements.
 - Moving too fast from pilot to full scale implementation programme due to pressure to deliver may result in the inability of being able to develop designs and procedures adequately.

l) *Still, D., Walker, N. and Hazelton, D. 2009. Basic Sanitation Services in South Africa: Learning from the past, planning for the future. Water Research Commission, Pretoria. WRC Report No. TT 414/09*

➤ **Users acceptance**

- Planning and initiation:
 - Improved health and hygiene practice requires training before implementation. Most respondents in a survey indicated that they received no such training.

- The Water Services Authority is responsible for the choice of sanitation for a given area. Several decision tools exist:
 - ✓ Choice need to consider *Social Considerations*:
 - Where toilets are located?
 - What type of cleansing material is used?
 - Will the community bore any additional water costs?
 - Implementation: improved health and hygiene practice requires training during implementation. Most respondents in a survey indicated that they received no such training.
 - Operational requirements:
 - In terms of affordability, the 2001 White Paper provided for sanitation subsidies to the poor. These subsidies are administered through the MIG (Municipal Infrastructure Grants) funds.
 - The SFWS also outlines that subsidies for free basic sanitation should cover the hygiene promotion costs and operating costs of providing a basic sanitation service to households.
 - Subsidy for operating costs should be calculated as a subsidy per household per month for each settlement type and technology used.
 - Subsidies should be applied in an equitable and fair manner.
 - A survey on the impacts of sanitations revealed:
 - Users with flush toilets were most satisfied with their sanitation service, but those with a lower level of service (VIPs, VIDPs and UD) were more satisfied than those without.
 - Sanitation delivery is not only about managing toilet construction programmes. Health benefits of improved sanitation will only be realised with improved health and hygiene practices – realized through training, before, during and after implementation.
 - Most respondents received no health & hygiene training.
 - Case studies reveal most households object to the concept of sharing toilets with other households.
- **Functioning:**
- Planning and initiation:
 - Case studies reveal that a failure to properly involve the community in the sanitation choice and in health and hygiene training before implementation is likely to result in the poor functioning of the technology.
 - The Water Services Authority is responsible for the choice of sanitation for a given area. Several decision tools exist:
 - ✓ Choice need to consider *Technical Considerations*:
 - Environmental factors, e.g. soil type, flood prone
 - ✓ Choice need to consider *Financial Feasibility*:
 - Capital costs
 - Operation & maintenance

- Implementation:
 - Survey revealed that there is no difference in the likelihood that there will be a convenient hand washing facility at an improved sanitation facility relative to an unimproved facility.
 - Case studies reveal that a failure to properly involve the community in the sanitation implementation and in health and hygiene training during implementation is likely to result in the poor functioning of the technology.

- Operational requirements:
 - The SFWS places more emphasis on sustainability, financial viability and efficiency.
 - Case studies reveal that communal sanitation is very prone to failure. Some reasons include:
 - Most households object to the concept of sharing a toilet with other households
 - Such objections are worsened by arguments around who would be responsible for keeping the toilets clean
 - Some households claim the facility through fencing it off or placing on locks
 - Need to consider whether there is:
 - Road access for vacuum tankers
 - Presence of functioning solid waste disposal service
 - Where waste would be disposed

Appendix C: The framework for assessing user acceptance and functioning of MCSF

Phases	Users' acceptance	Functioning
Planning and Initiation	<ol style="list-style-type: none"> 1. Appropriate Technology 2. Ecological Technology 3. Sustainable Technology 	<ol style="list-style-type: none"> 1. Status of the sanitation 2. Sanitation technology selection 3. Appropriateness of the technology 4. Users' awareness programme
Implementation	<ol style="list-style-type: none"> 1. Participation 2. Users' awareness 3. Understanding of the Technology 	<ol style="list-style-type: none"> 1. Sanitation technology option 2. Infrastructure development 3. Operational requirements
Post Implementation	<ol style="list-style-type: none"> 1. Oversight & Ownership 2. Users' awareness 3. Development Opportunities 4. Monitoring & Evaluation 	<ol style="list-style-type: none"> 1. Operation and Maintenance 2. Monitoring and Evaluation 3. Users' issues

Appendix D: Case study profile

D1. City of Cape Town (Pooke-se-Bos)

1. Background of Pooke se Bos

Pooke se Bos can be considered as a relatively recent settlement recognized since the year 2000, part of the dwellers were evicted from a settlement located only 300 m away on the other side of the marsh where they were squatting since around 1984. The household survey has found that more than 60% of the current Pooke se Bos inhabitants came from the other side of the marsh which makes this settlement for its dwellers more like a neighbourhood rather than a township with high human migration rates.

There are a very few non-South Africans in the settlement and the main language spoken is Afrikaans. Pooke se Bos is divided into two main groups. One group supports the committee and consists mainly of the families living in the settlement for several years. This group lives in bigger and better off shacks located generally in front of the road with closer access to the stand posts and container toilets and less flooding related constraints. In addition some of the front shacks have their own generator. The other group is generally not well organized and normally consists of dwellers living in smaller shacks in the low lying areas of the settlement which are more vulnerable to floods. This last group is generally characterized for having more alcohol abuse and drug related problems as well as less income than the committee supporters group.

This report presents the site location, population of the community and the type of housing. The different types of sanitation systems are bucket systems and chemical toilets. This was the first sanitation in the community and after that there were container toilets. The sanitation that is currently in use is the MobiSan technology.

2. Site location

The settlement of Pooke se Bos is located 15 km from Cape Town CBD, in a place called Athlone. Pooke Se Bos is a small settlement juxtaposed adjacent to the wealthy Indian suburb of Rylands. The settlement is located on private land in an industrial area, which limits the service provision of sanitation. There is neither sewerage connection nor stormwater drainage within the settlement. The settlement consists of shacks and these shacks are not provided with electricity. The settlement is surrounded at one side by a road, at one side by a graveyard, and at the back by wetlands and dry land with bush shrubs on its other side. Pooke se Bos is located on Pooke road and Turfhall road, both these roads are busy roads, to keep children from running around across the roads, the community opened a day care centre to occupy children.

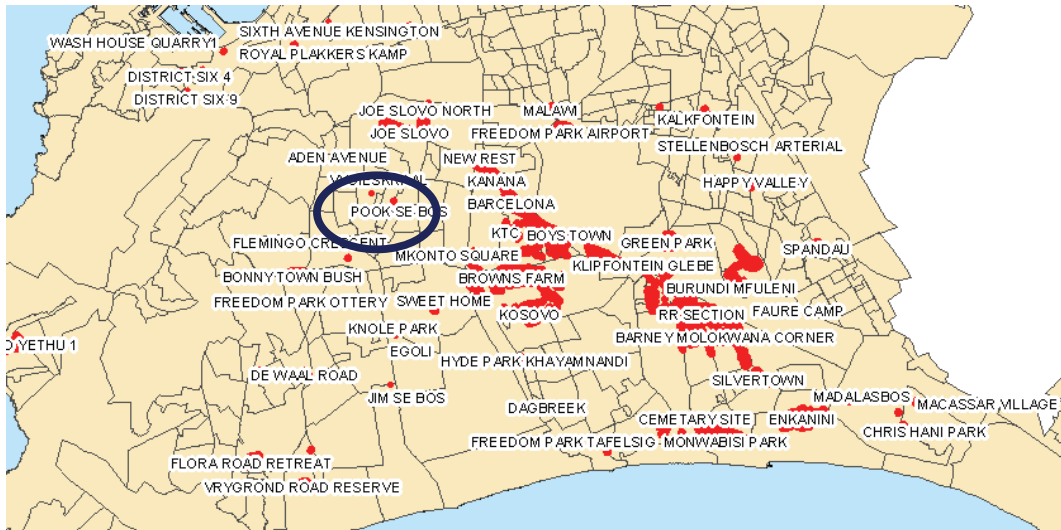


Figure 1: Location of Poke se Bos informal settlement

3. Population

A household survey was held between 10 June and 10 July 2009 during where 116 shacks were identified. Currently in Pooke se Bos there are 94 shacks according to the community leader. During the survey, 66% respondents were women and the remaining 34% were men. Over 28% of the settlement is under 12 years of age and only 3.5% are older than 60, there is only one person older than 70 in Pooke se Bos. This confirms that the life expectancy is lower and birth rate is higher compared to wealthy neighbourhoods in Cape Town.

The unemployment rate is very high reaching. It is estimated that the population is between 350 and 400 people. This is based on a counting of the community and this number was both mentioned by the community leader and the caretaker of the MobiSan (who was also involved in the counting). The population of the settlement was estimated to about 400 people. The precise amount of men and women in this settlement is also unknown. It is certain though that there are more women than men in the community.

The number of children is based on a visitors list of the toilets in which name and age of all women were captured. It is estimated that about 4 or 5 persons in the community (1%) are black and that the rest of the community is coloured (Naranjo, 2010).

4. Type of housing

Pooke se Bos is a very small settlement consisting of shacks separated by the main road giving entrance to the settlement. Typically a shack is constructed with corrugated iron sheets cladding a wooden frame, these are an increasingly common form of accommodation for millions of people and are mostly found in or around urban areas, built particularly on the outskirts of larger cities.



Figure 2: Type of housing in Pooke se Bos

5. Level of services in the informal settlement in terms of water and sanitation

The level of services in the community is very poor compared to well-established areas. One of the reasons is because it is a poverty stricken area and people generally can't afford to pay rates to upkeep and maintain the services so the government supplies them with the bare essentials, which by law states that everybody has the right to clean water and sanitation.

a) *Water supply*

A way of implementing this is that a couple of families are issued with communal taps of which they have the responsibility that no vandalism is done to it and to use it conservatively. The maintenance is the upkeep of the city of Cape Town; however a close relation between community and authorities are vital to success of the services.

b) *Sanitation facilities*

The Pooke se Bos community sanitation system was very poor, first made use of the bucket latrine system which was very unhealthy. It was then changed to container toilets (using similar bucket) and were only cleaned ones a week. The container sanitation system was also very unhygienic because the municipality had to empty the buckets manually.

6. Previous sanitation technologies used prior to the current

The previous sanitation systems implemented in Pooke se Bos were container toilets, chemical toilets and bucket latrines.

a) *Bucket latrine system*

Before the provision of the MobiSan in Pooke Se Bos informal settlement, the community used a bucket latrine system and chemical toilets. The bucket was placed underneath a latrine hole (situated in a concrete structure) and used to collect human excreta. This was not a hygienically preferred form of sanitation as it was cleaned once a week and most of the time looked very dirty. The cleaning was done by the municipality and no care was taken to ensure adequate and regular

cleaning of the facility. Many people preferred the bush over the toilets because of these issues until the MobiSan was introduced in this settlement on 12 May 2009.



