

THE RIGHT TO HUMAN DIGNITY
A Study of Communal Water and Sanitation Facilities for the
Peri-Urban Settlement of Inanda

SIDESH RAJBALLI



A Dissertation submission to the Faculty of Humanities, Development and Social Sciences, University of
KwaZulu-Natal, in partial-fulfilment of the requirements for the degree of Master of Architecture
Durban, South Africa, 2016

The Right to Human Dignity: a Study of Communal Water and Sanitation Facilities
for the Peri-Urban Settlement of Inanda

Sidesh Rajballi

Supervisor: Mrs Bridget Horner

Howard College of Humanities

School of the Built Environment & Development Studies

Submitted as part of the requirements for the degree, Masters in Architecture (M.Arch)

2015



Abstract

Sustainable urban sanitation presents one of the many challenges towards service delivery and is directly related to poverty alleviation. Without appropriate social infrastructure such as water and sanitation - communities in the developing world can easily spiral into a decline. Water and appropriate sanitation, centre on community building and support communities to achieve high standards of health, equality, and good quality housing, good schools, safe, clean and friendly neighbourhoods.

Without these social support infrastructure, peri-urban settlements struggle to become cohesive, and living communities with a sense of place, belonging or identity. In the developing world, communities without access to water and sanitation facilities suffer from a wide range of social problems and a platform for social discourse. Women are closely related to sanitation and water usage due to their social responsibilities at home and within their communities. Women tend to manage households and are the primary caregivers to children and extended family, also playing a nurturing role for the vulnerable, disabled and sick in the community. In South Africa, women living in rural and peri-urban areas face significant challenges. They live within a cycle of poverty, without appropriate access to a private toilets or to clean drinking water at the home. This research paper sets out to achieve an understanding of the daily living conditions communities face both spatially and programmatically, with a focus on women living in the peri-urban settlement of Inanda Durban. The objective set out tackles how architecture can be envisioned to meet dignified possibilities for and enrich the livelihoods of communities through the provision of appropriate and sustainable and suitable water and sanitation.

Key words: *Water; Sanitation; Human Dignity; Women; Peri-urban; Architecture;*

Declaration

I declare that this thesis is my own, unaided work, carried out exclusively by me under the supervision of Mrs. Bridget Horner.

It is being submitted for the degree of Master of Architecture (M. Arch) at the University of KwaZulu-Natal. It has not been submitted before for any degree or examination at any other university or institution.

.....

SIDESH RAJBALLI

Student Number: 206 5066 38

June 30, 2016

Dedication

I dedicate this to my loving Mother.

Contents

<i>Abstract</i>	iv
<i>Declaration</i>	v
<i>Dedication</i>	vi
<i>List of Abbreviations</i>	xii

CHAPTER 1

1.	Introduction	01
1.1.	Background	02
1.2.	Motivation for the Study	02
1.3.	Problem Statement, Aims and Objectives	03
1.4.	Scope of the Research	04
	1.4.1 Delimitation of the Research Problem	04
	1.4.2 Definition of Terms	05
	1.4.3 Stating the Terms	06
	1.4.4 Key Questions	06
	1.4.5 Secondary Questions	07
1.5.	Research Methodology	07
	1.5.1 Approach and Data Collection Methods	07
	1.5.2 Second Methodological Approach	09
1.6.	Conclusion	10

CHAPTER 2

2.	Concepts and Theories	12
2.1.	Introduction	13
2.2.	Sustainability Theory	13
2.3.	Social Sustainability	14
2.4.	Analysis, Discussion and Conclusion	18

CHAPTER 3

3.	Literature Review	19
3.1.	Introduction	20
3.2.	Sanitation is about Health	20
3.3.	A Brief History of Water and Health	21
3.4.	Water and Sanitation in South Africa	24
3.5.	The Right to Dignity and Equality	28
3.6.	Various Acceptable Sanitation Technologies	32
3.7.	Analysis, Discussion and Conclusion	42

CHAPTER 4

4.	Case Study	43
4.1	Case Study: Community Ablution Block (CAB)	44
4.2	Feedback From Interview	52
4.3	Future Recommendations	57

CHAPTER 5

5.	International and Local Precedent Studies	59
5.1	Introduction	60
5.2	Delwara Community Toilets	61
5.3	Community Toilet Block For SPARC	66
5.4	'Toigetation' Bamboo Toilet Block	75
5.5	Productive Infrastructure	78
5.6	Analysis and Discussion	81

CHAPTER 6

6.	Analysis and Discussion	82
----	-------------------------	----

PART II

86

CHAPTER 7 - DESIGN REPORT

		87
7.1	Introduction	87
7.2	Project Description	88
7.3	Clients Requirements	

CHAPTER 8 – SITE SELECTION

8.1	Introduction – History and Background	89
8.2	Site Selection and Discussion	90
8.3	Summation	94
8.4	Conclusion on Site Selection	95

BIBLIOGRAPHY	97
LIST OF ILLUSTRATIONS	102
APPENDIX	107
A – Interview Questionnaire	108
B – Interviews	113

List of Abbreviations

AD	-	Anno Domini
BC	-	Before Christ
DWAF	-	Department of Water Affairs and Forestry
EM	-	eThekwini Municipality
EWS	-	eThekwini Water and Sanitation Unit
KZN	-	KwaZulu-Natal
MDG's	-	The Millennium Development Goals
M&G	-	The Mail & Guardian
NGO	-	Non-governmental Organisation
NSTT	-	National Sanitation Task Team
PPP	-	Public-Private Partnership
SA	-	South Africa
SAHRC	-	South African Human Rights Commission
SERI	-	Socio-economic Rights Institute of South Africa
SPARC	-	Society for the Promotion of Area Resource Centres
UD	-	Urine Diversion Toilets
UKZN	-	University of KwaZulu-Natal
UN	-	United Nations
UNESCO	-	United Nations Educational, Scientific and Cultural Organization
UNICEF	-	United Nations International Children's Emergency Fund
VIP	-	Ventilated Improved Pit Toilet
WHO	-	World Health Organisation

Chapter 1
INTRODUCTION

1. Introduction

1.1. Background

Toilets in public spaces were important for the creation of a functioning and liveable environment for communities, which in turn developed a new social discourse. In South Africa, water and sanitation were powerful devices that were used to racially oppress and discriminate. In developing countries, like South Africa, India, and across Latin America, the migration of people result in the rapid growth of urban city centres. The negative effects of these trends disproportionately affect the poor of the poorest communities. The hostile conditions of poverty, poor health and hygiene, and even illiteracy and corruption are all linked to a lack of adequate access to water and sanitation. Therefore, water and sanitation carry with them the ability to liberate or oppress communities within the built environment, whilst playing a fundamental role in their mobility and social development.

Women in most societies engage actively in planning, managing and delivering the daily household obligations. Women in peri-urban and rural areas manage the bulk of household chores, including child care, caring for the sick and elderly, caring for disabled family members, cooking, cleaning and laundering. Therefore the dependence on access to water and sanitation to women offer the constant commitment to their families and communities, a commitment that is often unobserved and taken for granted—chiefly because their work has no economic benefits attached to it. Their daily obligations place women in developing economies at the intersection of the inside and outside worlds, of family, household and community, ensuring that resources are secure in relation to their social, environmental and economic interests.

2.1. Motivation for the Study

South Africa has suffered a long history of inequality and racial segregation as a result of centuries of colonial rule and, more recently, the implementation of Apartheid (from 1948 to 1994). The spatial configuration of ethnic groups that defined the South African landscape for centuries is such that today the wealthy still live in developed urban and sub-urban areas while the poorest populations still reside in the undeveloped, rural parts of South Africa (Sutherland & Lewis, 2012). The

consequences of this ongoing racial discrimination have demoralised many communities and citizens in South Africa, with distribution of and access to basic services still suggesting high levels of inequality. Since the inauguration of democracy in 1994, the government has committed itself to undoing the injustices of Apartheid through the restructuring of legislative and policy frameworks. The ostensible goal has been ensuring equity at all levels of access, services and opportunities for South African citizens. However, water and sanitation service-delivery too many parts of South Africa, including Durban, regularly encounters significant challenges, involving piped water and sewerage, among other things. The same challenges exist in the provision of other basic services, such as housing, schools, healthcare and electricity (Sutherland & Lewis, 2012).

When the provision of human rights is compromised, the concept of human dignity is called into question. The present research is focused on the role of architecture and the architect, especially as it relates to the principles of equity and the right of every person to attain the highest possible standard of living.

It is important to acknowledge the potential of indigent women and feminism in the present state of traditional society. The changing role of women in impoverished urban and rural communities is often bought about through their empowerment, social inclusion, and the creation of healthy living environments. Therefore, educating and empowering women in rural communities can have a tremendous impact on the entire community.

1.3 Problem Statement, Aims and Objectives

Definition of the Problem

- What is the role of architects in order to facilitate appropriate, suitable and sustainable architecture for communal water and sanitation facilities?

Aims

- To research how sustainable social architectural spaces can contribute to the provision of suitable, acceptable and sustainable access to water and sanitation for the women of Inanda, Durban.

Objectives

- To identify how the current communal water and sanitation facilities impact on women's lives, livelihoods and general well-being.
- To investigate how a more responsive and informed architectural model for water and sanitation can be achieved through the active participation of women in Inanda.
- To cultivate an appropriate sustainable architectural model for water and sanitation services for the women in Inanda.
- In addition, the research focuses its attention on the imagination, creativity and innovation that architectural design can bring to the sustainment of healthy environments and as social assets in informal settlements.
-

1.4. Scope of the Research

1.4.1. Delimitation of the Research Problem

The migration of people from rural to urban areas redefines the relationship between humans and the landscape, and redefines local economies and livelihoods in the peri-urban interface. Peri-urban settlements are hybrid spaces that are ideal for sustainable architecture

The literature and primary research on the development of the Inanda Township in Durban is highly limited. This study will fill the research gap by providing a current empirical study of the development taking place in Inanda, with a special emphasis on issues surrounding water and sanitation within peri-urban settings that have been addressed by other architects within a similar context. It will also present the current and emerging challenges that residents, especially women, encounter on a daily basis. This study will contribute to the existing sustainability research by adopting an integrated research methodology that combines systemic evaluation with an assessment of stakeholder perspectives and decision-making dynamics. In this study, an evaluative framework will be developed and employed to assess the sustainability-outcome of Inanda and its impact on women's general well-being. The external factors that will be considered in this regard include distance, visible policing, smell,

lighting provisions, accessibility, and street conditions. Specific approaches to achieving sustainable architectural development will also be discussed. Problems and challenges will be identified and analysed, and recommendations will be made to facilitate the progress of in-situ planning and management in Inanda.

The research will focus on:

- Communal water and sanitation as social assets;
- Social sustainability theories in the field of architecture;
- The role of women in peri-urban settlements;
- Public health and the health of women;
- Water and sanitation as an architectural intervention to empower women.

The research will not focus on:

- The technical engineering aspects of water and sanitation;
- Governance and political advocacy.

1.4.2 Definition of Terms

Architecture: “The profession of designing buildings, open areas, communities, and other artificial constructions and environments” (<http://www.dictionary.com/>).

Adequate Sanitation: “Access to sanitation that is convenient for all household members, affordable, and that eliminates contact with human excreta and other waste water in the home and neighbourhood” (Mara, 2011:11).

Adequate water supply: “A supply of water that is safe, regular, convenient, and available at an affordable price” (Mara, 2011:11).

Building: “Something that is built as for human habitation; a structure”; “the act, process, art or occupation of constructing” (Dobrev, 2012)

Community: “Joint ownership”; “organized political, municipal, or social body; body of people living in same locality (centre, place providing social & other facilities for a neighbourhood)” (Oxford Dictionary, 1964:245)

Communal: “used or shared in common by everyone in a group” (www.dictionary.com).

Dignity: “nobility or elevation of character; worthiness” (www.dictionary.com).

Development: “the act of process of developing; growth; progress”(www.dictionary.com)

Economic: “Relating to the production, development, and management of material wealth, as of a country, household, or business enterprise”.

Ecosystem: “An ecological community, together with its environment, functioning as a unit” (www.dicionary.com).

Environment: “A subset of the natural world; an ecosystem” or “the complexity of social or cultural conditions affecting the nature of an individual person or community”; “the totality of the natural world, often excluding humans”; “a subset of the natural world, an ecosystem”; “the combination of the external physical conditions that affect the influence of growth, development, behaviour, and survival of organisms” (www.dictionaty.com).

Ecology: “Branch of biology dealing with living organisms’ habitats, modes of life, and relation to their surroundings” (Oxford Dictionary, 1964: 386).

Health: “The overall condition of an organism at any given time”; “soundness, especially of body or mind; freedom from disease or abnormality”; “a condition of optimal well-being” (www.dicionary.com).

Infrastructure: “An underlying base or foundation, especially for an organization or system” or “the basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines and public institutions including schools, post offices, and prisons”(www.dicionary.com).

1.4.3 Stating the Assumptions

- It is assumed by this research that the provision of appropriate community-based sanitation and water services in informal settlements, and improvements to the built environment, can effect change in habits to women and the community.
- It is assumed that a bottom-up approach towards these provisions will also assist in giving women a sense of ownership and maintaining communal water and sanitation facilities through appropriate style in design.
- It is assumed that the existing provisions for water and sanitation facilities do not provide options for future adaptation, growth or evolution.
- It is assumed that, through a positive architectural design response that allows for incremental growth, the challenges that women face can be tackled head on.

1.4.4 Key Question

- How can improved water and sanitation facilities contribute to and improve quality of life for the women of Inanda?

1.4.5 Secondary Questions

- How can women overcome the barriers of inadequate sanitation facilities and subsequently create a safe, healthy and sustainable living environment?
- What type of amenities and architectural planning principles are mandatory, in order to warrant safety and accessibility for women in the community?

1.5 Research Methodology

This research gathers data on the existing conditions surrounding communal water and sanitation in peri-urban Inanda. The issues investigated involve the environmental and social conditions surrounding community water and sanitation (Dobrev, 2011:15)

1.5.1 Approach and Data-Collection Methods

The primary research methods are outlined below.

This research is qualitative in nature, involving an assessment of the current conditions surrounding water and sanitation for communal use in the community of Inanda, as well as their impact on women. The research also looks at how inadequate water and sanitation services influence the health and well-being of women.

Observation

Participants will be asked to evaluate external factors such as distance, visible policing, smell, lighting provisions, accessibility, and street conditions. Participants will also be required to comment on the spaces surrounding the existing sanitation facilities, and on what time of the day people tend to use these facilities the most. Based on these observations, recommendations will be established to address the factors contributing to the community's living conditions (Mehrotra, 2011).

In-depth questionnaires

A total number of six Interviews with present patrons of the facilities will provide first-hand information about the conditions surrounding existing communal sanitation in Inanda. The interviews will be semi-structured or unstructured. Participants from the community that reside at home during the day will form part of the structured and

semi-structured interviews. The interviews will be conducted at the day-care centre, not far from the CAB facility that is discussed in chapter 4 as a case study. The ‘Sizimisele’ day-care facility will be used as a platform and catchment area to interview samples that come to the school to fetch their kids. This platform allows the samples to feel comfortable through the interviews as it is safe and the women can engage with each other through discussion and communicate with each other on their response to the interviews. The samples generally visit the facility between the mornings, 8:00am to drop of the kids and the evenings between 1:00pm – 3:00pm. A total number between 6 to 10 interviews will be conducted during these times.

Consultation with community organisations

Community organisations and NGOs, especially those with advocacy experience around sanitation and water provisions in Inanda, will be consulted. These consultations will elucidate the main concerns that the community faces, helping the research to deal directly with those problems in-depth. Community organisations have direct contact with members of the community, and can therefore offer insightful and useful information.

Free-hand sketching and writing

This option will be used when photography is not an option: for example, in cases of restricted access and invasion of privacy. Due to the sensitivity of the research plain photography could inherit sensations of inequalities especially to samples of the community. As an outsider within the community freehand, onsite sketching would allow members of the community to engage in the research. The sketches will illustrate and assist towards developing a deeper understanding of the CAB facilities in terms of circulation, movement and the contextual nature of the peri-urban settlement.

Sampling methods

The samples will be accessed through a common platform in the settlement such as the day-care centre and the houses surrounding the CAB facility. A total number of 6 samples will suffice to bring about clarity on their current sensations about the facility. The participation of the women of Inanda is critical for the assessment of the water and sanitation facilities provided. Their participation will help the researcher to

directly identify the main concerns of dignity, safety and health and hygiene. Though the research is directed at women, it will also raise concerns for male ablution facilities and planning principles. The reason for sampling with a priority placed on females is owing to the fact that women are faced with real challenges of safety as they carry out their domestic responsibilities, which include laundry, cooking and cleaning, among others things. Women have to walk every day in order to fetch water and therefore directly experience the challenges associated with inadequate sanitation in public spaces; water standpoints positioned close to main roads or highways make them vulnerable to abuse and violence.