Figure 3: Condition of container toilets

The condition of the previous sanitation system, the bucket latrine system, was always very bad because people were throwing dirty stuff in the toilets. As can be seen in figure 3, the toilets were unhygienic and it is therefore not surprising that people preferred the bush over the toilets. People were using newspaper as anal cleansing instead of toilet paper which caused regular blockages.

b) Chemical toilets

They were first introduced in Cape Town's informal settlements as an emergency health solution but since then have become a standard option. It consists of a 100 litres plastic bucket that is attached to the plastic superstructure. These are generally served three times per week but in highly populated settlements the service is requested five times a week.



Figure 4: view of the chemical toilets

c) *Container toilets*

The container toilets (figure 5) are similar to chemical toilets; these toilets were first introduced in Cape Town informal settlements as an emergency sanitation solution but since then have become a standard option. The only difference is that the plastic container is independent from the single or panel cast structure, therefore, the container itself has to be removed and replaced weekly.



Figure 5: View of container toilets

Before the implementation of the MobiSan, there were 33 container toilets (placed in different rows) located in the settlement. Only 23 of these toilets were operative and each toilet was intended to be shared by five families due to the housing density and to make things easier for the service provider. These toilets were managed by the City and were often vandalized and out of use. Families who didn't have access to toilets were using the bush or nearby garage facilities.

7. Population served

The existing container toilets were shared by two families or less whereas they should be serving five families. The reason for this was because some families would lock the toilets and thereby limit others from using it. The total population of the community that has been served was approximately 400 people. Following the dynamic of the settlement, the exact number of people living in the settlement is not well known. The number of 400 is given by the municipal official while 500 is provided by the community leader.

8. Type of mobile communal sanitation facilities in use

The MobiSan (Mobile sanitation unit) was brought by a Dutch consortium as a pilot sanitation project for the settlement. The demonstration project aimed to speed up innovation in informal settlement sanitation by introducing a mobile, container-based sanitation system. The MobiSan unit is designed as a community based facility to serve about 500 people; in case of larger communities more units can be installed. The MobiSan unit is continuously staffed with local (community) caretakers (2 per unit), previously trained and responsible for the cleansing, operation and maintenance of the system.

a) *Description of the MobiSan*

Technically, MobiSan facility (figure 6) consists of a stand-alone (no water supply, sewerage and/or electricity needed) sanitation unit equipped with 13 toilets and 12 urinals as well as hand washing facilities and a night soil disposal access. Toilets are based on urine diversion and faecal matter dehydration. Urine is collected in storage tanks for potential reuse. Faecal matter is dehydrated within the MobiSan resulting in reusable product. It also provides a small caretaker room and the facility is open from 5am until 9pm.



Figure 6: Front view of the MobiSan

The informal settlement Pooke se Bos was selected because of its poor sanitation system, the size of the settlement and amount of users. MobiSan was introduced in May 2009. It has been functioning successfully over 1.5 years now with a very high user satisfaction.

The window of the caretaker office is still closed by a wooden plate. As becomes clear from the figure, the unit is placed on a concrete slab and entrance is provided with stairs. The blue doors are toilets for children, the white doors for women and the red doors for men. The sinks are also visible in front of the caretaker office.



Figure 7: Rear view of the MobiSan

At the rear end of the MobiSan, urinals are installed for males and young boys. There is no roof over the urinals. The ventilation pipes at the top are also visible. The ventilation pipes are wind propelled and some has been changed to electrical ventilation due to a lack of sufficient wind in the area. Extra stairs at the urinals were added later as well, this was done to provide access for children to the urinals.

The facility is also equipped with a hand wash facility outside the caretaker control room. The small wooden block at the left side of the picture is to provide children access to the basin.



Figure 8: View of hand wash facility

There is a holder for toilet paper, but this is not present in the toilet. The caretaker hands out some toilet paper to the members when they want to make use of the toilets.



Figure 9: Internal view of the toilet

Faeces are collected and stored in two separate storage tanks (figure 10); the third compartment on the left side of the figure is used to store urine. From the toilets, the faeces fall into the middle compartment. When this compartment is full, faeces is transferred to the next compartment where it is mixed with saw dust. This is necessary to finish the process of making compost. The lever on the side of both faeces tanks are used to mix the faeces.



Figure 10: View of faeces tank and lever

9. Operation and maintenance of the MobiSan

The MobiSan is only operating from 5am to 9 pm, this means it only operates 16 hours per day during which the caretaker monitors the use and ensures cleanliness of the facility. These 16 hours is divided into two shifts, whereby the first caretaker is working from 5am to 1pm and the second one from 1pm to 9pm. The community dwellers do not have access to the facility at night. Where a caretaker gets a day off the other caretaker will be required to work the full 16 hours. The working hours for weekends are the same as the weekly working hours.

a) Functions of the caretaker

The responsibilities of the caretakers are to ensure that the MobiSan is always in a good working condition and to prevent misuse and vandalism. Caretakers also interact with community members by providing guidance regarding the use of the facility and encourage hand wash (especially among children). The caretakers must also keep the MobiSan clean and assure that they always have enough cleaning products and toilet paper.

The MobiSan needs to be cleaned on a regularly basis to function properly. Therefore caretakers check-up after every user of the toilets. The outlet pieces of the urinals are removed and cleaned after every 3 days to prevent blockages. Different cleaning detergents such as Pine, Blue Kem and Handy Andy are used to keep the toilet hygienic and clean.

b) Roles of the Municipality

The City of Cape Town supplies the cleaning products and toilet paper on request from the caretakers. The electrical ventilators also need to be maintained constantly to make sure that it operates on a regular basis. Neglecting of maintenance could cause serious damage to the MobiSan, which could lead to fumes polluting the air.

c) Roles of the community

The community should keep the facility constantly clean and work together with caretakers. As users, communities are requested to cooperate with the caretaker through adequate use of the facility, reporting and dealing with problems related to theft, illegal connections, misuse or non-compliance with operational requirements.

10. Problems encountered in the settlement with regard to sanitation

Providing sanitary systems in informal settlements is of major concern as a result of the location of the settlements making the installation of such systems very costly and difficult to install due to ground conditions.

The types of toilets previously provided in the settlement (container system and chemical toilets) were shared by 5 families. These resulted in conflict between users and lead to several cases of vandalism, misuse and negligence. The O&M was not regular and left users without choice than reverting to the bush or bucket system that was eradicated in the area.

With the introduction of the MobiSan, there is not much problems encountered to date; this is mainly due to the presence of the caretaker, ability of users to understand and apply operational requirements as shown by the caretakers and more specifically the use of toilet paper.

In general, most of the users do not experience problems, despite few reports regarding an uncomfortable feeling when a wind passes through the toilet seat. This is why some of the community members are not using the toilets. The MobiSan unit does not accommodate disabled people, due to the lack of an access ramp.

D2 Stellenbosch (Kayamandi)

1. Background

Kayamandi is a township situated in Stellenbosch which is about 48 kilometres from Cape Town. This settlement was called "Kafferland" during the apartheid years and was just opposite Stellenbosch Farmers Wineries. Kayamandi consists of people who came from rural areas of South Africa and other countries, in search of work for better living standards. The township is characterized by high unemployment rates and severe poverty. Although some developments were made in the past decades, informal settlements still dominate Kayamandi. Furthermore, absence of adequate social services, such as water distribution and sanitation systems has resulted in reduced life quality of people living in Kayamandi.

Kayamandi settlers mostly locate their houses along flood lines, high water table and on a hilly area. Their houses, commonly known as shacks, put municipalities in a challenging position to provide adequate services. Irrespective of this situation, the government is entitled to provide relevant services needed through the Stellenbosch Municipality to sustain the life of the Kayamandi residents. The services to be provided include water and sanitation systems and as result, decisions need to see the guaranteed access that can be conveniently gained from the services.

This report presents the background of Kayamandi, site location, population and the type of housing as well as the level of service in terms of water supply and sanitation systems. Furthermore, a discussion on operation and maintenance and problems encountered in Kayamandi with regard to sanitation are included.

2. Site Location

Kayamandi is the area of Stellenbosch municipality designated as a 'black area' during the apartheid years in South Africa and it lies, literally, across the railway tracks on the northwest edge of town. The township is located on the outskirts of Stellenbosch. Stellenbosch town itself is at the heart of the mountainous Winelands (figure 1 below) and is located 48 kilometres northeast of Cape Town in the province of the Western Cape of South Africa (IDP, 2007).

3. Population

According to the IDP (2007), Kayamandi informal settlement is settled by migrant labourers from the so-called homelands especially from the former Transkei and Ciskei. This is the reason why up to today most of the people who settled in Kayamandi are "Xhosas". The word "Kayamandi" itself is a Xhosa word with "Kaya" meaning home and "Mandi" meaning sweet/nice (Dennis, 2005).

According to Wanza (2010), the current population in Kayamandi is estimated at about 40 000 people occupying 75.06 hectare of land. Ten percent of the population is children under the age of 10 years and more than 50% of these children are from single mothers. More than 70% of the population in Kayamandi lives in squatter camps without proper infrastructure. In these camps there is a very high rate of malnutrition, poverty, aids and crime.

About 46% of the total population in the municipal area was unemployed a few years ago and most of the community still live in poverty where many shacks in Kayamandi are generally in darkness without electricity. There is electricity available for only very small areas and are not suitable for populated informal settlement areas. This is not widely used due to their low reliability specifically during maintenance periods.



Figure 1: Location of Kayamandi informal settlement

4. Type of housing

In 2007, there was a total of 3700 households in Kayamandi of which approximately 16.6% lived in formal houses and 83.4% lived in informal dwellings (prefabricated hostels and informal shacks) (IDP, 2007). Actually, Kayamandi is divided into formal and informal zone namely Main Kayamandi, Enkanini called new Kayamandi and Slab Town informal settlement.

4.1 Main Kayamandi

About two thirds to more than three quarters of the housing units have a formal character in main Kayamandi as this informal settlement existed for many years and it was recognized a township of Stellenbosch in the Western Province of South Africa. When the ANC government came into power in 1994 one of the priorities was the provision of housing for all citizens. Therefore, the main Kayamandi was granted with Reconstruction and Development Program (RDP), which made the township currently shaped by economic factors and urbanization trends.