1.5.2 The Second Methodological Approach

Semi-structured interviews

Interviews will be conducted with the sample group in an environment that makes participants feel comfortable enough to speak openly. This will in turn ensure that the data collected is useful and insightful. The sample will be allowed to expand on certain aspects or topics that were not thought of by the researcher, allowing matters to be developed for further discussion.

Precedent studies

These will be carried out in order to understand how issues surrounding water and sanitation within a peri-urban setting have been addressed by other architects working in a similar context. Two to three precedent studies will be interrogated to this end. These precedent studies will guide the research by indicating how social and environmental considerations impact on a community. They will also help create a building typology for communal sanitation that provides a safe, healthy and clean environment for women.

Literature Review

The literature review will consist of the following types of material:

Newspapers, which will provide recent and up-to-date knowledge and discussions relating to the topic;

Journal articles, which will provide recent scholarly knowledge and debate relating to the topic;

Books, which will provide historical and theoretical information that can enhance the information found in journals and newspapers;

Internet, which will provides quick access to information and knowledge from current papers worldwide.

Data Analysis

Photo elicitations will be used to stimulate conversation with the sample group (women) in a group discussion with regards to the existing provision of communal sanitation and water. The interviews will be conducted using a questionnaire and will then be analysed and broken down into various categories and sub-categories that will assist in generating ideas for an architectural design that fosters dignity for women. The women will also be allowed to comment on which additional facilities they think would be required to ensure comfort, safety, health and dignity.

1.6 Conclusion

In this chapter, the importance and history of the provision of water and sanitation in human settlements were discussed. Since the earliest patterns of urbanism, water has been one of the key elements in establishing good public health and social well-being. The provision of reliable sanitation in developed and urban areas has been a fundamental tool for empowering women in the built environment. Communal water and sanitation in rural and peri-urban areas and developing communities have become problematic for women and children. By adopting a sustainable approach towards these basic provisions, and limiting the use of resources, architecture can act as a catalyst for social and environmental transformation, and is therefore a necessity for preserving the well-being of future generations. The provision of communal water and sanitation in poor urban settlements must be ensured, in order to uplift women in these communities.

With urbanisation taking place on a massive scale in developing countries, the demand for resources is increasing. Architecture can contribute towards a more sustainable environment through urban planning, waste management, and sustainable

alternative methods of building. The following chapter suggests how sustainability in architecture and urban planning can be used to facilitate appropriate communal water and sanitation facilities for women.

Chapter 2

THEORIES AND CONCEPTS

2.1. Introduction

In this chapter, the theory of sustainability is explained in relation to its social, aspects. The concepts related to the theory of sustainability are outlined in the literature review in Chapter 3. The first section of this chapter explores the overall theory of sustainability. The second section addresses the social pillars of sustainability, exploring through the role of social assets and community building. This chapter therefore maps the three pillars of social sustainability that pertain to the topic of communal water and sanitation facilities as social assets. In addition precedents developed from architectural projects of similar social and cultural backgrounds the architectural projects discussed in this chapter are precedents of similar nature intended to formulate the final design outcome.

2.2. Sustainability Theory

Sustainability theory identifies the necessary measures that must be taken to ensure the survival of future generations (Thiele, 2003:02). The three pillars of sustainability describe the relationship between man and his impact on the *environment*, the *economy* and *society*. Sustainability from an architectural standpoint can be understood as the process by which people interact with the built environment and with each other without causing any harm to the environment and preserving natural resources. In architecture, each sphere of sustainability has a different meaning and is usually defined by its physical dimensions (Dobrev, 2011:18)

Basiago (1999) outlines the background of each pillar of sustainability. He argues that the social aspects of sustainability refer to “a system of social organization that alleviates poverty”. Therefore, social sustainability encompasses notions of equity, empowerment, accessibility, participation, sharing, and cultural identity, seeking to preserve the environment through economic growth and the alleviation of poverty (Basiago, 1999:149). Environmental sustainability, according to Basiago, means “ecosystem integrity, carrying capacity and biodiversity”. The natural capital of the planet must be maintained as a source of economic gain and as a sink for waste. Economic sustainability, which involves sustainable “growth, development and productivity, has guided conventional development science in the past” (Basiago, 1999:150). Economic sustainability holds the assumption that natural resources are

limited, and relies on “sustainable development” to put restraints on natural, social and human capital and expenditure.

Sustainability therefore attempts to merge ecology and society with industry and technology. Authors like Basiago (1999) argue that sustainability is a natural economic asset, which implies that a link exists between man and nature. In short, sustainability involves building with concern for environmental and economic factors, as well as for human life, well-being, and other social factors.

2.3. Social Sustainability

Social sustainability is a widespread concept and carries with it multiple definitions within various disciplines. In the context of this paper, social sustainability refers to the collective and individual needs of people within a society, and is the positive condition for a strong sense of social cohesion, equality and access to key basic services. For the purposes of creating a discussion on what the true definition of “social sustainability is within the South African context, the most relevant definitions will be discussed here.

McKenzie claims that social sustainability is broadly related to “a life enhancing condition within communities, and a process within communities that can achieve that condition” (McKenzie; 2004:11). McKenzie argues that such a definition for social sustainability suggests a range of approaches that need to be adopted, and also suggests that sustainability as a condition needs to be measured via a series of indicators. These indicators include: equity of access to basic services, equality across generations, culture, political participation, creating awareness of social sustainability, a sense of community and responsibility, mechanisms for the community to identify strengths and weaknesses, mechanisms for community action, and mechanisms for political advocacy (McKenzie, 2004:13). McKenzie adds that “either the conditions already exists, or the goal remains to be achieved” (McKenzie, 2004:13). Sustainability is seen as a condition or asset within communities that allows them to maintain social cohesion and overcome hardship.

A definition of social sustainability provided by McKenzie is “a positive condition marked by a strong sense of social cohesion, equality of access to key services such as

water and sanitation facilities²² (McKenzie, 2004:15). Accordingly, McKenzie suggests that social sustainability be treated as a condition, with a set of indicators used to measure it. He argues that the distinction between the condition and the framework for measuring it often becomes blurred. Therefore, the criteria for measuring social sustainability must make reference to the space (locality, region) it occupies and the allocation of recreational resources, civic spaces, street design, location of services, among other things, in relation to the population. The overall conclusion that emerges is that societies must be studied, sustained and altered not through policy and institutional changes, but through incremental development and growth that is compatible with the evolution of civil society, fostering an environment that is conducive of culturally and socially diverse groups and that encourages social integration, all while creating improvements in quality of life (McKenzie, 2004:17).

For this dissertation, social sustainability will be defined as follows:

Social sustainability occurs when the formal and informal processes systems, structures and relationships actively support the capacity of current and future generations to create healthy and livable communities—socially sustainable communities are equitable, diverse, connected, and democratic to provide a good quality of life. (McKenzie, 2004:18).

Through this definition of social sustainability, “society” is measured by the equity of all members, advantaged and disadvantaged, and at the individual and collective/community level. However, social sustainability also deals directly with the social conditions within a community and their impact on future generations with regard to services, social and natural resources. Food, water, shelter, education, proper sanitation, basic healthcare, and a clean and healthy environment all fall within the parameters of the basic aspirations and needs of a society living within the built environment. Social sustainability, from an architectural perspective, involves the social interactions that take places within the built and “natural” environment. These interactions must be considered in any process designed to ensure constructive opportunities that benefit future generations. Taylor argues that “an unequal society is an unjust society” (Taylor, 2004:4). In short, when inequalities arise, they impact on the immediate social needs of the community: poor living conditions and poverty emerge. Social sustainability is therefore an integrative concept reliant on modern infrastructure, and mostly driven by access to adequate, clean and healthy living

environments, which includes access to housing, education, healthcare, clean water and sanitation facilities. In this study, the focus is particularly on women and their active role in all of these basic services. Women centre around facilities and social activities as can be seen in figure 2.01 – which illustrates the linkage of various local and social facilities. Each of the facilities illustrated below demonstrate how social facilities can link to each other in a community. With such connections community building and neighbourhoods become centres for social inclusion rather than stand-alone facilities. Local facilities cater for the greater community, open spaces cater for the social wellbeing and support the local services, whilst housing can be seen as to cater for the neighbourhood supporting both the open spaces and the local facilities.

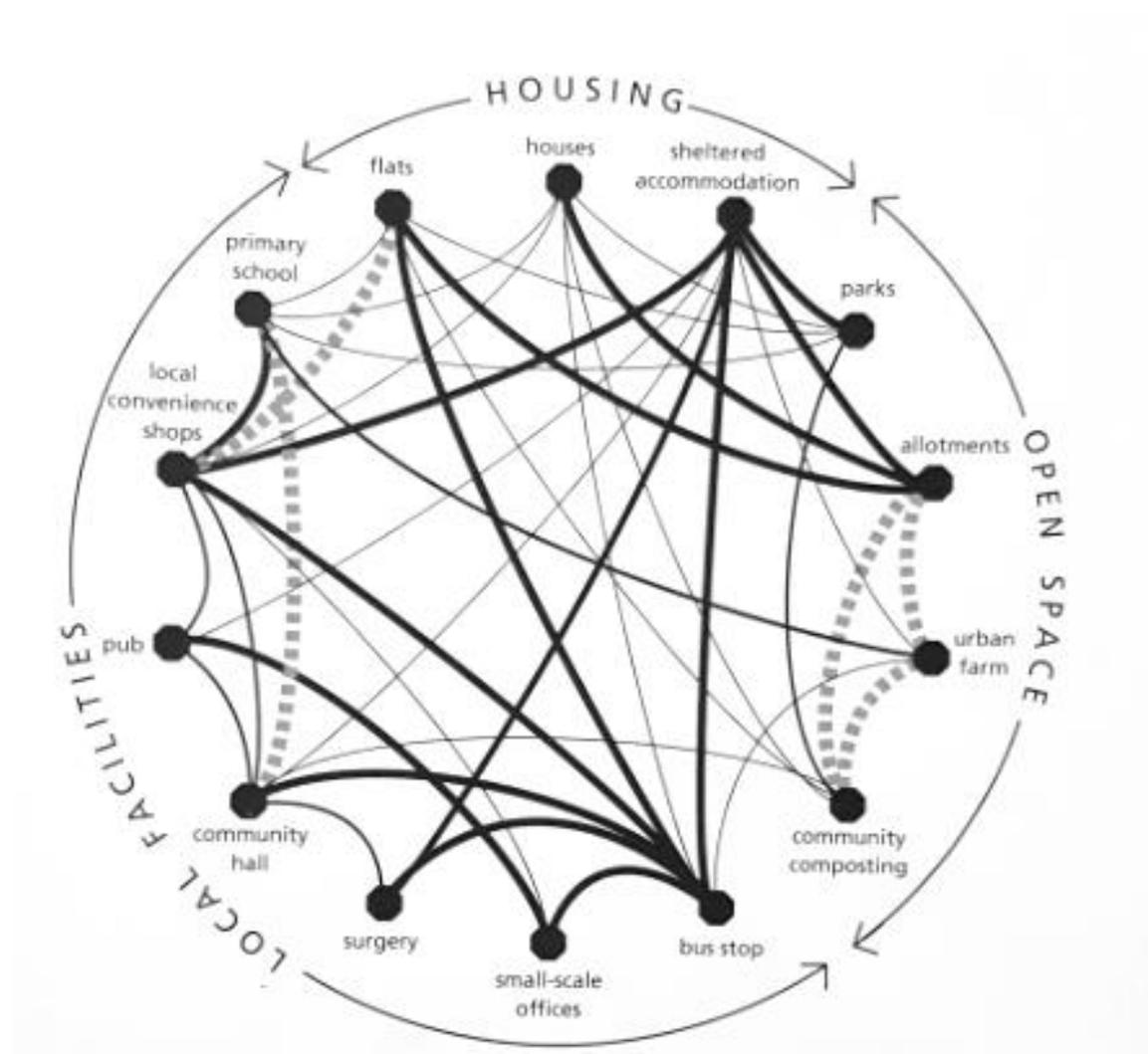


Figure 2.01: Diagram representing possible social activities with the communal facilities at the core (Barton et al., 2010)

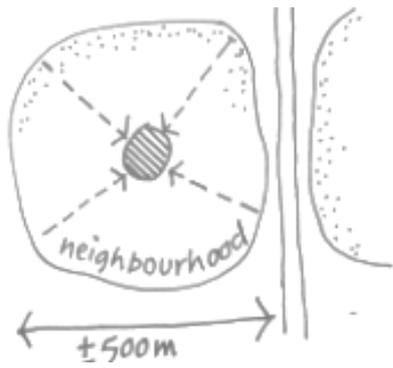


Figure 2.02: locating the communal at the center of a community will not necessarily enable the site as a place for social activity (Barton et al., 2010:240)

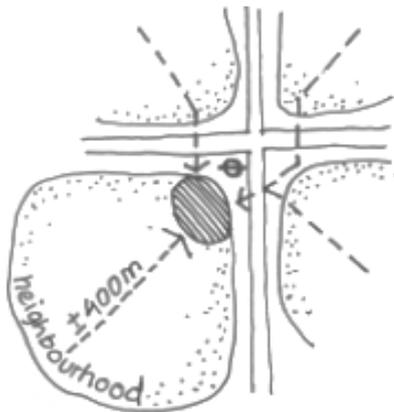


Figure 2.03: locating communal facilities along a visible node to attract more users (Barton et al., 2010:240)

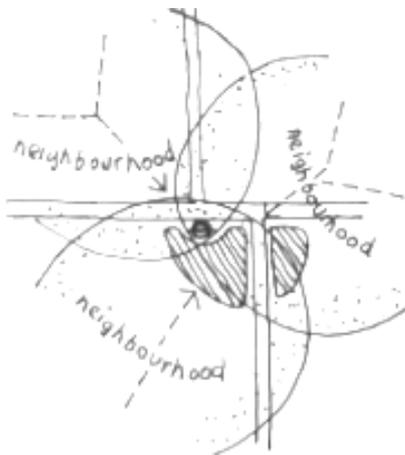


Figure 2.04: ideally the best location is at a tangent to a pedestrian pathway. This recommendation falls within the urban theory of design and user experience of walkability (Barton et al., 2010:240)

Figures 2.02 to 2.04 represent illustrations of how the services for social integration will function locally and spatially. The ideal location for communal water and sanitation, which include supporting functions are ideally located to promote walkability. Therefore the spatial configuration of social assets need to be located between neighbourhoods and along walkable routes. In conclusion, providing communal facilities at a tangent to the path enables the use of more sustainable sanitation options, such as the bio-gas digester at the community level, further strengthening the position of communal facilities. Sanitation options and their importance are discussed in the next chapter.

2.4. Analysis, Discussion and Conclusion

A good public space is a community asset will generously accommodate life and support human activities. Spatial configuration plays a meaningful role in the development and evolution of public facilities such as the examples discussed. Moreover, when designing spaces for communal water and sanitation, the structural representation of spaces contribute immensely to the quality of life to its inhabitants, ranging from spatial forms and choice of material. A visually appealing and appropriate representation can be achieved through the configuration place and response to context and culture. Sustainability in architecture and within the context of urban spatial configuration can assist in place-making for water and sanitation through heightened visibility. Furthermore, the environment in which people live plays an important role in their development and in their sense of place in a society. Therefore, the recommendation is that communal water and sanitation ideal position would be alongside overlapping social facilities such as schools, clinics, healthcare, households, etc. If communal facilities can meet these basic requirements, place-making for community building will be able to function together through participation of the architect and community, hence allowing the design process to define the design intent. Connectivity between local activities is vital and must always be considered.

Chapter 3
LITERATURE REVIEW

3.1. Introduction

The main objective of this literature review is to outline the importance of access to adequate water and sanitation facilities, and the role of such access in the safeguarding of public health. This chapter extends the discussion of critical theories and concepts initiated in the previous chapter. It sets out to establish the principles of improved water and sanitation facilities, and their impact on the dignity and livelihoods of women and their communities. The literature review focuses on the South African context, highlighting the challenges women in peri-urban settlements face daily, specifically in relation to communal water and sanitation facilities. Potential solutions to these fundamental challenges will be illustrated through a collection of architectural design mechanisms. The objective is to demonstrate how current conditions can be adapted to facilitate sustainable and comfortable access to clean water, in turn expediting and maintaining hygienic sanitation Durban.

3.2. Sanitation is about Health

Sanitation is a word that can be replicated to suit a number of different definitions within a number of different platforms. Some examples of the definitions of sanitation include (a) physical infrastructure, (b) hygiene-related behaviour, and (b) waste disposal in the context of household and institutions (Asmal et al., 1996:3). Sanitation could therefore refer to the principles and practices pertaining to the removal, collection or disposal of human excreta, household garbage and waste water, which assist in preventing the spread of diseases to people in a community or social setting (Asmal et al., 1996). On the other hand, sanitation can refer to the broader physical infrastructure that functions to protect public health. Safeguarding public health has numerous benefits for society. It expands public knowledge on preventing contamination and promoting personal health and well-being, it increases life expectancy, it encourages gender equality, it reduces child mortality rates, it assists in eradicating poverty, and it protects the environment from pollution and exploitation, among other things (WHO, 2015).

The burden of poor access to water and sanitation often affects the most vulnerable people within societies, mainly women and children—especially those residing in developing countries (Roma & Pugh, 2011:11). Diarrhoea and cholera contamination

are the products of poor sanitation and polluted water-sources; they are transmitted through a faecal-oral pathway and represent the most significant health hazard for children (Roma & Pugh; 2012:16).

The safe disposal of human waste (sanitation) through the building and maintenance of toilets, combined with regular hand washing, prevents the spread of germs and is necessary for good health and general well-being. The British Medical Journal published a report in 2007 on “Great Medicine” over the last one hundred and fifty years. The report states that the sanitary revolution since the early 1840s has been the greatest contributor to public health and medicine advancements since the advent of antibiotics, insulin and medical surgery (Rulseh, 2007). Sanitary toilets assist medical practitioners, healthcare workers, NGOs and governments worldwide in preventing the spread of disease and generating awareness of the importance of optimal health and personal hygiene. The report further highlights the fact that the implementation of piped water to homes and sewage disposal since the Industrial Revolution are among the greatest human achievements in Western history.

3.3 A Brief History of Water and Health

Water is life: all forms of life on earth are predicated on the existence of water. In many ways, human civilization has evolved primarily through the use of water (see Chapter 1). Early sanitation solutions emerged over time, as concentrations of people came together in an area. From the early hunter-gatherer communities to more modern societies, the water closet has been an important feature of Western Civilisation. The earliest recorded form of the sanitation dates back to the period of 3250-2750 BC in Ancient Egypt, as well as to the Indus Valley Civilisation, the Mycenaean era in Greece and, later, to the Roman and Byzantium civilisations (Palmer: 1973:13). In the nineteenth and twentieth centuries, sewer systems were constructed in many parts of the United States and Europe. As untreated sewers contaminated waterways and water sources, public health and hygiene became compromised, and experimentation into improved sewer-treatment methods began.

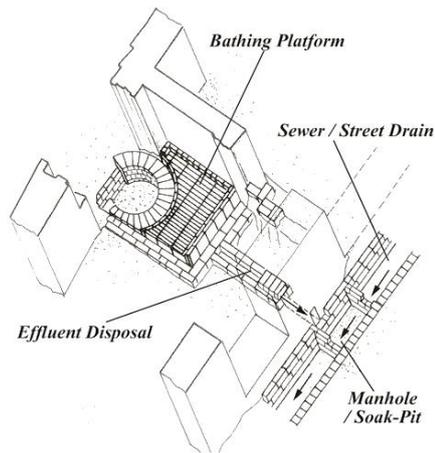


Figure 3.01: Indus Valley (3200-1900 BC) domestic mechanisms for the disposal and transportation of wastewater (URL0001)

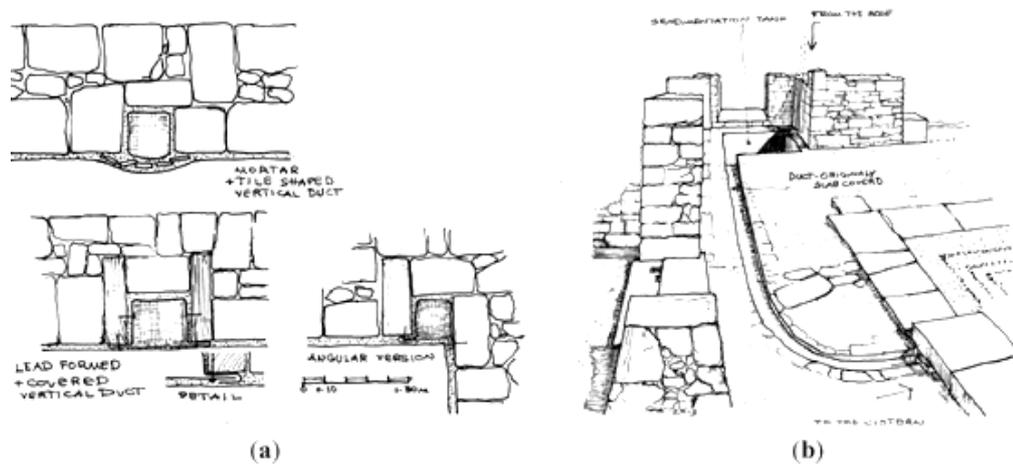


Figure 3.02: Sewerage and drainage mechanism during the early Mycenaean periods in Greece: (a, b and c) are types of vertical ducts, and (b) is a sedimentation basin leading rainwater to the cistern (URL0001)

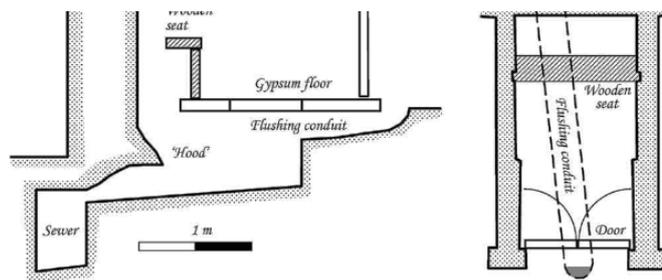


Figure 3.03: illustrations of a section and ground floor plan of a residential toilet quarter in the Minos Palace. These sanitation technologies were carried over to the ancient Greek Mycenaean period (Angelakis, et al., 2005:212).

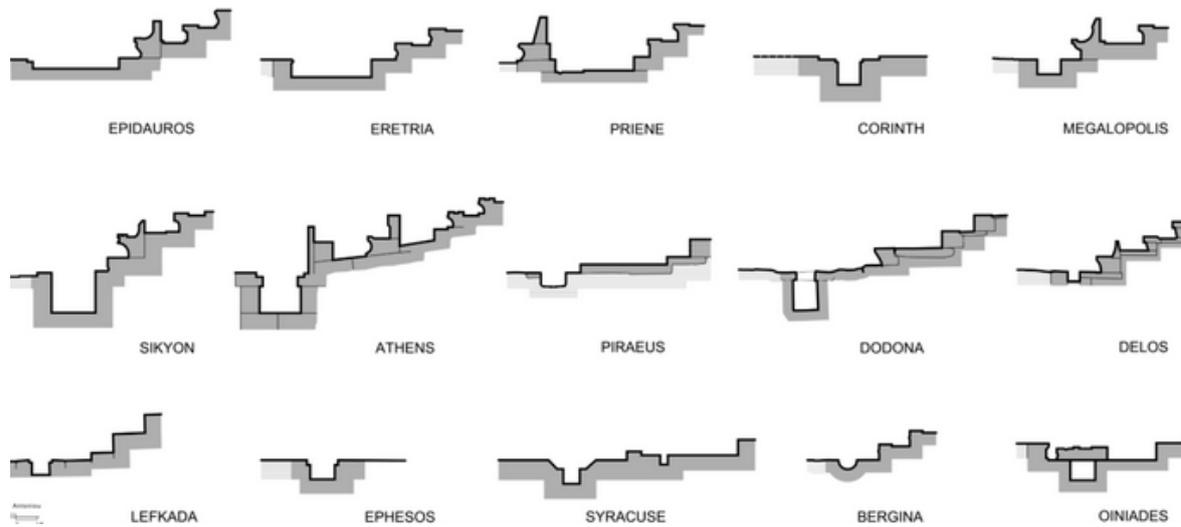


Figure 3.04: Cross sections of the various drainage duct typologies employed during the ancient Greek Mycenaean period, adopted to suite the various Greek arenas (URL0001)

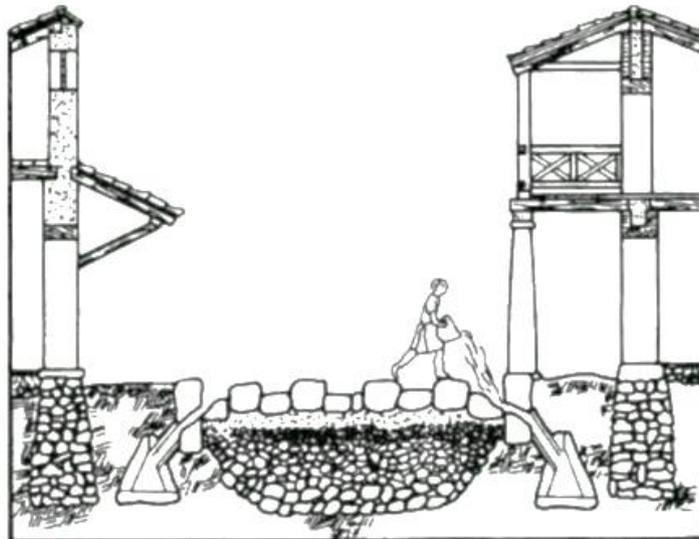


Figure 3.05: Street-side openings to the Roman Sewers. The sewers carried off sewage, urban runoff, and drainage water together (www.waterhistory.org/histories/rome)

Sanitation and early waterborne sewer systems as seen in Figure 3.05 illustrate early Roman sewer systems which improved the livelihoods and well-being of early human societies. The sewers were located at the edge of the street below buildings and channelled off water from living environments, hence reducing the risk of disease to the public. The provision of appropriate measures for sanitation and water was located in the responsibility to address social services, and improve the general health of people in both the public and private spheres of society. These improvements also enhanced convenience and accessibility, and led to other public services being

developed. Water and sanitation were essential parts of social welfare, generating planning principles for the particular needs of the community in a manner that was suitable, sustainable and acceptable.

3.3. Water and Sanitation in South Africa



Figure: 3.06 South Africa- 30.0000⁰S, 25.0000⁰E (www.phespirit.info)

Figure 3.06 represents the location of South Africa on the African continent. Amisi and Nojiyeza divide the history of sanitation in South Africa into three periods: Apartheid (1948-1994), democracy, with its new constitution and sanitation policies (1994-2001), and the eradication of the bucket sanitation system (2001-2008) (Amisi & Nojiyeza, 2008). As the authors observe, non-whites residing in Bantustans and homelands during Apartheid were not provided with adequate housing, water, sanitation, schools, hospitals and other public infrastructure. Black South Africans resided mostly in townships and informal (“squatter”) settlements. These settlements consisted of make-shift housing (built from recycled material) and lacked safe drinking water and sanitation facilities. Such living conditions, marked by poor access to basic services, often threatened the general health and well-being of the many poor residents (Amisi & Nojiyeza, 2008). It was only a handful of people in the townships and squatter areas who had access to ablution facilities that were clean and hygienic (Figure 1). Amisi and Nojiyeza note that, “[i]n Durban, the provisions of clean water to black households and settlements were relatively expensive”. They mention that, in the Inanda township in Newtown, “[w]ater was sold by water vendors” for “25c per bucket” (Amisi & Nojiyeza, 2008).

Water provisions to poor settlements were made available in the form of a spigot (standpipe), servicing approximately fifteen thousand to twenty thousand people (Amisi & Nojiyeza, 2008). Women and children were responsible for the water-collecting activities within the settlement. The water was used for cooking, cleaning households, and bathing children, which were among the women's basic daily responsibilities. The authors continue: "They were required to walk substantial distances in order to fetch water, and were manually collected in the containers, ranging from huge plastic jugs, bottles, and cans. Only twenty percent of African households reported having a tap within the household" (Amisi & Nojiyeza, 2008).

In addition to these water challenges, the townships and informal settlements suffered from a lack of sewerage infrastructure and sewer-treatment facilities. Instead, residents in some townships and informal settlements made use of pit latrines (or bucket-system latrines), while those in other townships utilised portable toilets. This lack of sewerage infrastructure, combined with the bucket system, created enormous health problems during heavy rains, mostly due to accidental spillages of the bucket. Moreover, groundwater contamination was a major cause of concern. Health problems included infectious diarrhoea, worm infestations, cholera and gastrointestinal disorders (Amisi & Nojiyeza, 2008). In 1982, a major cholera epidemic hit rural South African townships, killing two whites, a small number of Indians, and a huge number of black South Africans (New York Times, 1982). The Apartheid government responded to the epidemic by providing chlorine tablets and health education, including pamphlets in English and Afrikaans. Other sanitation included the inadequate disposal of garbage, with many open civic spaces and open areas around households and neighbourhoods serving as dumping grounds (Amisi & Nojiyeza, 2008).



Figure: 3.07: Simple pit latrine (www.lboro.ac.uk)

In 1994, South Africa celebrated its first democratic elections and the official abolition of Apartheid. With the ANC government (African National Congress) in power, new policies were introduced, following a legal framework on sanitation provision. The White Paper on Water Supply and Sanitation (1994) established the National Sanitation Policy and the National Sanitation Task Team (NTSS). This was followed by the National Sanitation Strategy in August 2005 and the Community Water and Sanitation Programme (Amisi & Nojiyeza, 2008). Post-Apartheid legislature declared the bucket latrines, chemical toilets and simple pit latrines inadequate sanitation technologies. The VIP (Ventilated Improved Pit Latrine) became the sanitation choice for entry-level service provisions (Asmal et al., 1996). The White Paper on Water Supply and Sanitation defines adequate sanitation as follows: “[The] provision and on-going operation and maintenance of a system of disposing of human excreta, waste, refuse which is acceptable and affordable to the users” (Asmal et al., 1996). Inadequate water and sanitation result in poor health, poor hygiene practice, disease, illness, and poverty.

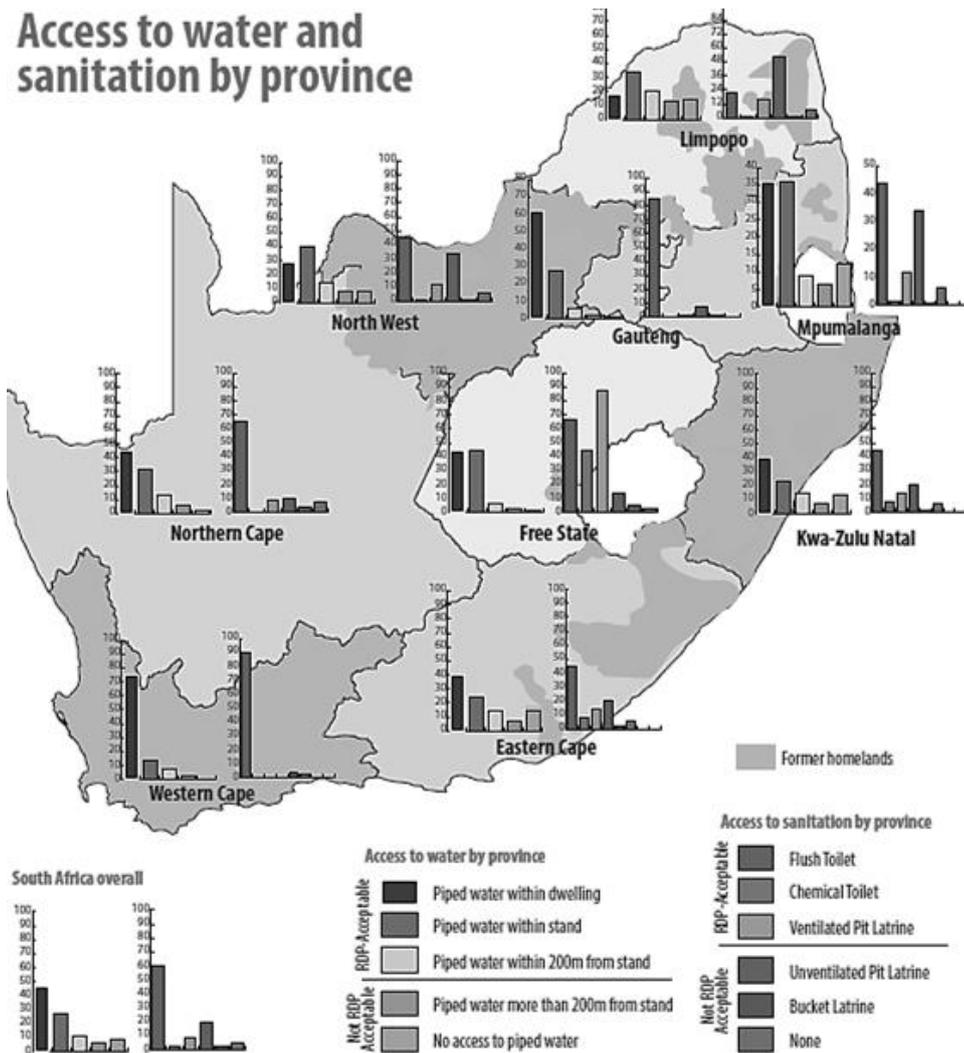


Figure 3.08: Stats produced by the South African Human Rights Commission indicating the lack of access to water and sanitation in South Africa (Mail & Guardian, March 7 to 13, 2014)

The Mail & Guardian published a report on the post-1994 state of sanitation and water in South Africa. In Kwa-Zulu Natal, 40% of people had access to flush toilets, while 5% used chemical toilets, 10% used the VIP, 20% used unventilated pit latrines, 2% used bucket latrines and 8% had no access to a toilet facility. Similarly, 40% of people in KZN had piped water running to their homes, 20% had access to a spigot or standpipe, 10% could access water within a 200 metre radius, 5% had piped water more than 200 metres from home, and 10% had no access to piped water.