The form of accommodation as indicated was built between 1950 and 1966 to house 2000 migrant labourers. In hostel accommodation each household has approximately six square meters of space and this was in full view of other occupants. Previously there were six hostels in Kayamandi. Each hostel consisted of 20 families and originally two toilets and no shower facilities (Erhard, 2000).

The development of a Costal Land built 10 years ago has 125 detached housing units of 48 m². The units have two bedrooms, a bathroom, kitchen and lounge. The developers were also responsible for the upgrading of nine prefabricated hostels. These have been changed into semi-detached houses with two bedrooms, a bathroom, lounge and kitchen and are 36 m² in size (IDP, 2007). Housing in formal areas has a formal and semi-formal character showed in Figure 1.



Figure 2: View of formal housing in main Kayamandi.

4.2 Enkanini (New Kayamandi)

The new Kayamandi is on the hill of Stellenbosch and is a recent informal settlement which emerged two years ago. The settlement is dense, comprising of many shacks more than 300 shacks which are unstructured and unplanned, built with diverse material such as cardboard and plastics. This settlement is not provided with electricity and is located on private farm land, which limits the service provision of sanitation. There is neither sewerage connection nor storm water drainage within the settlement.



Figure 3: View of Enkanini informal settlement

Housing in Enkanini informal settlement is predominantly composed of informal dwellings with an average of 5 x 5 metres of floor space. The informal dwellings are constructed entirely or partially of wood, corrugated iron, plastic and other low-cost building material (Figure 4). According to Wanza (2010), the estimated population in Enkanini is less than 1000 people using fifteen mobile toilet facilities installed in this informal settlement.

4.3 Slab Town

Slab Town is a small informal settlement in Stellenbosch, consisting of 18 shacks built from diverse materials such as cardboards, wooden planks and plastics. The occupants of this place have been staying there for eight years using a mobile toilet facility with flush water. These toilets have not been serviced since they were installed. The settlement is occupied by an estimated 65 peoples (Wanza, 2010).



Figure 4: Informal Housing (Shacks), in Slab Town

5 Level of Services

5.1 Water Supply

A water supply system has to fit into the communities' social patterns and must not be beyond the technology of the receiving community. In informal settlements, however, stand posts are well feasible water supply techniques for a long time to come particularly due to improperly planned housing layouts, which makes individual connections extremely expensive.

Figure 5 shows 2 communal standpipes installed at lower levels in order to make it easy for both adults and children to use taps with different types of containers. The standpipe is made from cement to prevent theft of pipe taps with an accommodated wash basin connected to drain away wastewater and grey water.



Figure 5 External view of right side of Kayaloo

Each standpipe is situated at a suitable position within the community area in order to limit the distance that the resident may need to cover to collect water. The walking distance for the most distant user in the Kayamandi area is at the least limited to 200 m.

5.2 Sanitation Facility

Kayaloo (Figure 6) is a type of mobile communal sanitation facility used in Kayamandi informal settlement at Stellenbosch; this was designed for 1 unit mobile sanitation with 10 toilets which can accommodate 15 to 20 people with flush water inside of each unit. Due to drastic increase in informal settlements, the available facilities are inadequate to cater for the growing population and thus lead to the available facilities being inefficient to the communities as the maintenance is not improved.

Kayaloo mobile toilet facility is separated with metal compartments where each compartment toilet has a plastic seat without a cover lid to keep out flies and one push button to flush the toilet after use. Flushing was facilitated by a Flush Master Junior flush valve and non-recyclable PVC flush pipe, securely protected behind a metal screen to discourage vandalism. The flush master push button is only visible from the cubicle. The anti-vandalism features on the Flush Master valve is illustrated in figure 7. The Kayaloo mobile sanitation is connected to one main sanitation system that collects all the waste for the all communities and transported directly after the toilet has been flushed.

Enkanini informal settlement is provided with 15 mobile toilet facilities which flush water and one mobile communal sanitation facility in Slab Town informal settlements. This however is not enough with the rapid growth of the population found in these informal settlements.



Figure 6: External front View of Kayaloo

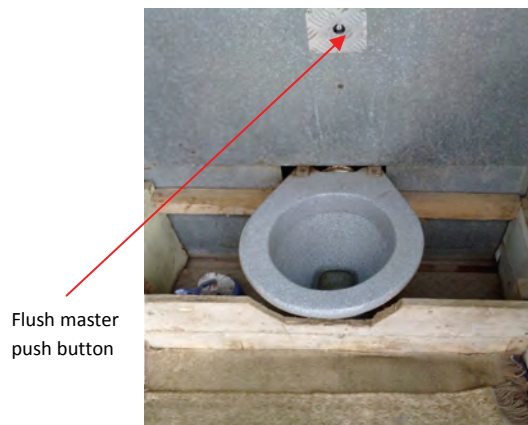


Figure 7: Internal view of Kayaloo

6. Operation and Maintenance

Kayaloo needs to be cleaned on a regular basis to function properly. Although the operation and maintenance of public infrastructures are not considered constant, the Stellenbosch Municipality should make sure that all the mobile sanitation facilities are operating fully and proper maintenance are done. This is because during the investigation some of the mobile sanitation units were found to be in poor conditions where a higher level of commitment from users of Kayaloo is required.

Community users of the Kayaloo are more sensitive to, and consequently less tolerant of abuse. In some of the toilets used in Kayamandi, the toilets were often used as rubbish depositories and the use of anal cleansing materials other than tissue paper, such as rags, plastic bags and tree leaves end up in the pits. Stellenbosch municipality is responsible for maintaining the toilets and should employ more people in the community to look after the toilets. When any incidence is reported by the community, the Municipal workers come but not regularly, therefore toilets are frequently blocked and not often repaired.

7. Problems encountered in Kayamandi with regard to sanitation

Continuous in-migration of people into Kayamandi from the rural Eastern Cape brings "new people" into town and this influences more uncontrolled shack development. These new residents are clearly not aware of the appropriate use of shared facilities and sanitation systems available. They often do not know that it is not appropriate to dump materials into toilets and drains, which causes constant blockages and lot of damages. Therefore, there are many problems encountered in Kayamandi such as:

a) *Disease caused by unhygienic toilets*

The users are not aware of the correct transmission routes of excreta-related diseases in order to prevent this transmissible disease, people should keep the toilet pedestal clean and wash their hands after using the toilets. Sometimes disease results from dirty water caused by blocked drains, and a constant feature caused by dumping inappropriate materials in toilets and drains.

b) Vandalism

There is evidence of vandalism or breaking of toilets and the throwing of inappropriate materials into toilets and drains. There is no sense of ownership amongst residents for the common services used. So, broken taps shown in figure 8 have been identified in Kayamandi.



Figure 8: A broken tap in Kayamandi

c) Rehabilitation of sanitation facilities

In Kayamandi, some of the mobile sanitation facilities have been found broken, doors unlocked sometimes conflict arises because of the padlocks as only 3 keys are issued per padlock. They resolve the issue by breaking doors of the toilets, use and leave it without flushing. There is carelessness and ignorance of people about the nuisance of the smell for others, especially those close to a blocked toilet, saying that it's not their place or not having their own houses and property.

d) Inadequate municipal services

Lack of skips and bins results in waste being disposed of everywhere. This is further exacerbated by the loss and theft of municipal provided bins. The municipality seldom responds when a problem is reported.

e) Insufficient cleaners

There is a lack of cleaners in Kayamandi in order to maintain a safe level of sanitation usable to everyone.

f) Lack of health organization campaign

In Enkanini and Slab Town informal settlements there are a lack of health and hygiene programmes.

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D3 eThekwini (Shembe)

1. Background

Shembe is a township in KwaZulu-Natal in South Africa that is situated 24 km inland from eThekwini, the Greater Durban Metropolitan Municipality. Shembe is far from the Central Business District and consists of limited basic sanitation service infrastructure, inadequate recreational facilities and a shortage of social facilities. Like most of the informal settlements in eThekwini Municipality, rapid growth of the settlement was influenced by the people migrating from rural areas and other towns in search for better life and employment opportunities. Due to their low income, these people cannot afford to pay for safe housing in a healthy environment so they settle for a place where their income allows them to stay.

Although it is an informal settlement, the residents still need to live in a clean, healthy and safe environment with adequate sanitation services provided to them by the municipality. Currently the settlement experiences higher residential capacities and the sanitation services installed by the council are now unable to cater for the growing population. Water distribution and sanitation services systems are some of the services that the residents are lacking and this is detrimental to their health and life.

The report will therefore investigate the condition of the existing water distribution and mobile sanitation facilities in the informal sector of the township.

2. Site Location

Geographically, Shembe is situated in Inanda, an old township near KwaMashu and Ntuzuma, situated adjacent to each other. These three informal settlements are combined into a single area, referred to as INK. The physical boundaries between them are blurred. eThekwini Municipality manages INK through a single administrative unit, and local councillors are responsible for wards that cut across all three areas. The area is situated in a hilly landscape, which reflects the landscape of Kwazulu-Natal in general.



Figure 1: Location of Inanda in Durban Metropolitan

3. Population

According to Sibiya (2011), the current population of Shembe informal settlement is about 3 150 people occupying shacks of the area. This was obtained to the ratio number of each unit which was accommodated for 75 households multiplied by the number of the toilet facilities (including men and female). About 55% of households in the area have one to three members, and a further 35% accommodate four to seven people.

Over 65% of the population is younger than 29 years of age, indicating that youth development is a priority. The female to male ratio is almost on a par, with 51% of the population female and 49% male. Despite this, male-headed households are in the majority at 57%.

Around 95% of the population speaks Zulu as a first language. The limited level of English instruction inhibits opportunities for employment within eThekweni's knowledge economy.

4. Type of Housing

In total, the Shembe area comprises predominantly formal and informal housing, but the area is largely dominated by formal housing (52%); while informal housing accounts for (43%) and traditional housing made in mud accounts (5%) of the area.



Figure 2: Type of housing at Shembe informal settlement

5. Level of Service

5.1 Water Supply

It was found that the supply of water in the community is not enough; consumers are facing serious problems about the way they get water. Most of the people in the community have to carry water to their houses in buckets, which is a problem for them because some of them have to walk a long distance in order to get water. It was also found that some of the people in the informal settlement cannot fetch water due to the geographic situation of Shembe where some of the shacks are situated down the hills where they are unable to walk up the hills and fetch water.