In addition to South Africa’s sanitation challenges and water scarcity, a report from the South African Water Research Commission (SAWRC, 2012) predicts heavy rainfall patterns resulting from climate change, carrying a high flood risk in certain parts of the country, with other regions expected to experience severe drought over the next decade (Jayes, 2014:98). The SAWRC also reported that 1.58 million

kilolitres of clean water are lost annually, with the losses resulting from leakages due to theft and illegal connections in peri-urban areas, as well as commercial authorisation such as fire departments (Jayes, 2014:98). South Africa's water supply functions on two types of water infrastructure, namely storage dams and water services. The losses of water cost the country approximately 7.2 billion ZAR annually, while 35% of the total water supply is flushed away (SAWRC, 2012). The United Nations (2015) water-scarcity fact sheet estimates that, by the year 2025, 1.8 billion people will be living in countries with absolute water scarcity and two-thirds of the global population could be under stress conditions. Developing countries will experience 50 percent water withdrawals and developed countries will experience 18 percent withdrawals (UN.org).

Durban, unlike much of the developing world, is known to be one of South Africa's most progressive cities, especially in terms of the provision of basic clean water and the desired levels of sanitation to its rural and peri-urban areas. In more isolated parts of the province of Kwazulu-Natal, however, there are many areas with underdeveloped infrastructural and coverage. Women and adolescent young girls are forced to manage households, which results in them walking long distances to collect water from communal standpipes, rivers or dams (M&G, 2014). In informal settlements, either sanitation is absent or sanitation services are provided via state- and community-built latrines. Communal washing stations, showers and toilets receive an unlimited supply of water via communal taps, with communal municipal mains laid along roads and paths (Sutherland and Lewis, 2012). Water activities for bathing and hand cleaning are carried out at communal ablution facilities (CAB), which are sometimes stationed far from the households in informal settlements. Communal container block within informal settlements consist of designated flush toilets and showers for males and females, as well as communal taps and troughs for clothes washing. From the community level and down to the individual level, women encounter many challenges associated with the communal ablution facility.

3.4. The Right to Dignity and Equality

Women in peri-urban South Africa spend most of their time at home during the day, managing households, collecting firewood, cleaning households, caring for children,

the elderly, etc. Given all the daily responsibilities at hand, access to safe, clean, comfortable and private toilets is vital. A lot of time is consumed by water-collecting and laundry activities. Access to adequate water and sanitation facilities remains a powerful locus for empowering women in undeveloped rural and peri-urban areas. Toilets bring to the surface differences and inequalities across gender (male and female), ethnicity (black and white) and culture (east and west). Most importantly, toilets involve the right to human dignity (Penner, 2014)

Human dignity is a fundamental human right. Like all human rights, human dignity is “inherent to all human beings, irrespective of nationality, place of residence, gender, ethnicity, religion, language preference, or any other status” (UN: 2011). Human dignity does not need to be earned; the right to it is automatically granted. Human dignity means that every person has value, is worthy of respect and should be free from any form of discrimination, violence or inhumane treatment. The United Nations (2003) states that “the human right to water and sanitation is indispensable for leading a life in human dignity”. The United Nations Development Program (2002) states that access to water and sanitation is one of the cornerstones of human development and poverty alleviation. Therefore, a fresh and clean supply of water, coupled with a clean, safe, hygienic toilet facility, is among the most basic and desirable requirements for all human beings (Mara & Evans, 2011:08).

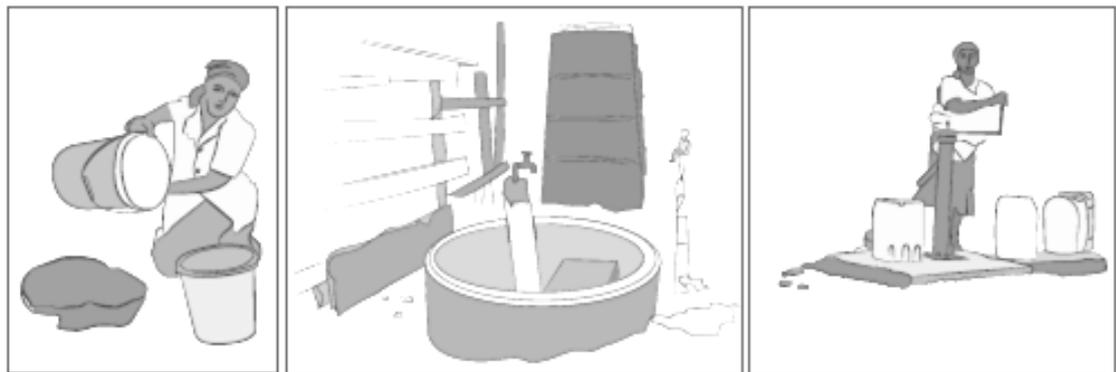


Figure3.09: Illustrations representing the basic role of women in South Africa’s informal settlements (M&G, 2014)

Women residing in informal rural and peri-urban settlements often find their dignity compromised by lack of access to appropriate water and sanitation services. The vulnerabilities around dignity are closely linked to safety, health, hygiene, childcare

and the distance and accessibility of sanitation facilities. Women experience different needs to men when using a toilet. It is significantly easier for men to relieve themselves in the open compared to women. Privacy, comfort, cleanliness, pregnancy, menopause and safety are among the issues that can be compromised by a lack of water and sanitation services. Furthermore, women usually care for and teach children, so when women's needs are not met, the needs of the children are also not met.

Women become vulnerable to infection during their menstrual cycles when using unhygienic toilets with little privacy, especially when there is no appropriate means of disposing used sanitary towels (M&G, 2014). Inadequate disposal of used sanitary towels can be harmful to the natural ecology, since sanitary towels are not easily biodegradable. A single sanitary towel takes longer than six months to biodegrade, while the plastic liners on sanitary towels do not biodegrade at all. As already mentioned, toilet facilities highlight social and cultural differences in gender. Public toilets are therefore urgently needed. They should be provided as a social- and environmental-upliftment tool, in line with a human-rights-based approach, in order to ensure good health, privacy, safety, acceptable levels of hygiene awareness and practice, the preservation of dignity and the protection of the environment from toxic waste.

When water and sanitation are not considered essential parts of daily life, and when facilities are not provided for a growing population, privacy becomes a critical issue, particularly for women (UNDP: 2006). Furthermore, when access to a toilet to relieve oneself is restricted, the chance of developing a urinary tract infection, chronic constipation or physiological stress becomes imminent (Evans & Mara, 2011:08). Not having access to private household sanitation facilities means that women and girls are easily exposed to danger when going out at night or using an isolated communal toilet (Mara & Evans, 2011:13). Such outcomes force women and girls to practice open defecation late at night or early in the mornings, especially if their only other option is a communal toilet (Drewko, 2006:11). Women in rural communities are required to walk into bushes to relieve themselves, where they are often exposed to violence and the risk of rape, to say nothing of the effect on their dignity. The lack of water and sanitation infrastructure therefore closes women off from the right to education, health, safety and a clean environment.

Toilets tend to be indicative of a person's state of being and place within society (Penner, 2014). Improved sanitation and access to clean water are two vital components that have been shown to increase the attendance of girls in school, since improved toilets ensure privacy, safety, hygiene, health education, and a reduction in social humiliation (UN, 2014). Similarly the responsibility for collecting and carrying water impacts on adolescent girls and their attendance at school. According to a SAHRC (2014) report, the duty of fetching water for the home, if parents are sick, elderly or disabled, falls mostly on young females (M&G, 2014). Girls living in impoverished areas also tend to drop out of school if there is not a sufficient supply of clean water and soap for hand washing and personal hygiene, especially when they reach puberty (M&G, 2014). People with disabilities are further challenged by the current provisions of water and sanitation facilities. The challenges are linked to wheelchair access, door width and the direction of door swings. In some cases, toilets are placed far away from houses or on uneven terrain, impacting heavily on the dignity of persons with disabilities (M&G:2014). These poor levels of service delivery are rooted in a lack of communication between communities and government. Communities are not consulted during the planning and delivery process. Public participation is an essential part of ensuring that communities receive appropriate facilities, linked to their unique social and cultural context. As it stands, facilities are often located along busy roads and within the vicinity of public spaces, but the infrastructure fails to meet the acceptable standards of service delivery.

Consequently, the importance of providing the essential service of public toilets to residences in peri-urban areas such as Inanda has in recent years captured the attention of national government and NGOs worldwide, with a special focus being placed on project funding. In September 2013, The Mercury published an article titled "Water and Sanitation Become a Living Nightmare in Durban's Inanda Township", which outlined the frustration of many rural communities and their concerns about infrastructure development. Critical problems with development, adequate water and sanitation, affordable housing, electricity, waste removal, and clean air to breathe were among the sources of the community's dismay. Polluted air from raw sewers contaminating streams and flowing into neighbouring properties creates a major human health and environmental crisis, besides the harm it causes to the natural ecosystem. Yet the sanitation crisis extends further. In terms of communal ablution

facilities, in ward 56, 150 houses share two showers and three toilets; in ward 44, 500 houses share four toilets; and in ward 55, 320 houses share four toilets. The challenges accompanying the toilets relate to cleanliness, queues, sexual assault on women and low feelings of self-worth for the 80 000 households in the community. The Mail and Guardian reported on the situation from March 7 to 13, 2014, as part of a supplement to the South African Human Rights Commission (SAHRC). The newspaper found that it is usually the rich who have an unlimited supply of and access to clean water, while the poor remain on the periphery of the community, forced to live off polluted streams, unreliable water sources and inadequate living environments (M&G, 2014).

In formal urban areas, household toilets are typically private and found inside the house, while bulk waste-water reticulation and treatment of sewage is public (Tissington, 2011). In rural, peri-urban and informal areas, toilets are either communal (public) or private (in the case of dry toilet systems), with some kind of on-site system found outside the house (Tissington, 2011).

In the post-Apartheid landscape, the provision of water and sanitation services has been delegated to various water service authorities (WSAs), which have become the responsibility of local municipalities (Sutherland & Lewis, 2012). Each WSA is given the responsibility to produce a plan for the efficient, affordable and sustainable provision of water and sanitation in a specific area (EWS, 2011). However, water and sanitation services face significant challenges with regard to service provision, as is the case with housing and electricity (Sutherland & Lewis, 2012). With limited funding from national government, and the country's impending water-shortage crisis, demand for adequate water and sanitation services is ever-increasing (Sutherland & Lewis, 2012).

3.5. Various Acceptable Sanitation Technologies

Many people worldwide rely on the use of a free or pay-for-usage *communal or shared toilet facility* on a daily basis. A public toilet facility that is accessible to the general public (depending on its surrounding context) carries with it no form of discrimination but rather functions to provide people with convenience, privacy and dignity. But in order to provide a public sanitation facility that functions optimally,

the facility requires access to water, to facilitate basic practices of personal hygiene. A public sanitation facility also requires a dedicated staff member to monitor and control the basic maintenance of the ablution facilities and to restock supplies such as toilet paper, soap and clean water at all times. A caretaker must be on duty to keep the premises in good order, prevent vandalism and prevent the facility from becoming a health hazard. In absence of such maintenance, public sanitation facilities can easily become a breeding ground for the spread of diseases like diarrhoea and cholera. Public toilets fall into two degrees of public-ness: (a) a public sanitation facility or (b) a communal or shared sanitation facility.

- (a) A public toilet facility is usually found in *public spaces* where people congregate. A public sanitation facility is used by a range of people in large or small groups at varied times who do not necessarily reside within close proximity to the sanitation facility. These users are hence regarded as visitors, travellers, or as people that are merely passing by. Therefore a public sanitation facility services the needs of people frequenting public areas such as shopping centres, bus terminals, parking lots, airports, train stations, parks and markets, amongst others public spaces (Drewko, 2006:11). Moreover, it is customary for public sanitation facilities to cater for appropriate gender-separate conveniences, with male and female having different toilet functions. The public facility may offer convenient facilities for women such as breast-feeding stations, nappy-changing stations, change rooms, waiting rooms, security supervisions, caretakers, courtyards, and so forth. Although certain people may not be inclined to frequent public toilets, the option for them to do so still exists. When people spend large amounts of time away from their homes, they will eventually make use of a public toilet facility (Drewko, 2006:11).
- (b) Alternatively, a *public toilet* can also be defined as a sanitation service that is a *communal or shared toilet block*. These toilets are located in overcrowded residential and sub-urban areas, where residents do not have the privileges of a private toilet facility. The public *communal or shared toilet block* is accessed by a diverse range of residents from a local settlement. Communal toilets are normally built in densely populated slums or informal per-urban and rural areas where space is limited, infrastructure has low coverage, and people do not have sufficient finances to build individual toilets. Therefore, community

toilets in such areas act as household toilets that are designated to more than one household. Communal public sanitation facilities can also sometimes be utilised by users living outside the specified region (Drewko, 2006:11).

When decisions about public sanitation and water facilities are made, public participation by the people who will use them is most important, to ensure that all prerequisites are met for improving health and welfare. In order for such a facility to operate over a period of time, and in good working order, maintenance and care-taking must be considered in the early stages of planning and building. In most cases, the responsibility falls on women or, in certain cultures, on the lowest cast in the society. The various sanitation options available in South Africa are described below, to give the reader an understanding of the toilet technologies adopted in rural and peri-urban areas.

Pit Latrine

The pit latrine (bucket latrine) is one of the most common dry toilet systems in sanitation technology. Excreta, along with anal-cleansing material, are deposited into a pit excavated in the ground. The pit can be dug to any depth but is restricted to a diameter of no greater than 1.5 metres, to prevent the pit from collapsing. Generally, a pit of 4.5 cubic metres can last up to 20 years before it reaches full capacity. The improved, ventilated single pit latrine is a cheap yet effective option and can be built on-site by the user (Susana.org). Single-pit latrines are appropriate for densely populated rural and peri-urban areas where water is scarce and there is a low ground water table. The single-pit latrine cannot be built in areas prone to flooding or in rocky terrains. The common problem associated with this technology is that of odours, insect breeding, low reduction in pathogen destruction and contamination of groundwater (Susana.org).

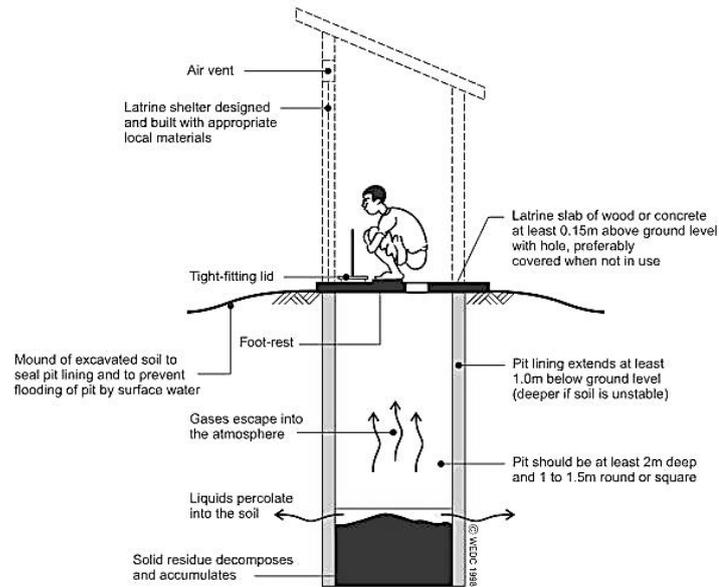


Figure 3.10: The ‘drop and store’, single pit latrine section (URL0006).

Ventilated Improved Pit Latrine (VIP)

The VIP system works on the same basic principle of the pit latrine, with a depth of at least 2.0 metres to 2.5 metres, and is suitable under conditions where the soil cannot become waterlogged. Limitations of this type of latrine are linked to odour and flies. This can be overcome by installing a vent pipe to the latrine (Pacey; 1980:46).

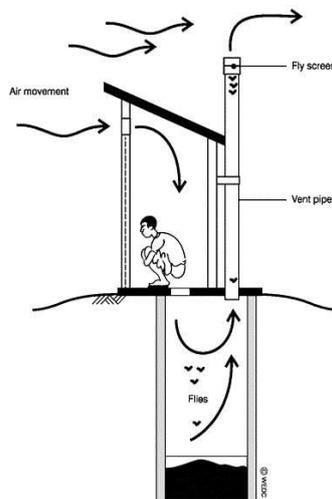


Figure 3.11: Typical VIP found in most rural and peri-urban areas (URL0007).

Urine Diversion Dry Toilet (UDDT)

The UDDT toilet technology is based on the simple principle of separating urine and faeces before they mix. The UDDT toilet system consists of two compartments; one compartment carries excrement and stores the solid waste. It is critical to avoid

mixing human excreta to prevent pathogen build-up. The UDDT works best in places where people will recycle the waste as a fertilizer, and where the groundwater table is high or there is a risk of flooding.

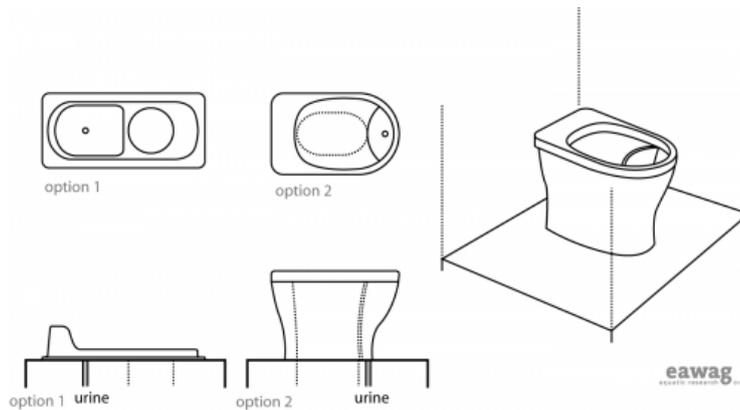


Figure 3.12: Typical Urine Diversion toilet bowl, with a compartment for separating urine and faeces (Susana.org).

Advantages

- Low water reliance
- No problem with flies and odours if well maintained
- Built locally on-site as per resources
- Suitable for all user types and various cultures
- Recycled excreta and urine can be used to make organic compost
- Suitable for installation in rocky areas and areas prone to flooding
- No risk of groundwater contamination

Disadvantages

- No pre-fabricated units are available
- Requires user training to construct and maintain
- Prone to misuse and mixing of waste
- Excreta build-up is visible
- Difficult for children to use
- Regular removal of waste from vault

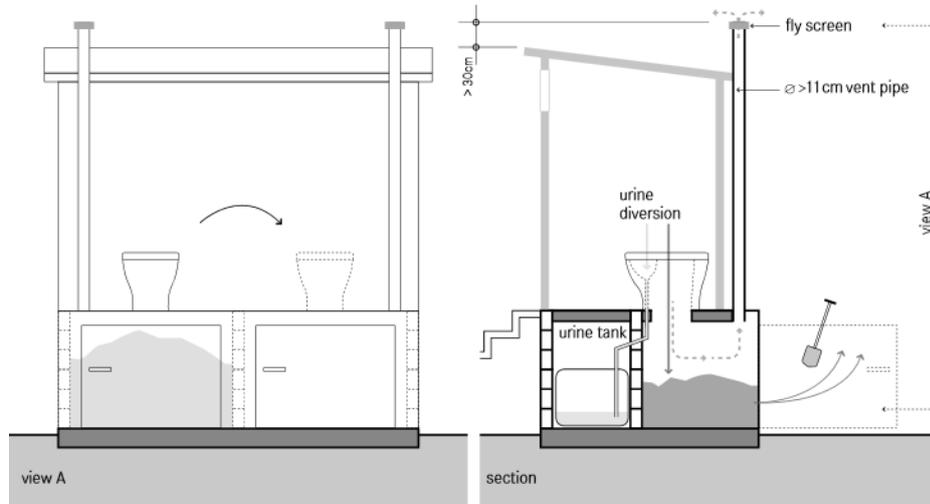


Figure 3.13: The UDDT dehydration vaults require good ventilation and must be watertight, to prevent external moisture from entering (sswm.org).

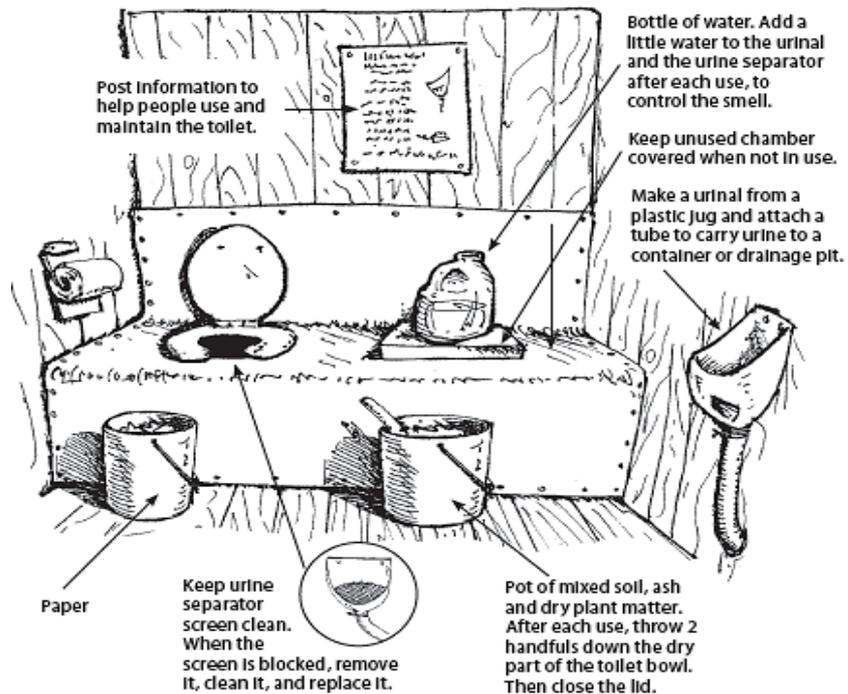


Figure 3.14: Use and maintenance of a two-chamber UD dry toilet (www.hersperian.org:132)

Community Ablution Block (CAB)

Community Ablution Blocks, or CABs, are an interim water and sanitation service initiated and developed by the Durban ET municipality to address the backlog of such facilities for citizens living in urban informal regions. Each established CAB facility consists of separate male and female toilets (WC), showers (SH) and wash-hand basins (WHB), as well as troughs for washing clothes. A paid caretaker is also employed by the ET municipality, and is responsible for the cleaning and maintenance of the facility (EWS: 2013). Settlements within the urban core of the district are connected to the ET municipal waterborne sewer line, while settlements on the periphery contend with VIP latrine systems that require no water to dispose of human waste (EWS: 2013). The CAB is connected to its own VIP pit and is emptied when required. The communal blocks were established by converting steel shipping containers into male and female ablution facilities. A number of communal blocks have been established in settlements that are not short-listed for housing development (www.iwawaterwiki.org). The facilities have the responsibility and duty of providing services on the basis of:

- Equity (easily accessible to the population)
- Affordability
- Environmental effectiveness (pollution prevention, health promotion, compliance with national and provincial legislation)
- Sustainability (limited cross-subsidy and maintained and accepted by communities) (SSA: 2010)

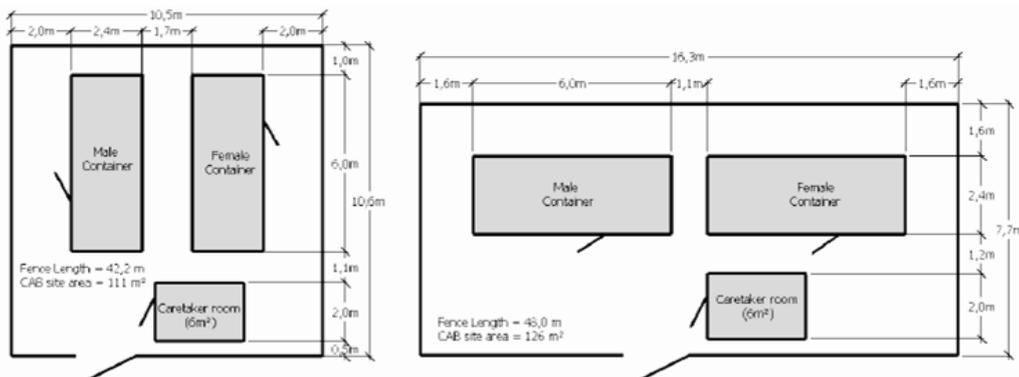


Figure 3.15: The typical proposed CAB site establishment found within the eThekweni municipal area (Pieter, 2014)

Although the CAB is connected to a waterborne sewer line, water going to the facility is supplied with a meter to control the consumption per person, which is estimated to be around 35 to 40 litres per day (SSA: 2010). The criteria for meeting and implementing a CAB are based on land acquisition, space consideration (> 250 sqm), gradient of ground (< 1.3), environmental considerations (groundwater). The site must also have a basic level of water supply (Gounden; 2008). The average cost to implement a CAB was 280 000 ZAR between 2009 and 2011. The container alone cost the EWS 65 000 ZAR, and the collective costs of transporting the container to the site, site preparation, sanitary fittings, and so forth, amounted to approximately 200 000 ZAR (SSA: 2010).

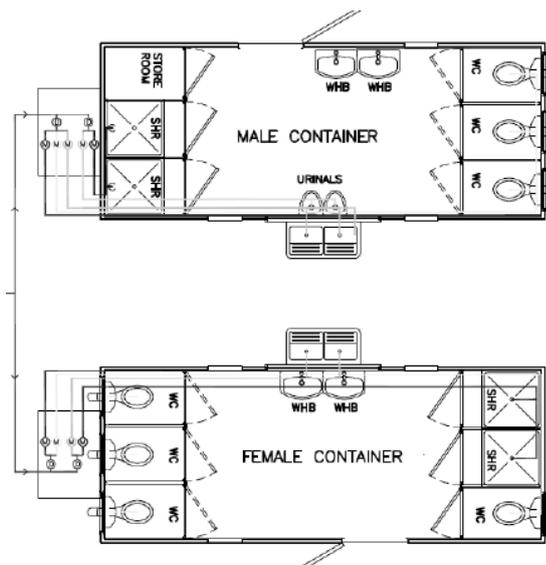


Figure 3.16: The typical CAB plan configuration for the male and female ablutions container (Pieter, 2014).

Bio Gas

The Biogas Digester refers to an on-site sanitation treatment technology that transforms food waste and decomposable material into a resource. Waste in the Biogas Digester is either transformed into biogas (an alternative energy source/gas for cooking) or the digested slurry can be used as organic manure in the garden. Biogas is a mix of methane, carbon dioxide and other gases that can be converted into renewable energy, generating electricity to supply heat or light (Susana.org). Biogas technology can be applied to all levels of the built environment, which includes the individual household, neighbourhood (shared) or city (public). The gas is formed in the tank and rises to the top of the chamber, mixing the slurry as it rises. The digestate—the material remaining after the anaerobic digestion of a biodegradable feedstock—in the tank is rich in the organics and nutrients necessary to fertilise the garden soil before planting, and reduces odours as pathogens are rendered inactive (Susana.org). Biogas systems are often used as an alternative to septic tanks. The reactor tank can be built out of brick or a prefab tank can be installed above or below ground, depending on soil conditions, space, resources and the volume of waste received. The reactor chamber is usually located close to where it will be used. The gas production time is a minimum of 15 days in hot climates and 25 days in moderate temperature. The reactor must be built to specification and be fitted with a gas outlet pipe to discharge gas. To start the reactor, it should be inoculated with cow dung or septic tank sludge. Organic waste should be shredded and mixed with water or digestate prior to feeding. Gas equipment needs maintenance to prevent leaks and/or corrosion. Depending on the design, the reactor should be emptied every 5 to 10 years (Susana.org)

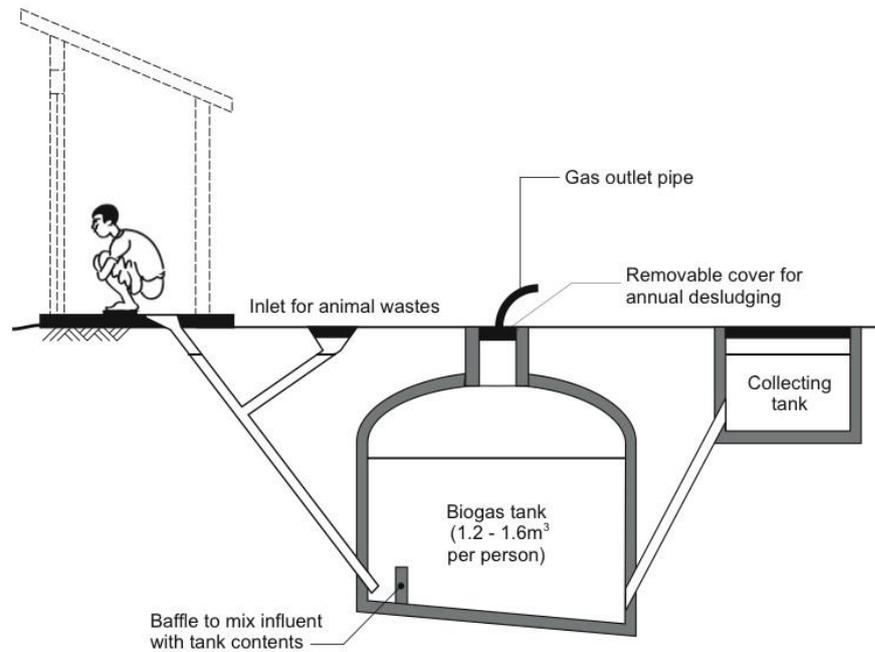


Figure 3.17: A typical section and configuration of the biogas chamber for human and animal waste (www.sswm.info).

Advantages

- Generates renewable energy
- Small land coverage required (underground)
- No electrical energy required
- Conservation of nutrients to replenish soil for planting
- Long service lifespan
- Low operating costs

Disadvantages and Limitations of Biogas

- Requires expert design or skilled workmanship to install and maintain
- Incomplete pathogen destruction might require further treatment
- Limited gas production in temperatures below 15° C
- Dangers associated with the flammable gases if mismanaged

3.7 Analysis and Discussion

In conclusion, safe and sustainable sanitation facilities are essential for ensuring the health and well-being of a person and/or community. Access to communal water and sanitation facilities in developing communities offers a platform for social engagement and upliftment. Such a platform can only be established if the community is included and empowered in design processes, through public participation and community engagement.

The literature suggests that the inclusion of women in the planning stages of the provision of communal water and sanitation can bring about a sense of dignity, recognition and acknowledgement. Appropriately designed communal water and sanitation facilities create a platform for the convergence of engineering infrastructure and architecture, disciplines that could manifest a new hybrid for appropriate access to communal sanitation and water. This new architectural hybrid can structure modern strategies of sanitation provision and creatively challenge the traditional method of designing and building community sanitation facilities. Further to that, the development of such a hybrid can creatively deal with sustainability and waste reduction in human habitats. Architectural spaces and the built forms surrounding communal water and sanitation have further opportunities to engage directly with their users and evolve within the context of the community they find themselves in.

Effective architecture and design of localised systems for resource and waste management can create a sustainable facility within its context. Communal facilities can be converted into independent facilities that function off the grid and are efficient at waste management: for example, using the bio-gas technology. Current provisions of communal sanitation and water facilities are critically inadequate, and can be significantly improved in terms of their social and perceptual efficiency. Implementing appropriate measures to boost visibility and hygiene strengthens communal sanitation facilities and makes them more useful as a community apparatus. Finally, the design strategy for communal facilities should adopt appropriate uses of materials from the local context, providing a sense of identity for the community and making the space recognisable as a public facility.

Chapter 4
CASE STUDY

Type of Project:

Urban upgrading with community-based water and sanitation

Project Period:

2010 by eThekweni Water & Sanitation Department

Number of Inhabitants serviced:

75 households within a 200m radius

Address of Project Location:

Inanda Africa (peri-urban settlement), Durban, South Africa

4.1 CASE STUDY: Community Ablution Block (CAB)



Figure 4.01: Exterior photograph of CAB (source: [Author](#))

Introduction

This case study focuses on the Community Ablution Block (CAB) located in the peri-urban township of Inanda (Fig 4.01), providing the relevant knowledge and information about the communal water and sanitation facilities of the area. This case study also provides the cultural, and visual data highlighted by the research surveyed in the literature review (Chapter 3). The users of the CAB facility are black isiZulu-speaking South Africans residing in either temporary or permanent shack structures, or informal housing (Fig 4.02). The income levels per household are generally low, with many members in the community being unemployed and locked into the cycle of poverty. Existing infrastructure in this township consists of roads, street lighting, and storm water drainage; however, waste management is poor and under-developed.