The previous water supply network has been designed a few years ago in accordance with the population figures available at that time. Since then the number of residents increased substantially and the capacity of the system evidently became insufficient. Each supply area currently receives water at only two occasions per week. As a result of the system being operated at a capacity higher than what has been designed for, wear and tear levels are high while very little maintenance and refurbishments can be undertaken on the infrastructure. Breakages and electrical power failures cause major disruptions in the supply programme and a deficit in the total supply as a result.

As a result of the low level of service and irregular supplies, water users have a negative attitude towards the supply authorities and wellbeing of the scheme. For this reason residents very often make unauthorised connections to the bulk supply pipelines in the hope of higher volumes and higher frequency of water supply. These unauthorised connections are not in accordance with any technical standard and in most cases cause water loss due to constant leaking of the connections under high pressures.



Figure 3: Communal tap at Shembe informal settlement

5.2 Sanitation Facility

5.2.1 Previous Sanitation

According to Lucky Sibiyi (2011), before the installment of the ablution facility, the population of Shembe informal settlement was using the pit latrine (Figure 4) or bush. It was also found that the same community still uses the pit latrine during the night while the ablution container is closed. Some other people of advanced age, mostly old women still use the pit latrine because they cannot walk up the hill to easily reach the ablution container.



Figure 4: Pit latrine in Shembe

5.2.2 Current Sanitation

The current sanitation used at Shembe Informal Settlement is the CAB (container ablution facility) showed in figure 5. The eThekweni municipality has a quota whereby they try and cater for enough ablution blocks so that each facility consists of 2 units (one for male and another for female). The male unit comprises 3 toilets, 2 showers and 1 storeroom while the female unit comprises 4 toilets and 2 showers. Each unit can accommodate up to 75 households, and a typical household consists of 5 people meaning that a unit can accommodate about 375 users.



Figure 5: External view of female CAB

CAB consists of 2 different block containers which have two separated areas:

- The male block generally contains: 2 urinals; 3 toilets; 2 showers and 2 washbasins.
- The female block includes: 4 toilets; 2 showers; Hand washbasin and Laundry basins outside the facility.

The dwellings should be within a radius of 150 to 200 m from the toilet block. Lighting at night is provided via translucent roof sheeting and external mast mounted floodlighting.



Fig 6: Internal view of CAB in Shembe

6. Operation and Maintenance

The municipality is in charge of the facilitation and monitoring of the communities served by the CABs. A caretaker, selected by the community and appointed by the municipality, is in charge of the daily management of the facility, providing cleaning and communicating with the service of municipal workers in case of problems in the facility.

The caretakers' responsibilities as conceived by eThekweni Municipality are the following:

- Cleaning of the facility (in the morning and afternoon),
- Ensuring availability of toilet paper, (provided by the municipality),
- Informing users about washing hands after using the toilet, before handling food and after changing babies' nappies.
- Reporting lack of cleaning materials and structural problems with the facilities,
- Remaining at the facility during duty, to ensure access to user.
- Spreading the message of good hygiene and the importance of sanitation.
- Making the municipality aware of sanitation-related needs.
- Reporting faulty sanitation systems and sanitation risks to the environment to the municipality.

7. Problems encountered in Shembe with regard to sanitation

The community use standpipes to get water and they are experiencing more problems because most of the people staying in the community depend on one standpipe. There is a shortage of standpipes in the informal settlement whereby most of the people have to walk a long distance in order to get water. The community is unable to use the toilet because the container ablution facility is far from where they are staying – further downhill.

Inadequate sanitation facilities and infrastructure combined with unhygienic practices represent a community's sanitation problem. The unhygienic practices are clearly the result of:

- Lack of sanitation facilities;
- Inadequate water supplies;
- Poor facilities for the safe disposal of waste water and other domestic waste; and
- Inadequate toilet and hand washing facilities.

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Appendix E: Interview questionnaires and Field notes

Appendix E1: User acceptance

E1.1: Interview questionnaire

1. Planning					
Appropriate Technology	1. Were you involved in selecting the toilet?			Yes 10pnts	No 0pnts
	2. How were you involved?	I suggested the selected technology 10pnts	They asked for my opinion 5pnts	They only explained to me how the chosen technology works 0pnts	
	3. Was enough information provided about each type of toilet?			Yes 10pnts	No 0pnts
	4. Do you understand how to use the facility?			Yes 10pnts	No 0pnts
	5. Do you believe that all user groups (children, disabled and others) will understand the use?			Yes 10pnts	No 0pnts
	6. How satisfied are you with the toilet?	Very satisfied 10pnts	Just satisfied 6pnts	A little bit satisfied 2pnts	Not satisfied 0pnts
	7. How frequently do you use the toilet?	Always 10pnts	Most of the time 6pnts	Sometimes 2pnts	Never 0pnts
	8. Does the toilet offer you privacy?			Yes 10pnts	No 0pnts
	9. Does the toilet offer you dignity?			Yes 10pnts	No 0pnts
	10. Is the toilet appropriate for women?			Yes 10pnts	No 0pnts
	11. Is the toilet appropriate for children?			Yes 10pnts	No 0pnts
	12. Is the toilet appropriate for the elders?			Yes 10pnts	No 0pnts
	13. Is the toilet appropriate for the disabled?			Yes 10pnts	No 0pnts
	14. Are there separate facilities for male and female users?			Yes 10pnts	No 0pnts
	15. Is the toilet facility close to you?			Yes 10pnts	No 0pnts
	16. Is it safe to use the toilet?			Yes 10pnts	No 0pnts
	17. Are you able to use the toilet at night/ after hours?			Yes 10pnts	No 0pnts
	18. Are there locks on the toilets?			Yes 0pnts	No 10pnts
	19. Does the toilet cater for your special religious needs?			Yes 10pnts	No 0pnts
	20. Does the toilet cater for your special cultural needs?			Yes 10pnts	No 0pnts
	21. Can you afford to use the toilets?			Yes	No

			10pnts	0pnts
Ecological Technology	22. Will the toilet protect or pollute the environment?	Protect environment 10pnts	No impact 5pnts	Pollute environment 0pnts
	23. Will children have easy access in coming to contact with the human waste?		Yes 0pnts	No 10pnts
Sustainable Technology	24. Has the toilets resulted in less illnesses?		Yes 10pnts	No 0pnts
	25. Has the toilets resulted in a cleaner environment?		Yes 10pnts	No 0pnts
	26. Has the toilets resulted in less flies?		Yes 10pnts	No 0pnts
	27. Does using the toilets impact negatively on your income?		Yes 0pnts	No 10pnts
2. Implementation				
Participation	28. Were you involved in the construction of the toilets?		Yes 10pnts	No 0pnt
	29. Were you paid for your involvement?	Yes 10pnts	No 0pnts	N/A
	30. Were you trained in management/construction of the facility?		Yes 10pnts	No 0pnts
	31. Was your shack of those that had to be removed?		Yes 0pnts	No 10pnts
	32. Were you satisfied with that?	N/A	Yes 10pnts	No 0pnts
	33. Were you provided with assistance in reconstructing your shack?	N/A	Yes 10pnts	No 0pnts
Understanding of Technology	34. Do you understand the operational requirements or how to use the facility?		Yes 10pnts	No 0pnts
User Awareness	35. Did you receive training on good health and hygiene behaviour?		Yes 10pnts	No 0pnts
	36. Are you able to train others on good health and hygiene behaviour?		Yes 10pnts	No 0pnts
	37. Do you practice what you have learnt in the training?	N/A	Yes 10pnts	No 0pnts
3. Post Implementation				
Oversight & Ownership	38. Are you responsible for looking after and managing the toilets?	Yes 10pnts	There are paid caretakers 5pnts	No 0pnts
	39. Can you manage the toilets if given the opportunity?	Yes 10pnts	No 0pnts	
	40. Is there conflict among the residents around access to the toilets?		Yes 0pnts	No 10pnts
Development Opportunities	41. Do the toilets provide a source of income for you?		Yes 10pnts	No 0pnts
User Awareness	42. Are there regular user awareness programmes?		Yes 10pnts	No 0pnts
	43. Does the user awareness training lead to good practice?		Yes 10pnts	No 0pnts
M&E	44. Were you trained to do monitoring and evaluation?		Yes 10pnts	No 0pnts

E1.2: Field notes

1. Stellenbosch

a. Municipal Interview

Date: 25 November 2010

Municipal Official: Heindren Wanza, Water and Sanitation Department

Time: 9:35 AM-10:35 AM

This interview focusing on *user acceptance of MCSF* was conducted simultaneously with the interview focusing on the *functioning of MCSF*. Some of the questions for user acceptance complemented the questions for functioning and vice versa and hence the two interviews ran in parallel.

The interview was in reference to the three case study sites within Stellenbosch that includes *Slab Town*, *Kayamandi*, and *Nkenini*. However the interviewee also made reference to another site in Franschhoek to further explain himself. The following are some additional notes which complement the interview schedule.

There are a total of 27 *Kayaloo* units between the three case study areas:

- Slab Town: 2 (can accommodate 400 people)
- Kayamandi: 15 (can accommodate 3000 people)
- Nkenini: 10 (can accommodate 2000 people)

One unit includes 10 toilets and 1 toilet can accommodate for 20 people, therefore 1 unit can accommodate for 200 people. In total, the *Kayaloo* units in the three case study sites of Stellenbosch can accommodate for 5400 users.

➤ *Problem Identification*

A need for sanitation was indeed identified as it was clear that no toilets existed previously. Residents would then either use the toilets of other houses that had toilets or they would relieve themselves in the outdoors along the rivers. A problem analysis was therefore conducted that was specific to sanitation, and not other services. The analysis did not include a participatory methodology as it only involved the municipal official speaking to residents.

In terms of considering settlement conditions, it was only in Franschhoek that the economic characteristics of users were considered. However this was not done for the case study sites under review.

Where the gradient of the slope is concerned, reference was made to Nkenini.

➤ *Integrated Planning*

A department that was not listed in the interview schedule but that was noted as being complemented by the sanitation service includes that of the *Green Clean Department*. The Solid

Waste department was given half its score of 2.5 points as the response to whether this department is included in the integrated planning was both yes and no. He explained that it does not complement the Solid Waste department in that some toilets are near the refuse bins, but that it is difficult for the Solid Waste department to go inside the settlement to those disposal points because of the steep slope of the settlement as well as because of the gravel road which also has deep trenches in it. However, the sanitation services also complements the Solid Waste services in that people want to keep their toilets clean and so they tend to pick up their solid waste, making it easier for the Solid Waste department.