Figure 4.02: Google image of the Inanda Township indicating the site location of the community ablution block



Figure 4.03: the site in relation to its context (source: Author)

Justification of Case Study

The site was chosen as a case study first of all to inform the research about the current contextual and spatial setting of the CAB (Fig 4.03). The CAB is situated on the site selected in the final architectural design intervention. The CAB also ties in strongly with the social and environmental issues of sustainability discussed in Chapter 2, and reflects the processes of adaptation and evolution over the past five years of its establishment. Secondly, the case study is directly linked to the peri-urban context of service provision for water and sanitation. The CAB facility is designed around the modular constraint of a dry shipping container (6.0m × 2.4m) and along an active pedestrian path and road. The CAB forms part of the eThekweni municipality initiative to provide water and sanitation to the many unserved indigent households in its peri-urban and informal areas. The purpose of the CAB is to provide households within the eThekweni region with equitable access to the basic services of water and sanitation. The installation of the CAB also forms part of the eThekweni municipality's housing plan, which aims to eradicate informal housing over the next ten years by providing full-service formal housing. Therefore, the CAB is part of the municipality's temporary service provision, intended to provide dignity to residents in the informal settlement of Inanda, Durban.

Design Criteria

The necessary criteria for implementing a CAB facility depend upon land acquisition in informal settlements, and space considerations of the land (minimum 250 sqm), with the average slope of the ground not being less than 1:3. Environmental considerations such as ground water pollution and the basic level of water supply must also be considered (Susana.org).

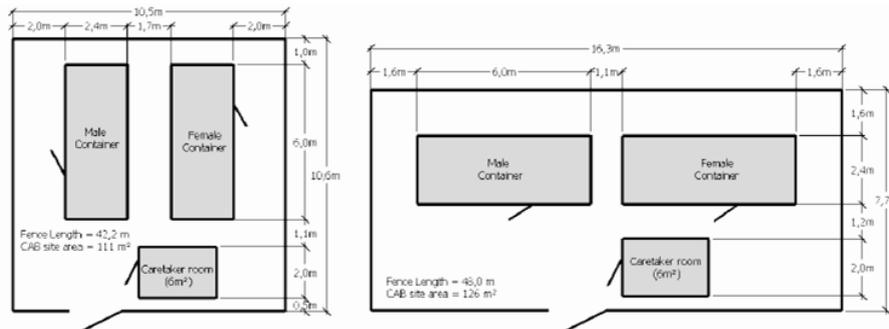


Figure 4.04: The typical proposed CAB site establishment found within the eThekweni municipal area (Pieter, 2014).

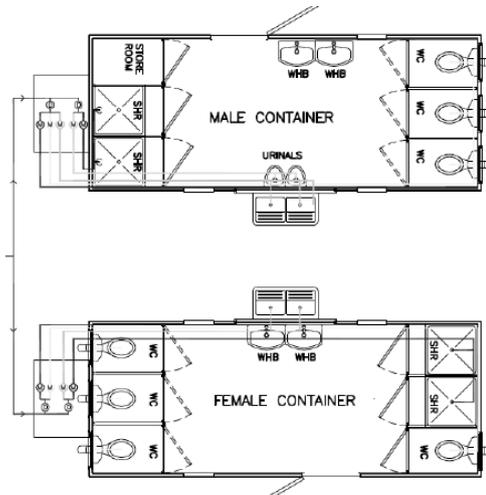


Figure 4.05: The typical CAB configuration for male and female containers (Pieter, 2014).

CABs are shared water and sanitation facilities in the form of pre-fabricated shipping containers (fig 4.04 & 4.05) modified to meet acceptable standards of ventilation and plumbing (Susana.org). CABs are provided in settlements that are densely populated and within close proximity to a sewer-line infrastructure. Each CAB is provided with two separate areas, one for males and the other for females. The male container is characterised by 3 male toilets, 2 urinals, 2 wash hand basins, and 2 showers. The female container has 4 toilets, 2 wash hand basins and 2 showers. Laundry facilities

are also provided in the CAB to service houses that are within a 150 to 200 metre radius of the block (Susana.org). Lighting provisions adhere to translucent roof sheeting and externally mounted floodlights. Water is reticulated to the CAB facility, and consumption of water per person per day (fig 4.06) is approximately 35-40 litres (Susana.org).

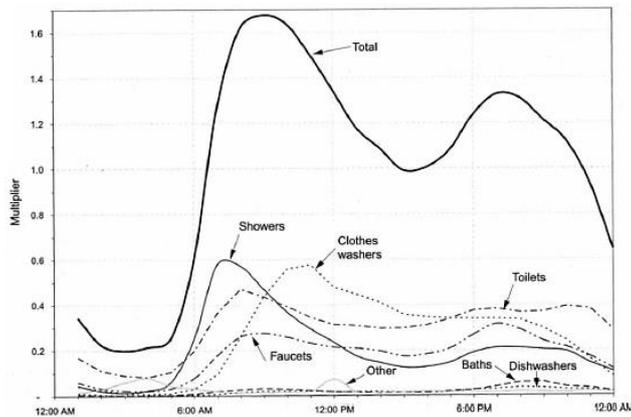


Figure 4.06: Average daily water usage at CAB (Pieter, 2014).

The installation of the CAB is designed to create opportunities for employment. A caretaker is employed and trained with respect to the technical, environmental, hygienic and managerial aspects of the facility. The caretaker is responsible for addressing all activities related to the facility, including leakages, blockages, and the supply of cleaning materials. The more prominent employment component of the CAB, however, is the allocation of construction jobs to members of the local community, while the CAB is being built. The overall cost to implement a CAB (2009-2011) is 280 000 ZAR. The container alone costs 65 000 ZAR and the collective costs of transporting the container to the site, site preparation, sanitary fittings, and so forth, are approximately 200 000 ZAR (SSA: 2010). The fabricated facility has the responsibility and duty to provide services on the basis of:

- Equity (easily accessible to the population);
- Affordability;
- Environmental effectiveness (pollution prevention, health promotion, compliant with national and provincial legislation); and
- Sustainability (limited cross-subsidy and maintenance and acceptance by community). (SSA: 2010)

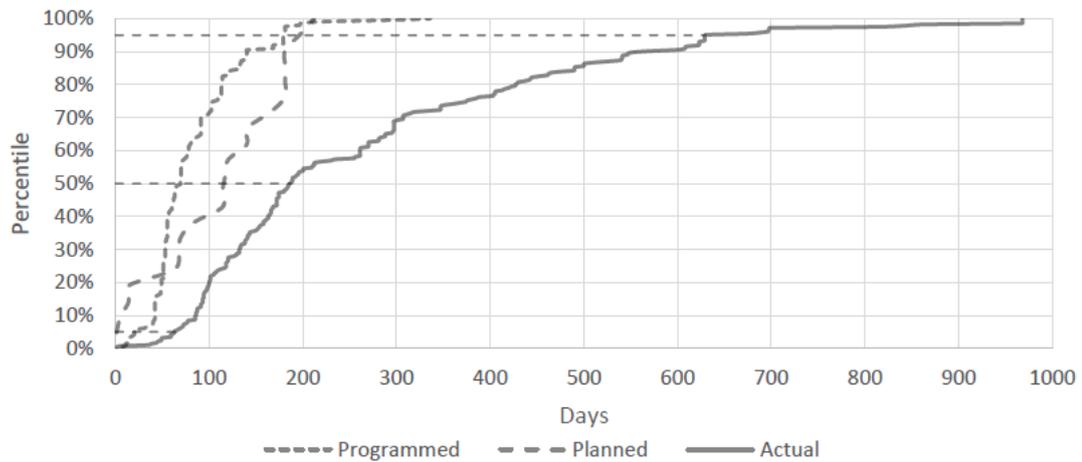


Figure 4.07: planning and construction timeline for a CAB (Crous, 2014:129)

Sustainability of the CAB

The sustainability criteria for the CAB adhere to the issues of health and hygiene, as well as environmental, technological, operational, financial and economic issues, and socio-cultural and institutional responsibilities (fig 4.07). These issues of sustainability were outlined in Chapter 2, under Theories and Concepts.

Health and hygiene involve a reduction in the risk of exposure to pathogens and any other hazardous substances that might impair the well-being of people in rural settlements. Adequate health and hygiene can be achieved through the application of an appropriate sanitation system such as the CAB (Susana.org). Appropriate sanitation can help mitigate the escalating problem of HIV infection in informal settlements by providing the hygiene services necessary for people suffering with HIV/AIDS.

Environmental sustainability of the CAB as a sanitation system depends on the resources needed for the installation of the CAB. These resources allow for the appropriate disposal of waste. The technology and operation of the CAB relate to the functionality and ease of constructing, operating and monitoring the entire system, as well as its robustness and adaptability to existing systems within the settlement (Susana.org).

Economic sustainability is achieved by the fact that each household in the community is capable of covering the cost of sanitation and receiving its benefits. As mentioned, the construction and assembly of the CAB generates new job opportunities for people

in the community, alleviating the high unemployment rate in the area (Susana.org). Additionally, these projects can stimulate the development of local entrepreneurship if construction work is sub-contracted to small local businesses (Susana.org). The social sustainability of the CAB is achieved through the social appropriateness of the CAB system and correct treatment of gender issues (Susana.org). Moreover the introduction of adequate water and sanitation services infuses a sense of dignity into the local community and allows for people's privacy and security, especially women's (Susana.org).

Common Problems Associated With the CAB



Figure 4.08: (Top Left): the waste water pipes are external and easy to vandalise
 (Top right): broken rodding eye
 (Bottom left): discharge pipe with faeces in it
 (Bottom right): grey water is discharging directly into the environment
 (Crous, 2014:180)



Figure 4.09: The container requires external maintenance and re-paints every 22 months
 (Crous, 2014:168)



Figure 4.10: Taps are cheap and weak, often the plastic taps get broken or change direction when turned by the user. Leaking taps often flood the floor (Crous, 2014:171)



Figure 4.11: toilets are cheap and often break, leak or have blockages (Crous, 2014: 168)



Figure 4.12: Wastewater is not reticulated and discharges into the surrounding environment, which becomes breeding ground for insects (Crous, 2014: 177)



Figure 4.13: (top left) The laundry facilities are poorly managed and limited for the amount of users – (top right) the laundry stations are also used for water collection – (bottom left) laundry is left to soak with water and soap – (bottom right) the taps are locked at certain times by the caretaker to ensure unauthorised people don't use the facility (Crous, 2014:176)



Figure 4.14: Vandalism of the CAB with broken windows (Crous, 2014:162)



Figure 4.15: (top left) the consequence of blockages result in the facility being unbearable to use, not only exposing people to human faeces but also the environment posing a serious health risk (Crous, 2014:176)



Figure 4.16: (top) broken door and locks – invasion of privacy (Crous, 2014:162)

4.2 FEEDBACK FROM INTERVIEWS

4.2.1 Secondary research semi-structured Interview questionnaire and feedback

The case study, as analyzed above introduced the site and the context of the site. This section however, involves the direct feedback from women in the neighbourhood. The interviews were conducted at the ‘Sizimisele Centre’, children day-care center (fig 4.17). The ‘Sizimisele Development Trust’, is a crèche, health care support facility, and a place where people from the community, particularly women, engage in arts and crafts such as beadwork, crocheting, agriculture etc. (enanda.co.za).

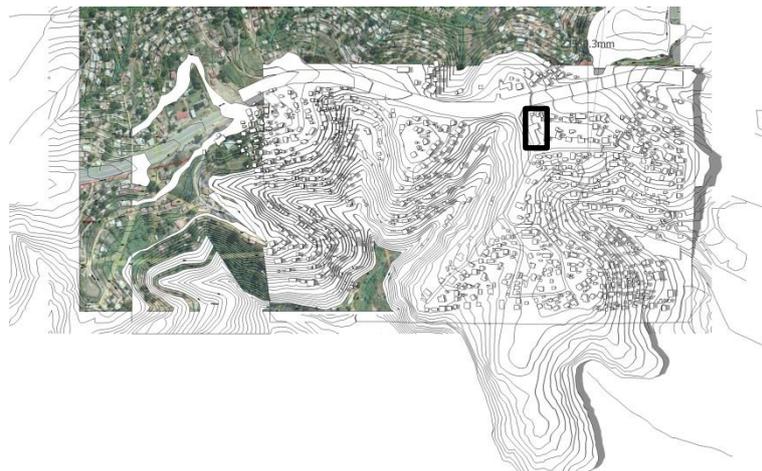


Figure 4.17: The ‘Sizimisele Development Trust’ located in Inanda Africa 1985 (ward55).

The day-care facility was used as a primary catchment area to conduct interviews with women who often visited the facility to fetch their children. The correct times for mothers to visit Sizimisele was between morning 8:00am and evenings, 1:00pm to 3:00pm. Permission

was granted by the founder of the facility, Mrs Maggie Dhadhla the 1980's. Maggie was kind enough to organize samples from the surrounding neighborhood and communities to conduct sit down questionnaire interviews with them at the facility itself. A language translator was also provided. Fifteen interviews were conducted with samples, ranging from 23 – 45year of age. In the questionnaire (see Appendix A) participants were asked to comment on the issues surrounding their experiences on communal water and sanitation. Health and safety were the key components in the questionnaire. The following is an assessment of the answers recorded. To establish a basic foundation for context, participants were asked open ended questions such as, where they reside, and their experiences in using communal facilities. Off the six participants, the range covered is illustrated in (fig 4.18).

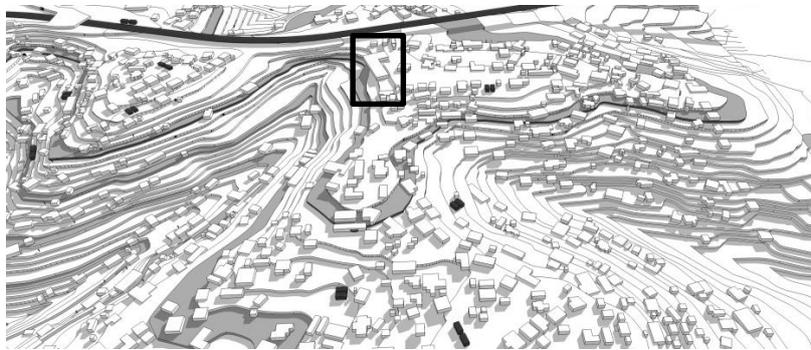


Figure 4.18: Sketchup illustrations of Inanda Africa ward 44 and ward 55 indicating the position of the communal facilities. (Author)

The most common response from all interviews where linked to safety and access to the community toilet facility at different times, mostly during the night and early morning. The overall rate of satisfied users was less than forty percent of all the women interviewed. The overall response was that they aspire to using household access to water and sanitation. Yet most of the participants were happy about the fact that they had access to waterborne sewerage, a toilet and piped water. However their overall disappointment was linked to privacy and location of the communal facilities. Privacy and location was closely associated to social taboos in the community, lighting of facility and route to communal facility and hygiene. Of the fifteen participants, five women still utilized the VIP latrine and the remainder had access to waterborne sewer.

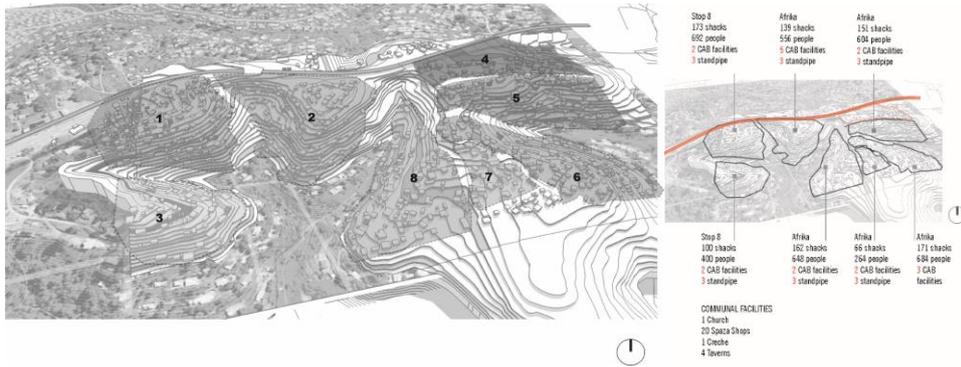


Figure 4.19

1. 0 participants
2. 2 participants
3. 0
4. 3 participants
5. 4 participants
6. 2 participants
7. 3 participants
8. 1 participant



Figure 4.20:

The cluster of households around the communal water and sanitation facilities represented in grey (Author)

With response to the context and user experience of the communal facilities, water drainage from the stand pipe seemed to have caused poor working environments for the women doing laundry. Some cases were associated to flooding the yards of households close to the standpipe. When the question on the position of communal facilities being situated along isolated of busy routes, all participants responded that the paths were active and busy during different times of the day. Through identifying the number of participants within each area and identifying all the facilities, the communal facility selected is shown in (fig 4.19 & 4.24). The criteria was based upon the urban principles of the street and pathway (chapter 2). Furthermore, the participants in the interview were mostly concentrated around this region.