➤ *Appropriate Technology*

The only way in which residents were involved was that a community meeting was held with them where it was explained that the particular type of toilet was the most efficient one they can be offered. There was no space for the community to select the type of technology. Detailed information was therefore provided only of Kayaloo and no other alternative technologies.

The question around whether the technology meets the basic minimum level of requirements of the national policy was said to be a good, but difficult question. This is because the policy is not clear what basic minimum is and that he believes that despite this lack of clarity, that the technology does meet the basic minimum level. However, he mentioned that the technology however is not appropriate for human habitat as nobody would want to live in conditions where one has to use such shared facilities. Therefore on a personal level, he does not see it to be acceptable as a basic minimum standard.

- Some children tend to play in the toilets.
- Ramps have been put in place in some of the units to accommodate for the elderly and disabled.
- Whether the technology is centrally accessible depends on the site and also is dependent on the community leader who indicates where toilets should be positioned.

➤ *Sustainable Technology*

In terms of affordability, the toilets are very cost effective for the municipality where it costs only R 5000 per year to maintain 1 toilet.

➤ *Detailed Procedure*

There is nothing officially in writing, but they do have an in-house guideline.

➤ *Participation*

In some places people were relocated.

➤ *Health & Hygiene Awareness*

Health and Hygiene Awareness programmes were only done in Kayamandi and 'Coloured' areas. Enkanini will only receive health and hygiene awareness programmes next year. The only support that residents were provided to assist in practising good health and hygiene behaviour involved providing them with a one month supply of toilet paper.

➤ *Pilot to Full-scale*

The technology was pilot tested in Slab Town.

Reflection: In terms of scoring, is it appropriate to give 0 points when no modifications are necessary? The rationale here lies in trying to understand whether it is a bad thing when no modifications are needed. This is because having to do no necessary modifications could be seen as a positive thing in that the technology was well designed and therefore no changes was necessary.

The above then applies also to the last question, in terms of scoring the duration after the pilot was implemented to full-scale implementation. Is it appropriate to give a lower score if a short period of time had lapsed between pilot to full-scale implementation? Because if no modification is necessary, why would there need to be a delay?

➤ *Oversight and Ownership*

There is a tender process that allows local operators to tender for the maintenance in terms of cleaning of the toilets.

➤ *Health & Hygiene Awareness*

The Green and Clean department is responsible for health and hygiene awareness programmes. He also mentioned that people are paid in Kayamandi to teach other people how to use the technology.

➤ *Monitoring and Evaluation*

There is no structured monitoring and evaluation system. There is only an “in-house” system. Community-based monitoring is ad hoc where residents would report defects, etc. In Kayamandi there is a team with radios and an office that takes on complaints as well.

b. Interviews with Users

➤ Slab Town

Interview 1

- 12 to 13 shacks
- 8 toilets
- They used to use two pit latrines before Kayaloo. They also use to use the bush opposite the railway line
- Some people have locks on the toilets, so how is it possible to share?
- They request a shower
- There is no caretaker – at least a local caretaker can be provided
- Good health and hygiene practice is what he has learnt himself

Interview 2

- Respondent was the former community leader
- There is no community leader
- Initially there was 13 shacks, now there are currently 18

- Between 1999 to 2001 the municipality took the community court because they were squatting. The community marched to the municipality until the municipality took note of their problems. The municipality then organized a meeting in the city hall where the residents were able to discuss their problems. Sanitation was raised as a concern.
- At night it is inconvenient for women and children to use the toilets
- He pointed out the problem about the pipelines in that there are only a few in each section. So when they become blocked it becomes a problem.
- Flies only occur in toilets that are not properly looked after, especially those that are not locked.
- During construction, the structure around the pit latrines were thrown down and they had to use the bush in the interim.
- There is nobody from the community appointed to be responsible for managing the toilets. They would only contact the municipality when they require the "rods" to unblock the toilets.
- Every Wednesday the municipality does M&E. Note, at this point 2 municipal personnel arrived to do M&E (photographs)

Interview 27

- There was no toilet , people were using the bush
- People were happy because there was no choice
- The toilet doesn't offer dignity because too many people in the morning in order to use the toilet
- Some other people don't flush toilets after use
- People don't want to clean the toilets

Interview 36

- Municipality is informed and they don't care to repair
- The toilet is not safe because, there is no electricity at night, sometime gangsters
- When Incidence are reported, Municipality workers come always late
- The toilet is closed and if you can't get the key you have to break the lock; use your own lock
- The Municipality must appoint someone to look after the toilets in order to maintain them
- The toilets must be cleaned to avoid transmission of diseases

➤ Kayamandi

Interview 3

- 10 toilets
- Previously 1 toilet for 5 houses. Later municipality brought Kayaloo

Interview 5

- Municipality never informed them about bringing in the toilets
- 6 people per toilet
- Dangerous to use to toilets at night
- Some people break the locks off the toilets because they don't have a key
- Sometimes conflict arises because of the padlocks as only 3 keys are issued per padlock. They resolve the issue by compromising through borrowing the key
- There are no taps to clean the toilets

Interview 50

- People are unhappy because currently 25 people are sharing 1 toilet, 10 units are used by 300 people, and it's unacceptable.
- The toilets are not disinfected and they are far from users
- There is always misuse, people don't want to use it properly as they found it, so people need to be taught.
- Municipality come but not regularly
- They are not locked and flies are every where
- The toilets are blocked and never been repaired

Interview 44

- The toilets are cleaned by the community and do it by their own
- Dirty water is running from the toilets to the shacks and make the environment unsafe for the community
- Municipality doesn't want to give us job or to help them when they are busy working for the toilets
- The community must buy their own lock in order to secure the toilets.

Interview 47

- The toilets are unlocked because of vandalism
- The community has been using bush before
- Community doesn't get any support from the Municipality to maintain the toilets
- The community cannot use the toilet at night because they are not safe and too much gangsters during the night.

Interview 46

- Nothing is done by Municipality when a broken toilet is reported
- There is conflict between people when they are not cleaning or flushing toilets after use
- There is no respect with this kind of sanitation because it's a mixing toilet(male and female together)
- The toilet is not safe at night and when it's raining
- Anyone is using toilet when is not locked and unknown persons don't care about dirtiness for the toilets
- The tapes are blocked and the community has to go far to get drinking water or washing water
- Kids are not supposed the toilets because they not safe from diseases and if it's used because there is no choice
- The toilets are not safe for disabled people

Interview 32

- Everyone must have a key to ensure access to the toilets and keep it clean
- Municipality must get that responsibility of employing people to clean the toilets
- Some of the cleaners have been in charge of it but resigning because of peanut money paid
- The community needs health campaign but who can organize it?

- The community needs more units due to higher number of users

Interview 45

- People are using the toilets because there is no choice but no dignity, privacy and safety
- People want clean water and not toilets because if there is need they can use the bush
- People want to use good toilets where they can feel free every time, include electricity

Enkanini

- No lighting
- No electrification
- Gravel contour roads
- Steep slopes, valleys

Interview 7

- Not satisfied with the toilet because many people use it, about 200 people
- The frequency of using the toilet depends on availability because in the morning and afternoon and weekends it is busy/full and people lock it. Only when people are at work then it becomes available
- There is no dignity, because if you are in the toilet somebody comes and disturbs you by knocking on the door while you are busy. Sometimes the toilets are not clean
- It is only safe to use when you lock it
- It is not appropriate for children to use, so they use the bush
- It is only possible to use the toilets at night if you have a key

Interview 8

- The community identified the need for toilets and taps so they selected members to represent them to liaise with the municipality
- 1 unit has 10 toilets which accommodates for 15 to 20 people. When the toilets are blocked it takes one week to fix so they have to use the bush
- Blockages are caused by newspaper therefore it is not a municipal problem but a community problem
- Not everybody can use the toilets at night because some people are very far from it
- There are 5 keys per lock
- Very few people were selected to assist in construction
- Solid waste use to supply them with black bags but not anymore

Interview 9

- No privacy because toilets are too close to each other
- Toilets are not clean because there are no chemicals
- No electricity
- Some people who don't have keys to locks cut off the existing padlocks and place on their own lock

Interview 14

- Their committees go to the municipality to tell what the problems are
- Toilets has not resulted in a cleaner environment because there is greywater around. Also faeces come out of toilets

Interview 17

- It is not safe to use toilets at night because of snakes and frogs

Interview 18

- The community identified the problems to include a lack of water and electricity, but only toilets were provided
- Toilets are not enough for the people
- 3 houses = 1 lock
- Buys own toilet paper
- Dumps rubbish on the side of the street. The municipality collects waste on Tuesdays and Thursdays (this was witnessed)

Interview 20

- Stellenbosch Civic Association (SCA) funds 10 people to clean the area 4 days per week at R60 per 8 hour day (R240 a week). This is rotational.
- The toilets do not allow you to take your time while using it

Interview 21

- People were invited via the loudhailer to the community meeting where needs were discussed. Not everybody came.

Interview 22

- Scared to use the toilets at night because it is very dark – no lighting and electricity

Interview 24

- With reference to the community meeting, people had to fight through strikes to make this meeting happen
- There is no privacy because people can sneak underneath the door or on top through the gap between the door and roof
- He had to remove his shack twice (1) for road construction; (2) for pipes of toilets
- The municipality provided him with 4 zinc sheets and 4 poles to reconstruct his shack

Interview 37

- The toilet is not safe at night for a woman or a child
- Locks are not because every passenger want to use the toilets
- There are too many users for few toilets
- Set someone who can look after the toilets
- Municipality must open job opportunities for the community

Interview 34

- There was no toilets, people have been using the bush
- Found any member of the church and give him responsibility of cleaning the toilets
- The toilet is good because we don't have choice

Interview 29

- If any blockages, municipality is coming to fix the problem but late
- We must be provided with soaps and chemical to clean the toilets
- It's not safe during the night and the day for a kid to walk as it's very far from the house
- No dignity because man and woman are using same toilets

Interview 30

- Happy because we are closer to the toilets and to water taps
- Not safe during the night because of darkness, no electricity
- Municipality should hire people to clean the toilets

Interview 49

- no locks on its and they are damaged, everyone is using it
- hire someone for the supervision of the toilets
- few toilets and many users
- happy because not using bush anymore

Interview 43

- municipality must give us job
- found another alternative, with this no respect for a man or woman
- the toilet is safe to use it at night only for a man
- toilet is not safe in terms of sickness, no appropriate cleaning products

Interview 48

- municipality can train people in order to fix it in case of blockages

Interview 28

- employ more people to look after them and provide more toilets

Interview 41

- smelling bad when there is blockage especially if you are closer to the toilets
- too much conflicts about keys then people prefer to unlock the toilets
- provide public toilets for anyone passenger, this will help the owners to look after its toilets
- need electricity to use the toilets at night
- not good for kids and elders

c. Socio-economic Data Summary for Stellenbosch Case Studies

Average Age (of respondents)	27
16- 22 years	31.91%
23-29 years	36.17%
30-36 years	23.40%
37-43 years	4.26%
44-50 years	2.13%
51+ years	2.13%
Gender (of respondents)	Male: 55.32%; Female: 44.68%
Race	Coloured: 8.51%; African: 91.49%
Highest education	Gr 7 & less: 4.26%
	Gr 8: 25.53%
	Gr 9: 14.89%
	Gr 10: 23.40%
	Gr 11: 17.02%
	Gr 12: 17.02%
Occupation	Unemployed: 74.47%
Average Monthly Household Income	R 1 461
Marital Status	Married: 36.17%; Single: 63.83%
Average Number of people living in dwelling	Male: 1.82 (52.44%)
	Female: 1.66 (47.56%) Total: 3.49
Average Number of dependents per dwelling	1.74

2. Pooke se Bos

a. Interview with Community Leader

3 February 2011, 09:10 AM

➤ *Sanitation Task Team*

Two years prior to the implementation of MobiSan they had a close relationship with the WatSan Department of the municipality. However, it was not quite a Task Team, but rather a relationship between the community and municipality. At the time they thought they were going to get flush toilets, so the MobiSan came as a shock.

➤ *Other Essential Services Complemented*

None. For example the MobiSan uses electricity, but they are not able to use the electricity or receive electricity supply.

➤ *Perceptions*

There are both positive and negative perceptions.

➤ *Specific User Needs*

Individual bucket toilets were given to some elderly people at their houses. This is because the MobiSan doesn't accommodate for elders and disabled – the steps are too steep.

Where women needs are concerned, with the old bucket system they were afraid they were going to get sick and they did. Currently, with the MobiSan, the wind is a problem which makes them get sick and receive an infection.

People want their own toilets because other people are sick and they are scared they will get infected. They feel that as church-goers it is not right that they have to share the same toilets as those who are not and that have diseases. They therefore requested a separate toilet from one of the MobiSan units for use for those who are "church-goers". She didn't want me to use the term "Church-goers" and said we should rather say "non-smokers". Because it is not fair that non-smokers must use the same toilets where people smoke in and inhale the odour left behind by the smoke of a smoker.

➤ *Sustainable Technology*

Some people still use the bush though.

➤ *Removal of Shacks*

Seven to eight shacks were removed from the location of the MobiSan. Correct community protocol was not followed for the removal of the dwellers as the municipality did not consult the leaders and affected residents, but rather consulted a drug dealer who wants to control everybody. So the committee was then sitting with the problem of considering where they now have to relocate those dwellers. The relocated dwellers were not happy because they didn't have materials to rebuild their shacks. Their new shacks are also now leaking when it rains because of the improper materials

they had to find. The committee did request material from the Municipality (Mr Grootboom), but he never gave anything.

➤ *Health & Hygiene Training*

There was health & hygiene training before and after implementation. They received quite a lot of training in this respect. It was good because it brought dignity back to the people and it reminded them to wash hands, etc. and practice good hygiene. The training has definitely resulted in good practice by the people.

Training is not offered to new comers to the settlement, but there are signs around by the facility which says soap is available and the other residents also impart their knowledge on to the new comers.

➤ *Oversight & Ownership*

Mostly women are involved. If there is a problem then they can phone the municipality and report the issue.

➤ *Employment Opportunities*

2 caretakers from the community

➤ *Some General Problems to be Highlighted:*

The wind that comes from underneath – problem for women

The steps are too steep and narrow. The steel platform of the steps is also slippery when it rains. Therefore request that the steps be widened and made less steep.

b. Interviews with Users

1-2 February, 2011

Interview 2

Toilet paper can't be afforded by the people – they are supposed to be supplied with it by the municipality – so those who can't afford to buy their own toilet paper go and use the bush because they use newspaper instead. And newspapers are not allowed to be used in the MobiSan system.

Interview 3

The toilets closes between 9 and 10 PM and is supposed to open at 6 AM but sometimes only opens at 7 or even 9 AM. So in the meantime people have to use the bush. When you come for example to the toilet just slightly after 9 PM the caretaker then tells you that “you suppose to know your time” and doesn't allow you in. But how can you predict the call of nature?

Because of the opening and closing times of the sanitation system, it impacts negatively on other services. They for example use to have wheelie bins, but the council complained that people defecate in the bins and so now they are given black bags instead.

MobiSan is not suitable for the elderly and disabled because the steps are too high. So these people (elderly) are given a container that is kept at their house.

In terms of flies, although it has decreased, but sometimes when the council delays the cleaning of the MobiSan or when the power is down then there exist a horrible smell which attracts the flies.

Interview 4

- They should be provided with smaller, more units of the same sanitation system.
- Drunkards don't know how to use the toilets.
- Issue of smokers in the toilets – separate toilets for smokers and non-smokers.

➤ *Appropriateness of the toilets for women:*

Issue of women's periods – therefore communal toilets are not appropriate for women, because of bleeding and their blood coming on the toilet seats and also the concern of where to dispose of their pads as there are no bins nearby the toilets. You don't know what sickness some people may have. They should therefore have buckets/bins nearby the toilet

They should also employ both male and female and not just male. This is because it is not appropriate for a male to clean up behind a female, especially where the issue of menstruation is concerned.

➤ *Appropriateness of toilets for elderly:*

This particular household was next to that of an old lady who has her own container toilet at her house. They complained about the smell from the old lady's house because of the toilet (this was also experienced by the research team while conducting the interview). The smell results in increased flies and the interviewees were concerned about the health of their children as a consequence. This occurs because the old lady's son who lives in his own shack also in Pooke se Bos (we interviewed him the following day) is supposed to clean the toilet and dispose of her waste, but he doesn't do it regularly. However, the caretaker from MobiSan should actually do this because he has been selected and paid to look after the sanitation needs of the whole community, which includes the individual toilets for old people, because these are actually part of the MobiSan system.

Interview 5

This individual does not use the MobiSan but uses the toilets at the garage since he received pimples from using MobiSan. He also rather use buckets for his children because it is risky at night to go to the toilet. On weekends outsiders would come and visit and make use of the toilets. These outsiders can bring diseases along with them.

Interview 8

After hours they use buckets and then emptied at the MobiSan facility in the morning.

Interview 10

She was one of those relocated. There were flies at the previous toilets.

Interview 11

- Son of the old lady who has her own toilets.
- The previous toilets made children become sick.
- They only came once to do health & hygiene training. They should come more often.

Interview 12

- Was not involved in the management, but just stood around.
- The old toilets were on the spot of the current MobiSan. She didn't receive any health & hygiene training, but they gave out pamphlets.

Interview 13

- Complained about the wind.
- He confused health and hygiene training with his current Health & Safety training.

Interview 14

Complained about the wind.

Interview 15

- We have been satisfied with the toilet, but the problem is the Mobisan is operating from 7h30 AM to 9h00 PM and after this time people are using the bush.
- We have been using bucket latrine system, and it was always dirty and unclean but Mobisan is very nice for the use of the community
- The buckets were only cleaned once a week. The bucket latrine system was also very unhygienic because the municipality had to empty the buckets manually.

Interview 16

- The toilet has resulted in less illness; people are getting sick especially for women when the wind is blowing under the toilet seat.
- The toilet is not appropriate for old people and disabled because there are stairs in front of the toilet and they can't afford to use this.
- Lack of using toilet after 9h00, people are using bucket and pot which some other people are dumping around the Mobisan reason why the back environment is very dirty and full of smell.
- One of the community's members has fallen two times with leg broken when using the stairs of the toilet.

Interview 17

- The municipality should employ another caretaker to extend the operational hours of the Mobisan Unit to 24 hours a day.
- The municipality should think to make provision for disabled people by redesigning the stairs.

Interview 18

- The community is very pleased with the performance, management and benefits of the MobiSan toilets.

- The toilet is more secure than the previous bucket system toilets, because it has a fence perimeter around the toilets which lead to privacy and safety while using the toilets.
- The toilets are also very hygienic and clean and there is less chance of getting diseases.
- The bucket system was very unhealthy, because the faeces and urine were together in one bucket.

Interview 19

- The toilet is always clean and safe from sickness because caretakers check up after every person who uses the Mobisan toilets.
- The toilet is healthy and clean because City of Cape Town supplies the cleaning products and toilet paper on request from the caretakers.
- The check-up of the Mobisan Unit is always followed by the caretakers in order to keep a good working condition and to prevent misusing of it.
- The Mobisan Unit has a hand washing basin to encourage the community to wash their hands especially children after using the toilet.

Interview 20

- We don't use the toilet because it's very dirty and unsafe from diseases.
- They don't clean the toilet and there is wind blowing underneath that is very dangerous especially for women.
- We are using bucket or open air instead of using the toilet.

Interview 21

- The toilet is unsafe from sickness, better to use that than to use bush because in the bush there are snakes, poopoo everywhere and very unsafe.
- There is sometimes conflict when using the toilet and leave it in bad condition.
- Toilet need to be operated 24 hours and not 15 hours for the use of this.
- Mobisan technology has failed in many things; the municipality should provide mobile sanitation with flush water.

3. eThekweni

a. Municipal Interview

Municipal Respondents: Lucky Sibiyi and Teddy Gounden

Date: 1 and 3 March 2011

Notes:

The section under Planning was discussed with Mr Sibiyi while in the field on the 1st March 2011. The sections under Implementation and Post-implementation were discussed with Teddy Gounden in his office on the 3rd March 2011.

There are 7 toilets in an AB facility (3 for males, 4 for females). According to Mr Sibiyi, 1 toilet is to service 45 people; therefore 1 AB facility can service 315 people. According to Mr Gounden, 1 facility is to service 75 shacks, where the average household size is 5.5 people, therefore 413 people are serviced by 1 facility.