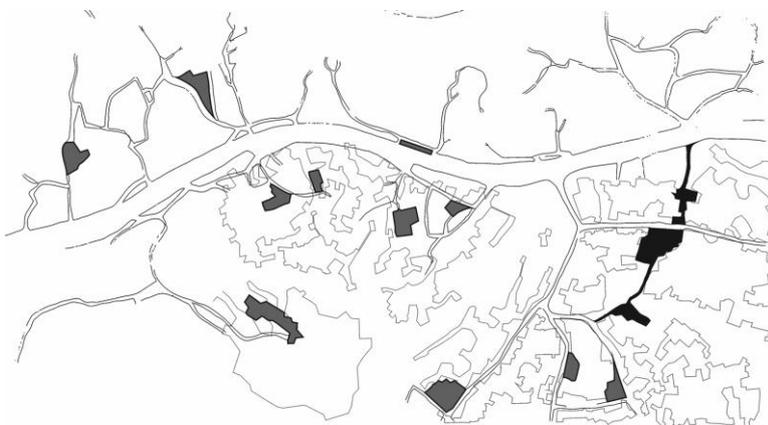


Figure 4.21:

From the interview participants, the highest population count and connection between each communal facility was the strongest (Author)

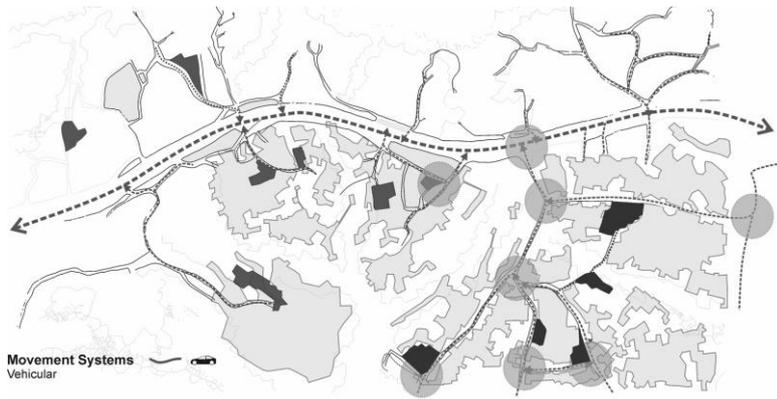


Figure 4.22: Hierarchy of communal facilities from the Highway and into the settlement (Author)

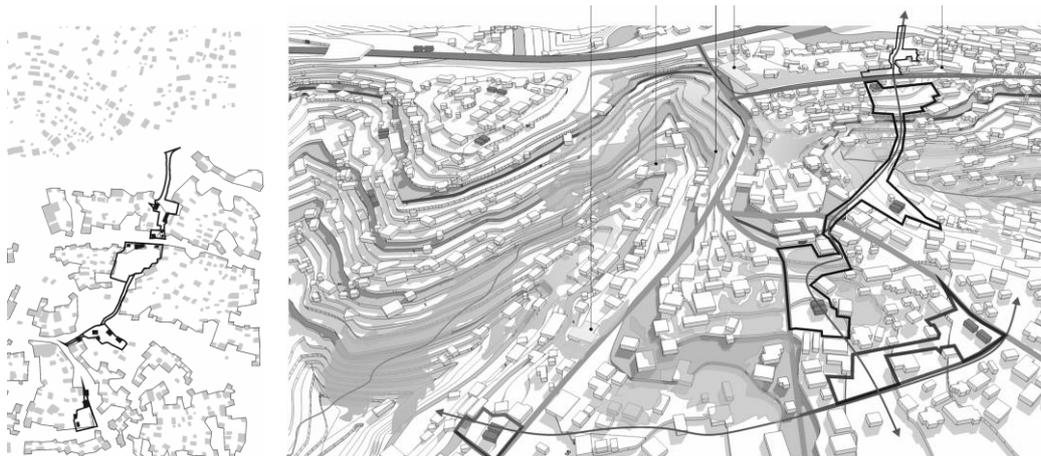


Figure 4.23: exploration of movement within the settlement with regards to context, safety and allocation of communal facilities (Author)

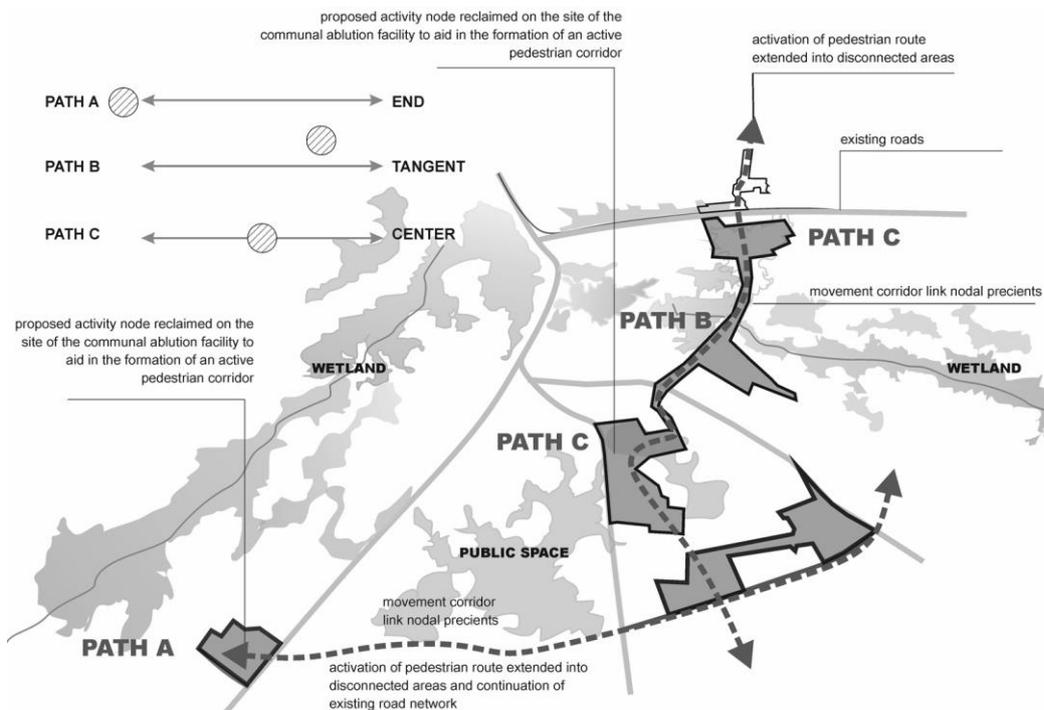


Figure 4.24: Urban analysis of possible nodal linkages (Author)

4.3 Analysis and Discussion

The implementation of the CAB emerged out of the necessity for water and sanitation for the rural population of Durban. Although the CAB has been adopted to address the main criteria for public health and hygiene, in practice it offers little in terms of social, environmental and economic sustainability. Although there have been campaigns for creating awareness in the community about the benefits of health and hygiene, no control to sustain the initiative is in place. The CAB facility is connected to waterborne sewerage and therefore uses clean drinking water, exacerbating future water shortages in South Africa. The CAB does not engage with the community in terms of its spatial configuration. Water used for laundry, shower and wash hand basins is not reticulated appropriately, causing water ponds around the vicinity of the facility. During rainy weather, the facility becomes inaccessible due to the lack of roof cover. The facility is also not insulated in the interior, resulting in it being unbearable to use during the hot and humid seasons. Overall, the CAB facility alone does not systematically eradicate or deal with problems in the community related to safety, operation times, vandalism, vagrants loitering around the area; a more bottom-up approach is required to address these aspects.

Users of the CAB used newspaper as cleaning materials, which caused blockages to the system; the municipality then provided toilet paper free of charge, and this was distributed by the caretaker. In cases where crime and anti-social behaviour occurred at night—making it difficult for women and children to use the facility at such times—the provision of lights and fences as well as the constant presence of the caretaker provided a somewhat safer environment. Copper pipes and taps, which were subject to theft, were replaced with plastic pipes and taps (Susana.org). With regard to the materials used and the design of the CAB, the dry shipping container was deemed most appropriate because of its robust, weather tight and modular structure, which can be easily adopted to suit a variety of functions. The CAB is adapted with window frames, partitioning and doors, together with sanitary fittings.

Although the CAB facility has been adopted from a modular container, the life cycle and reuse of the structure are not able to accommodate growth and/or changes in the community or its environment. Reuse options would be economically viable for the community, as compared to the costs generated by traditional centralised conventional

waste-water treatment plants. The potential of the CAB is notable: it could be used as a platform for community-based activities for women and children who live in makeshift shacks, where children in most cases do not have space to study. Micro-finance-scheme systems could evolve from the CAB, with the construction of shops and kiosks adjacent to the CABs, which would encourage social gatherings at the facility. The daily activities of women are not incorporated into the planning and implementation stages. Supporting facilities, such as a kiosk, hair salon, Internet café, community hall, could transform the CAB facility into a more socially acceptable infrastructure than the current stand-alone facility is able to be.

4.4 Future Recommendations

The study found that the provision of communal water and sanitation facilities (CAB) in Inanda focused mainly on technical factors during the design and implementation stages and not on the social needs of its users, in terms of context and culture. Defining the day-to-day factors and experiences of the users would determine the necessary functions and relationships between the community and this communal ablution facility.

Socially, the CAB failed to satisfy the current patterns of use and needs in terms of the aesthetic quality of the environment, and its performance, efficiency, safety, health and adaptability. In terms of functionality, the provision of communal water and sanitation should involve participation from the community it intends to service. If the users' needs are not met, then the product remains poor and sterile. Furthermore, supportive functions should be developed to accompany the functioning of the CAB, in order for the community to develop a sense of place.

The technical development of the CAB should be directed towards the environment—both natural and built. Architectural solutions and design technology should incorporate an understanding of the lifecycle, cost, quality, and ecological competence of the design. Sensitivity towards natural resources, environmental health, recycling of waste and the economic considerations of micro-businesses would help address the broader needs of the settlement. The CAB should also attempt to network with neighbouring CAB facilities, thereby strengthening urban patterns within the settlement itself.

Chapter 5

**INTERNATIONAL AND
LOCAL PRECEDENT STUDIES**

5.1 Introduction

This chapter intends to explore communal public toilet and water facilities, which have been designed and developed by architects in other parts of the developing world within a similar context of the peri urban as well as within the South African context. The precedent studies illustrate the value architecture can bring too providing sanitation services with regard to the conservation of resources, location of facilities, materials, disposal or management of waste, privacy, social sustainability, urban planning, engineering challenges and quality-cost, amongst other important considerations. The key aspect of focuses around the discussion of community building and communal water and sanitation as social assets.

Four precedents are discussed based on the following key areas gleaned from the literature and theories to outline the social significance of water and sanitation and the process of community building. The first study encompasses a community public toilet facility in Pune, India. The second facility is a community water and sanitation facility in the slums of Mumbai, India. The third study is based on the sanitation and water facility for a rural school in the Son Lap commune in Cao Bang Vietnam. The forth precedent study is set within the local south African Context by Joe Noero architects titled 'Productive Infrastructure'. All the precedents form part of the discussion on how architects, through the engagement with communities define the process for design both spatially, climatically, and programmatically.

5.2 Precedent Study 01

Project Description - Delwara Community Toilets

Location - Delwara, Rajasthan, India
Architect - Vir. Mueller Architects (New Delhi)
Year - 2010
Area - 55.742 sq
Source - (www.archdaily.com)

Justification of Study and Introduction

The Delwara community toilets, were chosen as a precedent study because of its basic sanitation infrastructure and sewerage disposal within available technology in a peri-urban setting situated in India. The approach the architects adopted for these communal toilets was strongly linked to social factors of sustainability. In addition to this, the facilities were to function as a prototype that could model itself elsewhere in the village of Delwara. The design rationale for the facility, attempts to address the idea of 'space for community' as opposed to purely providing sanitation services. In doing so, the design facilitates spaces for laundry/washing stations, recycling stations, rainwater harvesting, an orchid, planter beds and turning waste into fertilizer. The community facility also consists of a shaded central orchid which function to accommodate gatherings for members of the Delwara community.

Background, Climatic & Cultural setting

Delwara is a small peri-urban settlement in the state of Rajasthan, India. Rajasthan has a hot dry climate making water a valuable resource to the people of Delwara. The villagers in Delwara work on small agricultural plots adjacent to their homes and very few villagers have access to suitable sanitation within their residence. It is therefore imperative that basic sanitation infrastructure and such as plumbing and waste disposal is developed to address the community and their social needs. With water scarcity being prevalent and high levels of ground water contamination, dry composite toilets were selected as an appropriate model for the project.

Sanitation in India is a major crisis, especially with the population count of 1.28 billion citizens recorded in 2015 and which continues to grow rapidly. This figure places India as the second most populous nation in the world, whilst China is still known to have the highest population. With such a high density, providing adequate

services for sanitation and access to water, result with challenges. More than 72% of the population live in slums and resort to open defecation as a result of the shortage of basic services. Coupled with the unavailability of toilets, are issues that are related to the health and safety of women. Women are often raped and murdered in instances by which they have to relieve themselves in dark places during the night.

Architects Proposal – Motivation & Design Intentions

Vir Mueller architects appointed by the National Foundation of India, was commissioned to develop a model for public sanitation in Delwara. The primary agenda for the model was to create a prototype that could be distributed within the area of Delwara, in aid of assisting families in the village that severely lacked sanitation facilities. The Architects adopted a bottom up approach, through engagement with the citizens of Delwara village. The notion of communicating with the villagers was to design an appropriate model that will meet their needs. Through the engagement process of the architects and community members the site for the public toilet facility was selected spatially by the members of the Delwara community to ensure the facility would be used at all times through the year.

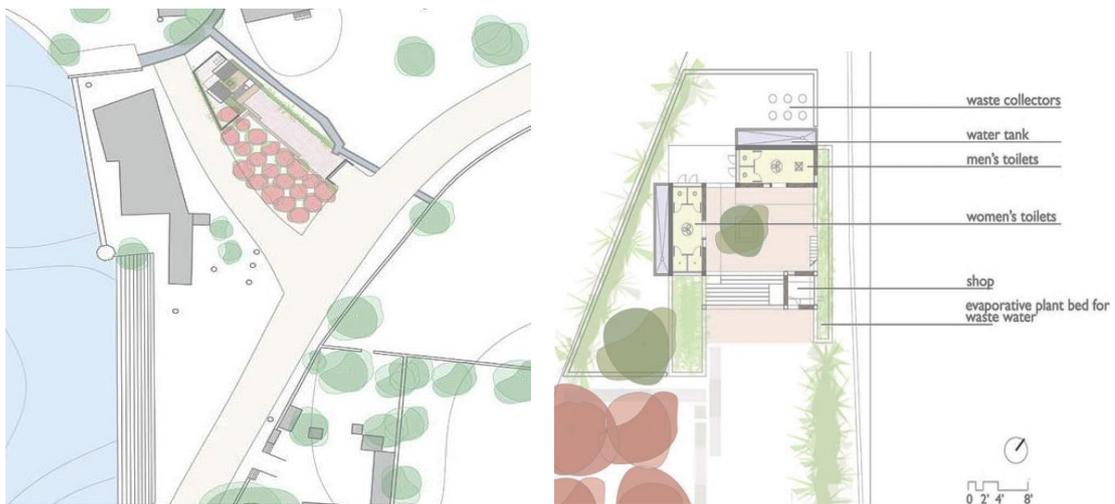


Figure: 5.01: Architectural Site development plan (www.archdaily.com)

Figure: 5.02: Architects Ground floor plan (www.archdaily.com)



Figure: 5.03: Delwara, male toilet facility (www.archdaily.com)

Figure: 5.04: Delwara, female toilet facility (www.archdaily.com)



Figure 5.05: Community Toilets Facility (www.archdaily.com)

Figure 5.06: Orchid Courtyard surrounding the toilet facilities (www.archdaily.com)

Social Sustainability

Within a social context, the community members suffered from a lack of space for the community to gather and there was need for a community platform in the village. Primarily for the community to hold discussions, meetings or just socialize with each other. The architect worked spatially and programmatically with the community and with regard to the decision making process. This ensured that the location of the toilet block would be situated on a site within close proximity and on route to the main bus stop in Delwara. This ensured that steady use of the facility would be achieved and require facilities that ensure safety, cleanliness and a place for laundry/washing.