Currently there are 7 AB facilities in Shembe, but a total of 10 facilities are to be installed to service the entire population. Given the ratios above, from Mr Sibiyi's figures we can estimate that the population of Shembe is around 3150 people, and according to Mr Gounden's figures the population of Shembe is around 4130 people.

1. Planning

a) Task Team

During the planning a task team was set up that included EWSS (water & sanitation) officials, EHP, 2 people from Electricity and 2 people from Housing. Task team was responsible for the project execution and overseeing the design consultant.

The need for sanitation was not identified by the communities, but by city officials. They looked at the backlogs in sanitation and identified that sanitation is needed. According to the municipal official a participatory approach was used. However participatory for him did not include participation of citizens but rather meant consultation with other departments or units. Here for example they consulted with the GIS unit in order to identify the location of areas where there is no sanitation coverage. They also confirmed this with the Housing department.

However the community did participate in terms of where they wanted the facility to be located.

b) Problem Analysis

The analysis looked at the current problem and the effects thereof. Here for example they looked at the previous cases of cholera outbreak and the Health department also provided more information on health and hygiene. They also considered the underlying causes of the problem and identified these to include the fact that the settlement is located on privately owned land (the Shembe's land) and therefore permanent infrastructure cannot be provided. Further they also identified the huge influx of migrants into the city as an additional underlying cause.

They did not address solutions to the underlying causal factors, but however provided a temporary solution to the current problem by proposing the AB toilets.

The analysis also considered all of the following settlement characteristics:

- Socio-cultural characteristics
- Religious characteristics
- Economic characteristics, therefore they looked at providing consumerables such as toilet paper as well as providing a full-time caretaker.
- Political situation – that is why they followed the correct protocol. Correct community protocol is critical because they are dealing with a private land owner as well as the church committee (Shembe Church). The protocol followed included:
 - Ward committee
 - Councillor. Councillors only get involved once there is a plan in place for a proposal.
 - Church committee
 - The Shembe – so they travelled about 200 km to him to get his blessings
 - They also have a register of community members who participated in consultation/meetings.

In terms of the political situation, they considered whether the settlement was an ANC or IFP stronghold, but not to prioritize recipients according to their political affiliation, but rather to assist in following-up. Because should the residents say no to the technology, because they didn't vote for toilets but for houses, then they would simply write a report documenting this and then give the report to the mayor or the correct political figure to address the situation.

- Density – that is why Shembe has so many facilities
- Lifespan was not considered as everybody has the right to sanitation. Further the sanitation is only an interim measure.
- Type of land – the technology is intended for private land.
- Gradient of slope – the whole of eThekweni is located on a hilly terrain. (Slope therefore shouldn't be factored as an indicator as the municipality is disadvantaged given this geographical feature.

In terms of the environment, EIAs were conducted particularly in ecologically fragile areas, such as settlements close to rivers.

c) Integrated Planning

The sanitation programme does complement other essential services. The services or departments that the sanitation programme complements include:

- Water & Sanitation
- Electricity – because the toilet allowed for the provision for the necessary initial infrastructure which makes it easier for the Electricity department to build on to provide further electricity services to the settlement.
- Housing – because the AB facilities provide an interim service, it allows time for the housing department to develop and roll-out proper development plans.
- Health – it provides people with easy access to clean drinking water.

➤ *Appropriate Technology*

Ramps were installed for the disabled where it was requested. (We didn't see this at any of the 5 sites visited in Shembe).

➤ *Ecological Technology*

He couldn't distinguish between whether technology protects the environment or has no impact. This question should therefore be refined.

➤ *Sustainable Technology*

It is managed by the correct line department, where the Systems branch in the WatSan department is responsible for maintenance.

2. Implementation

➤ *Detailed Procedure*

Past local experience was based on the experience of the VIP technology which became a burden to the council for emptying.

➤ *Participation*

Users were involved in the management of the implementation stage through the CLO (Community Liaison Officer).

Community consultation took place through the following set of events:

- Municipal department consulted with the community about the technology.
- The community rejected it completely because there were no job creation opportunities in it. They wanted a constructed toilet so as to generate work.
- Municipal department explained that there are job opportunities through the laying of the concrete base and trenches, etc.
- Municipality sold the idea to the politicians to take forward.
- The politicians went into the communities to sell the product.
- Those who rejected were left out.
- Eventually they all accepted it.

Initially a prototype of the container toilets were presented to the community.

Skills training was not provided to those who assisted in construction because they only selected those who had previous experience in construction work.

➤ *Health & Hygiene*

Pamphlets and awareness-raising were provided by the EHPs. They targeted problem areas for the training. The caretakers are responsible for providing continuous health and hygiene awareness to the users as well as monitoring of usage. Now education programmes are more reactionary. However they can't have continuous education/awareness programme in one area as they have to prioritize how they spend their energy and funds.

➤ *Pilot to Full-scale*

Piloting is a problem for economies of scale therefore they implemented it without piloting and then revised it for the necessary changes.

➤ *Oversight & Partnership*

Shared responsibility for O&M exists through the caretaker. However, O&M is not community-based, except for the caretaker.

➤ *Health & Hygiene*

No regular programmes, except for the caretaker.

➤ *Development Opportunities*

Institutional mechanisms for funding community-based O&M include the EPWP (Extended Public Works Programme).

➤ *Monitoring & Evaluation*

M&E done by supervisors every 2 weeks.

b. Interviews with Users

Tuesday, 01 March 2011

Some notes & observations of the fieldwork on Day 1:

The weather was warm and humid. The topography of the landscape is very hilly, and this is throughout Durban and KZN like this. The settlement is very large and covers a great area. As from the interviews, the land of Shembe is private land owned by the Shembe Prophet who lives 200 km from Durban.

The population is Zulu and isiZulu is the major language spoken. English is spoken, but those whom we encountered were not able to speak or understand English. I suspect that this is not entirely true for all, as some may simply just have wanted to avoid the interview. However it was clear from many we encountered that they were not able to understand us. In one instance for example an old lady woke up her daughter (who works night shift) to answer my questions as her daughter was able to speak English and not herself. In some other instances it was necessary for an interpreter (Lucky from eThekweni municipality) to translate the questions or for our isiXhosa speaking colleague (Sibonisiwe) to try and speak in isiZulu with the residents.

There was also not many people around the facility for us to interview so this had great limitations on meeting the quota of interviews we would like to have covered on the first day (we targeted to complete 15 questionnaires each –total of 30). We ended up completing only 10 in total as well as an incomplete municipal interview with Lucky as time didn't allow me to complete the questionnaire with him. The interview with Lucky was very detailed and took very long but yielded much valuable information. This interview will however be completed. Some questions Lucky referred the research team to Mr. Teddy Gounden for more details.

Another lengthy and detailed interview was also conducted with the ground level chairperson for the ANCYL who is also the appointed CLO (Community Liaison Officer) for the AB construction

project. The questionnaire with him (as well as Lucky) was very detailed only because I allowed the interview to go beyond the close-ended response of the survey, by opening up through probing and tentative listening. Consequently this allowed for deep insight of both the settlement (in terms of its tribal connection) and the sanitation implementation process.

Lucky indicated that people congregate around the facility in the morning (between 8 and 9 AM) and in the afternoon around 3PM. We should therefore time our fieldwork accordingly. Another limiting factor (I feel) was that we were with a municipal official (Lucky) throughout the fieldwork (guided fieldwork) which doesn't allow for me to wander off into the settlement as I normally would.

Shembe 1

Interview 1:

- A female, 33 years old, working as a construction worker for the AB facilities under the subcontractor ICON. She is also a resident living opposite the facility.
- She indicated that the toilets arrived on the 15th December 2010. According to the ANCYL chairperson however (interview 2) it arrived in November 2010. Before the AB toilets they used the bush and their own facilities –the pit latrines (see pictures).
- The toilets open at 7AM and close at 5PM. During “non-operating” hours she uses a big basin –which is actually the pit latrine. Her neighbour however does have a key to the toilets.
- There are no disabled people living here.
- She complained about the AB toilets saying that it smells if you stand outside and that it is also leaking.
- She was involved in the construction phase where she dug trenches for the pipes. She earned R1500 per fortnight.
- In terms of conflict, she indicated that when the toilets are locked after 5PM then young men complain about this.
- She is still earning income from the toilets, because they are still constructing other units. Note that this is not income from post-implementation, but rather from implementation of other new AB facilities.

Interview 2

- Chairperson of ANCYL at ground level since 1996. The activities of the ANCYL include new developments, awareness and crime prevention.
- The municipality consulted with the councillors about the toilets. The councillors were interested and the councillors then contacted the ward committee and the representatives of the ward committees. The representatives of the ward committee were interested in it so the ward committee called a mass meeting with the community members where the initiative was presented to the community. All the people agreed to the toilets. There was however some conflict because people wanted RDP houses. The councillor then called Lucky Sibiya, an official from EWS (eThekweni Water and Sanitation) to explain the initiative to the community. Lucky explained that the toilets has got to do with infrastructure and not RDP housing. He explained that the land of Shembe is private land that belongs to the Shembe prophet who doesn't approve of RDP development on his land.

- He is very satisfied with the AB toilets because previously he was using the pit latrine which wasn't safe because of diseases and when it rained everything came out and flies were present.
- He confirmed that the toilets do not have access for wheelchairs, but that there are no disabled people here.
- The toilets open at 7AM and close at 5PM.
- He earned income during the construction phase through the digging of trenches. Here he was (and still is) the manager of other workers as he is the elected Community Liaison Officer (CLO) for the construction company ICON. He earns R2 800 per fortnight.
- In terms of health & hygiene awareness, Lucky provided awareness on two occasions. The first was before construction and the second time was on the day the toilet was opened. Here he explained the importance of toilets and how to use the AB toilets. These two sessions were enough.
- According to him there is conflict because of jealousy. This happens when people come from other areas of Shembe then they are told "you can't use these toilets because you have your own toilet".
- He did receive training in M&E from both Lucky and ICON. He checks and monitors the toilets regularly and reports to the municipality.

Interview 3

- The toilet is not convenient after hours for children

Interview 4

- This family does not use the AB toilet because it is too far. They instead use their own pit latrine.

This ends Shembe 1. We then visited two other facilities, but nobody was around to be interviewed. We were told that we should come at 8 AM and 3PM to find the users.

Wednesday, 02 March 2011

Interviews were guided by two female representatives from EWS. These were from the fourth facility that we visited (since Tuesday)

Interview 5

- The toilet arrived here in August 2010.
- They were not provided with a choice of different technology types to choose from. Only the AB was presented at a community meeting.
- Some problems highlighted from the AB is that there is sometimes a shortage of water. This only happened one time – reported it.
- Children use the toilets but sometimes they abuse it.
- Nobody living here is disabled.
- The toilets here opens at 6AM and close at 8PM.

- No shacks were removed to construct the AB toilets, only the previous communal toilets were removed – the pit latrines.
- She did not receive health & hygiene training because she was not here at the time, but training was provided when they introduced the toilet. She is able to train other people on health and hygiene as she did it before.
- She was not trained on M&E, but she reports any problems to the municipality.

Interview 6

- This respondent only uses the AB sometimes, particularly for showering, because she also uses her pit latrine at her house.
- She doesn't use the toilets after hours as she sleeps at night.

Interview 7

- She only uses the AB toilets sometimes because it is far from where she lives and she would be too tired to go all the way to the AB so uses her pit latrine instead.
- She is blind in her right eye and therefore needs her own toilet.
- The toilet does cater for religious needs because during January and July, large followers of the Shembe gather here during religious ceremonies then. During this time the toilets are not enough.
- The toilets have not lead to a cleaner environment because they are still using the pit latrines.
- She was not involved in the construction of the toilet, but other residents were.
- The toilets only provide a source of income for the caretaker.
- She did not receive M&E training, but the caretaker did.

Interview 8

- This female respondent was not satisfied with the AB for the following reasons:
 - Because the municipality doesn't come for maintenance, so things (e.g. showers) are broken for a long time. Women therefore have to therefore share showers with the men's facilities. The men could rape the women.
 - The door of the male shower had a problem for a long time –it couldn't close.
 - She was happy at first, but since that woman started telling people to make quick in the showers she no longer liked it. (*Community dynamics*)
- She only use the AB sometimes because there is a lady there who keeps on telling people to hurry in the toilet and showers so therefore she doesn't like to use it. So she also use the pit latrine at her house. The pit latrine is however almost full.
- The toilets are only locked after 8PM.
- The toilets are in a good state because nobody use newspaper or dump disposable nappies in the toilet.
- She never saw the municipality come and do maintenance.
- There are illnesses but she is not sure if it is connected to the toilets.
- There are only flies in the pit toilets, but not in the AB toilets.

- She did not receive health & hygiene training, but based on general knowledge, she practices good health and hygiene behaviour.
- The caretaker is also supposed to educate users on health & hygiene.

The 5th Facility visited:

Interview 9

- Some people still use the pit latrines.
- The facility opens at 5AM and close at 8PM.
- The old toilets led to cholera.
- He worked on the construction of the facilities and earned R1 300 a fortnight.
- Health & hygiene training was provided through posters.
- The caretaker also provided health & hygiene awareness.

Interview 10

- She uses the AB facility most of the time, especially the showers.
- Children need to be assisted by parents to use the AB facilities.
- There are no disabled people here.
- She has to walk for 10 minutes to get to the facility because it is far from her house.
- It opens at 5AM and close at 6PM.

Interview 11

- These houses are considered to be developed, so the AB facilities are not intended for them although they use it sometimes. They have flush toilets at their house. They also sometimes use the AB facility to do their washing because they can't do the washing at home. They also use it for the showers.
- The toilets are very far from them –in relation to the 5th facility. (However, after the interview I saw another facility next to this house's property, but hidden behind vegetation growth.

c. Socio-economic Data Summary for eThekweni Case Study

Average Age (of respondents)	33		
16-22 years	12.22%		
23-29 years	36.67%		
30-36 years	21.11%		
37-43 years	8.87%		
44-50 years	12.22%		
51+ years	8.91%		
Gender (of respondents)	Male: 40%; Female: 60%		
Race	African: 100%		
Highest education	Gr 7 & less: 22.22%		
	Gr 8: 0%		
	Gr 9: 19.89%		
	Gr 10: 11.34%		
	Gr 11: 13.22%		
	Gr 12: 33.33%		
Occupation	Unemployed: 68.89%		
Average Monthly Household Income	R 1927		
Marital Status	Married: 18.89%; Single: 81.11%		
Average Number of people living in dwelling	Male: 1.98 (43.80%)	Female: 2.69 (59.51%)	Total: 4.52
Average Number of dependents per dwelling	2.94		

Appendix E2: Functioning

E2.1 Interview questionnaire

Criteria	Planning	Answers		
	Questions	Yes	No	Don't know
Status of the sanitation	Do you know to whom this land belong to?			
	Did you have access to sanitation prior to the provision of the current sanitation?			
	Was the condition of previous sanitation facility conducive for proper use?			
	Do you have any knowledge regarding possible causes of failures of the sanitation facility?			
	Did the lack or inadequacy of the sanitation system have an impact on you?			
Sanitation technology selection	Did you participate in the selection of the sanitation technology options for your settlement?			
	Did the municipality reveals or presents the design of selected technology to users?			
	Did the community shows happiness when the sanitation facility was presented?			
	Do you have knowledge of number of users the sanitation is designed for?			
	Did you suggest any alternative to the proposed sanitation?			
	Did the municipality consider your advices and preferences?			
Appropriateness	Is the location of the facility suitable for all users groups?			
	Following the presentation, do you think the facility will be easy to operate and maintain?			
Users Awareness	Did the municipality propose a users' education programme?			
	Do you believe that the municipality should take of the awareness programme?			
	Can community be responsibility of the awareness programme if municipality not available?			
	Did you suggest any other programme intended to enhance the functioning of the facility to the municipality?			
Implementation				
Sanitation technology option	Do you know what type of sanitation technology is being used in the settlement?			
Infrastructure development	Are you satisfied with the current location of the facility?			
	Is the selected location suitable for all users groups?			
	Is the sanitation facility solid enough to handle large number of users?			
Operational requirements	Following the use of the facility, do you understand now the operational requirements?			
	Does the non-compliance with operational requirements impact on the functioning of the facility?			
	Can something be done to ensure compliance with operational requirements if these affect the functioning of the sanitation?			
	Are the operational requirements of the sanitation making the O&M easy for the caretaker?			

Post-implementation Answers			
Operation and Maintenance	Do you believe that cleaning, sweeping, unblocking, disinfecting and fixing leaks are to be performed to keep the facility in good and serviceable condition?		
	Do you think that regular maintenance can ensure adequate functioning of the facility?		
	Do you think that the users should participate in the O&M of the facility?		
	Can users offer any contribution in the O&M of the facility?		
	Can users take responsibility for the O&M of the facility?		
	If users will take responsibility for O&M, may you need support from the municipality for achieving the O&M tasks?		
Monitoring and Evaluation	Is the sanitation facility easy to manage?		
	Is the sanitation facility easy to monitor?		
	Do you have idea of criteria that can be used to monitor and evaluate the condition of the facility?		
	Can users manage the facility on their own?		
	Is the M&E protocol in place at the facility?		
Users issues	Have you ever encounter problems related to the design of the facility?		
	Did you report any problem? To whom and how?		
	Did the municipality respond to the problems reported?		

E2.2 Field notes: visual inspection

The visual inspection was intended to verify and validate information provided by users. It concerned mainly the implementation and post-implementation phases where interviewers used visible indicators that impact directly on the functioning of the facility to validate information.

4.3.1 Implementation

a) Infrastructure development:

- Suitability of the facility for all users' groups: the facilities (at all case study sites) were found unsuitable for all user groups. These facilities were not disabled friendly as there was no space or specific toilet dedicated to elders or disabled persons.
 - Kayaloo: toilet space was very narrow, thus could not accommodate wheelchair
 - MobiSan: stairs to access to the facility were too sloppy, thus not providing elderly persons, wheel chair or pregnant women easy access to the facility.
 - CAB: narrow space and no access provision for wheelchair made the facility unsuitable for certain categories of users.
- Robustness: in all case studies, the material used to manufacture the facilities was mainly container ship and corrosion resistant metal sheeting. Fittings were both visible and made of non-reusable materials or made in enclosed section between toilets. The occurrence of theft was reported being low as there was nothing to steal at the facility.

b) Operational requirements:

- Ease of use: the Kayaloo and CAB are both flush toilets that were found easy to use for all user groups. The use of MobiSan in turn required users to be aware of the operational requirements. This was found to be challenging for users and the caretaker has to demonstrate regularly the use of the facility especially to new users.
- Compliance: the level of compliance was found to be high where facilities are easy to use. However, the occurrence of misuse occurred when other services such as solid waste collection didn't take place. For the MobiSan, the level of compliance was achieved through intense awareness and regular monitoring of the facility after each use.

4.3.2 Post-implementation

a) Operation and Maintenance

- *Support requirements for achieving O&M:* O&M is a key to the success or failure of the sanitation technology regardless of the type, design and cost. Users at all case study sites were not prepared to undertake O&M of their respective facilities. There was no evidence of users' willingness or commitment to maintain their own facilities.

- User participation and contribution in the O&M: at all case study sites, there was no evidence of users' participation in the O&M. Users believed that it's the responsibility of the municipality to undertake O&M tasks at all time.
- b) *Monitoring and evaluation*
- Ease of monitoring: all facilities at case study sites were found to be easy to monitor; this was mainly attributed to the design of facilities that provided easy access at all compartments for monitoring purposes.
 - User management: at all case studies, there was no evidence of local management of the facility. However, local caretakers (appointed by the municipality) were tasked to manage the facility.
 - M&E protocol: all M&E related issues were found to be the responsibility of the caretaker (for the MobiSan) who was tasked to report to relevant officials. Regarding the CAB and Kayaloo, the M&E was undertaken the environmental health practitioner (EHP) and who reported to the relevant department. In case of emergency, the caretaker (CAB) or users' group representative (Kayaloo) were tasked to report to relevant municipal officials.
- c) User issues:
- Reporting protocol: Users related were reported directly to the caretaker (MobiSan) who in turn report to the municipal officials. For the CAB, user's issues are reported to the caretaker, who reports directly to the EHP or to the relevant department (only in case of emergency). The Kayaloo process was more obscure (compared to the first two case studies), users report to the contractor (cleaner) during working hours or directly to the municipality (after hours); the municipal official in turn reports to the relevant department for action.
 - Response time to address the problem: depending on the extent of the problem, response time to address the problem was variable from one facility to another. For the MobiSan and CAB for example, the caretaker acts immediately for all soft issues such as small blockages, smell or leak. Major issues are reported and the waiting time varies from 12 to 48 hours.