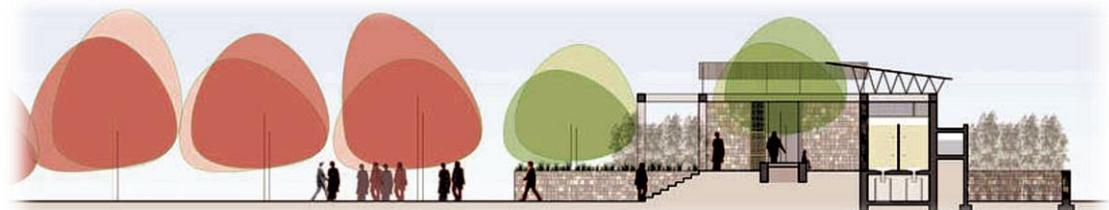


Figure: 5.07: Section through the sanitation facility (www.archdaily.com)

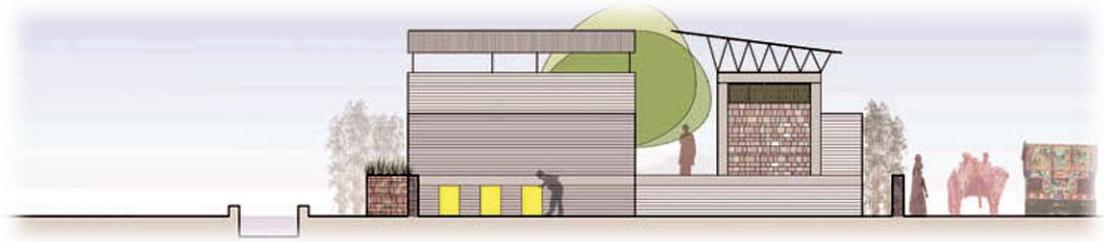


Figure: 5.08: Delwara public toilet South East elevation (www.archdaily.com)

Sustainable technologies

Sustainable technologies for harvesting rainwater, natural and recycled materials were adopted in the construction process of the facility, grey water recycling for irrigation of planter beds and turning waste in compost for fertilizer was conceived for the facility. The development for the proposal of public sanitation should be built locally, emits little to no waste, and most importantly prevent ground water contamination from the existing septic tank in the village. Dry composting toilet technology was used that where self-contained, in the sense that all urine and wastewater was collected into evaporative planter beds. Solid waste was collected in bins and rainwater runoff is collected in cisterns and fed into basins and in the toilets. Sustainability is further achieved through the choice of using recycled materials. Sustainable technologies is also achieved through the system of water harvesting, passive cooling and the process of recycling of waste into a renewable resource.

Harvesting Mechanisms

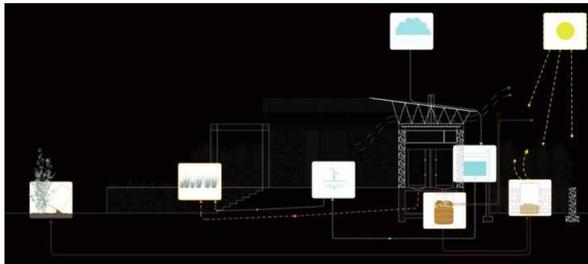


Figure: 5.09: Sustainable harvesting mechanisms of the toilet facility (www.archdaily.com)



Figure: 5.10: Material selection of the toilet facility (www.archdaily.com)

Summation

The architects approached the design of the public toilet facility in Delwara, primarily is a response to the user (community) and their aspirations. Commissioned with the

task to design a prototype-typology that could be built and expand regionally, yet be built locally constructed and emit no waste while preventing ground water contamination. The Delwara community toilet facility is consistent on the social and technological aspects of sustainability. The architects acknowledged that the nature of such a facility would require, at all times to be clean and offer safety to its users especially to women in the community who would be using the facility at night. Their approach was simple as it responded directly to the community's social aspirations and the technological aspects responded to the climate of Delwara. The Delwara community toilet facility was developed within the parameters of providing water and sanitation as a social and environmental asset to the Delwara region.

Key Point for establishing a community platform:

- Using recycled material for construction (Bamboo – trusses; beaten oil cans-roof covering; stone for walls and carved stone basins made by the villagers)
- Orchard or court-yard (for community gatherings)
- Within close proximity to public transport facility
- Communicating with the community for what requirements are necessary (wash station for laundry)
- Harvesting natural resources such as water and emitting no waste
- Planting and agriculture

Firstly, the use of green technologies was adopted, considering the function of the building is a public facility in nature. Therefore by reducing unnecessary expenses, and while meeting the needs of the users is imperative. The systems developed on for harvesting resources such as water and recycling waste responded to the region. Rain water, harvested by the roofs, made out of beaten oil cans and laid to rest on bamboo trusses fed, irrigated the bamboo fodder grass. The idea behind meeting the needs of its users was about creating a space for the community and a platform for social integration of the community. An example of which is the Orchard courtyard which allows for women in the village to congregate when washing clothes or collecting water for households. Strategically positioned close to a public stop ensured steady use of the facility and at the same time, making provisions for an orchard that serves as a gathering space for the village meetings.

5.3 PRECEDENT STUDY 02

Project Description - Community Toilets Block for SPARC

Location - Mumbai, India

Project Area - 140.0 - 150.0m²

Architect - RMA Architects

Source - (www.rmaarchitects.com)

This study will be carried out through published academic research and literature resources found on the internet and its resources, the library and its resources. The study is based on the publication by RMA architects (2012).



Figure: 5.11: Community terrace (www.rmaarchitects.com)

Figure: 5.12: Community terrace (www.rmaarchitects.com)

Introduction

This case study entails the project for a community toilet block in the slums of Mumbai, India (fig 5.11, 12). An open invitation challenge to deal with the challenges of public toilet facilities, SPARC (The Society for the Promotion of Area Resource Centers) is an NGO working with slum rehabilitation. SPARC has been commissioned by the Indian government to construct 300 public toilets in Mumbai. However, the toilets built are by engineers addressing only the technical aspects without any architectural design input.

The concept for the public toilets facility is based upon the ideas surrounding efficiency, universal access, dignity, gender, safety and a sense of community. This case study therefore leans toward the exploration of creating a social place for the slum community in India. The space, which is to be utilized by women and children, function during the day and night for discussions, teaching and learning, since cannot achieve in their overcrowded dwellings found in the slums (www.rmaarchitects.com).

Relevant to the issues mentioned in the literature review, the case study attempts to address the architectural design responsiveness for community based sanitation facilities. These are considerations within the social spheres of sustainability and adopted in the design principles by RMA architects.

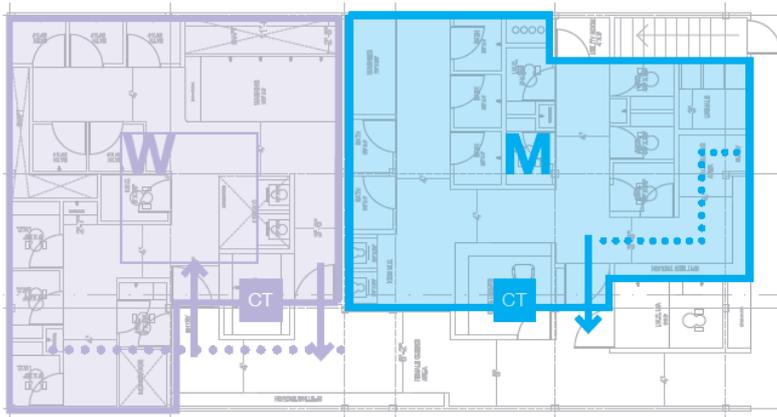


Figure 5.13: Typical spatial layout of toilet and shower facility for men and women maintaining the same dimensions 9x14m. The facility also contains a universal toilet (shower & toilet) as well as a children's toilets and shower. (www.rmaarchitects.com)

Justification

The SPARC community toilets (fig 5.13), was chosen as a case study because of the manner in which architectural design strategies for sanitation when implemented to inform appropriate spaces for communities living in poor slum communities.

Methods to boost hygiene, safety and visibility, strengthens the impact of the toilet facility as a community apparatus, both socially and perceptively through the choice of materials, and developing a space for the community above the toilet facility that can be used as gathering spaces. Considering the lack of space in the slum regions, children and women suffer from a lack of adequate space to educate one another or for kids to play and learn considering there isn't enough space in the homes or poor lighting for them to do their homework/study. In addition the caretaker of the facility is placed above the toilet to ensure the toilet is kept clean at all times and people don't steal the light bulbs or vandalize the facility. Also the caretaker of the facility whom is known to have the lowest cast in India, now gets a place to live. Through these interventions the toilet facility is transformed from a place of filth to a place of pride. The facility is designed to be an independent, of the grid system for electricity. And most importantly, the uses of materials used in previous toilet blocks were used to adopt a sense of identity for the community making it recognizable as a public facility.

Architects Proposal – Motivation & Design Intentions

Client

SPARC, an NGO organization working with slum rehabilitation housing in Mumbai, was asked to build 300 toilets in the slums. Commissioned by the Indian government, the organization (SPARC) identified that most the toilet facilities were built by engineers with no architectural design input. RMA architects was consulted and in working with the existing government specifications, reconfigured the spatial layout architecturally to maximize on the issues of efficiency of the toilets, and respond to the questions of gender, safety and sense of community.

Architects Design Concept

RMA architects within the constraints of the existing toilet block budget, developed a design for a 10 seated toilet block within the same footprint of the government toilet facility of 140-150sqm (fig 5.13). The design philosophy used was to transform ‘place filth’ into ‘a place of pride’. This was achieved through design principles of “natural light and ventilation, openness, day and night access; engendering improved sanitation behaviour, peer regulated and incentivized behaviour, effective management, materials selected for suite cost, time, quality and durability”. The toilet utility comprising of, 10 toilets (5male + 5 female), 10 bathrooms (5male + 5 female), 1 universal access (toilet + bathroom), kid’s toilet, laundry station/washing area, shop, *sarvajal* (clean drinking water stall), caretaker living quarters & community terrace. (RMA, 2012: 02). Due to the variation of site conditions, the plans were designed to be adaptable for reconfiguration. Access into the facility would be challenged depending on whether or not it free standing or adjoining an existing buildings and hence, the following considerations:

Entry and privacy: which were clearly zoned for men and women and strategically positioned to control sightlines?

Circulation and queuing: clearly defined circulation spaces within the toilets for men and women but at the same time using these spaces to be informative to the user,

and **Caretaker and control:** to actively maintain and act as a social observer over the facility (RMA, 2012: 02).

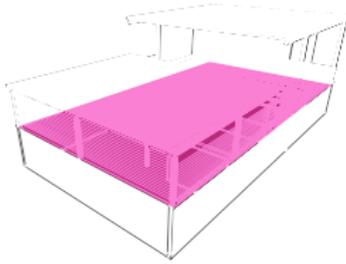


Figure: 5.14: Community Terrace (RMA; 2012: 07)

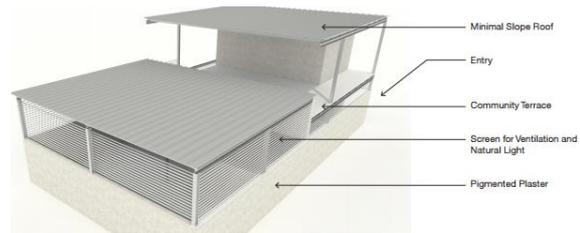


Figure: 5.15: Massing Model (RMA; 2012: 07)

Social significance

Through the application of the above mentioned design principles and design considerations, the toilet block hinges on the communities social life (fig 5.14,5.15).

With the community terrace situated adjacent to the caretakers unit an array of functions such as adult education (day or night), community meetings, day care facility or function as a childrens class room (RMA; 2012: 06).

The community terrace therefore plays a vital role for activities in the community. RMA architects adopted the terrace as an integral part of the design. With various alternative site conditions, the community terrace remained while other components of the building were adjusted. The social life of the toilet is the community centre (terrace).

The spatial configuration of the toilet facility is open on the ground floor with facilities that allow people to interact. The shop, care-taker and courtyard are functions that allow people to engage visually, creating a shared experience.

Sketch Design

Alternate A

Alternate B

Alternate C

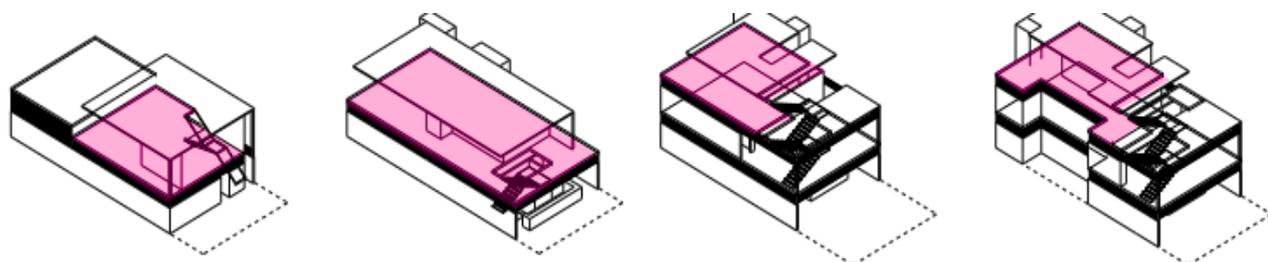


Figure: 5.16: Sketch configuration for rearranging building to suite site conditions (RMA; 2012:15)

Sketch Design and Alternate A

The sketch design prototype the ground floor accommodated for the toilet facilities and adopted the community terrace on the upper level; however its location is situated adjacent to caretakers unit (fig 5.16). Maintaining the height of the structure to two

story's depending on its context and site conditions. The only variation between the sketch concept and alternate A, is re-shuffling the components to suite the site for privacy, entry point, circulation, and queuing. Also, alternate a, separates the community terrace from the care-takes unit.



Figure: 5.17: Sketch Design (RMA; 2012:08) 2012:16)

Figure: 5.18: Alternate A (RMA;

Alternate B: Spacious Entry:

The concept of stacking is introduced to the toilet facility to accommodate for tighter sites conditions (fig 5.17, fig 5.18). Also incorporating the care-takers unit, and shop on ground floor it provides a more generous entrance verandah with an adjacent court-yard. The male toilet and universal toilets are located on the ground floor. The footprint occupies 9 x 14m in dimension. The female toilets are on the upper floor level community space is allocated on the upper floor alongside the female toilet facilities. This also ensures privacy for women along with a more generous accommodation of facilities. The second floor holds the quarters for the care-taker unit.

The concept of stacking is also introduced to the toilet facility in Alternate C. The footprint occupies 9 x 14m. The caretaker and shop are integrated within the spacious

entrance verandah but allows for smaller adjacent courtyards where applicable, depending on the site. The community space is located on the upper floor and care-takers unit on the second floor still maintain privacy and a generous accommodation.

Alternate C: Shop and Interior Court-yard

In Both Alternatives, that being B and C, there margins for planting on the ground floor and upper levels become available. The space for social interaction is maintained in all variations of the building for the community (fig 5.19, fig 5.20). The community terrace furthermore allow for safe usage at night or for children to study for school as there isn't appropriate spaces for them to do so in their homes (URL: 003).



Figure: 5.19: Alternative B

Figure: 5.20: Alternate C

Building Materials

With regard to building material components and in the context of tectonics (fig 5.21), building material selection for public sanitation facilities is important. With the appropriate selection of materials, the health and hygiene of the facility and its users will be celebrated. RMA architects, choice of materials were selected on three guiding principles i.e.

Quick Deployment: “Metal joists and flagstones allow the upper slab to be erected quickly. The street level floor is comprised of a simple RCC / PCC slab. Walls from ground to 2-3m are plaster over brick structure”, (RMA; 2012: 10).

Maintenance: “Inside, large vitrified tiles with minimal joints are used for the wall and floor surfaces. At the roof, corrugated extruded metal, such as ‘Kalzip’, provide a lightweight and durable canopy at low cost and can ensure water-tightness with a minimal slope”, (RMA; 2012: 10).

Reversibility: “Hopefully, these facilities are not to be viewed as permanent solutions – for as the settlement upgrades and amenities improve, the structure housing this facility could perhaps be adapted for other social infrastructure – such as a school or clinic, or even dismantled completely, to be partially reused in another location”, (RMA; 2012: 10).

Utilizing materials that are locally produced through tradition and low technologies as well as materials that are familiar to the local environment is fundamental for the social well-being of the affected community. This enables the building to relate to the context of its surrounding and the users of the facility. Plants were used to diffuse odors and uplift the surrounding environment



Figure: 5.21: Exploded Diagram illustrating material use for the facility (URL0003)

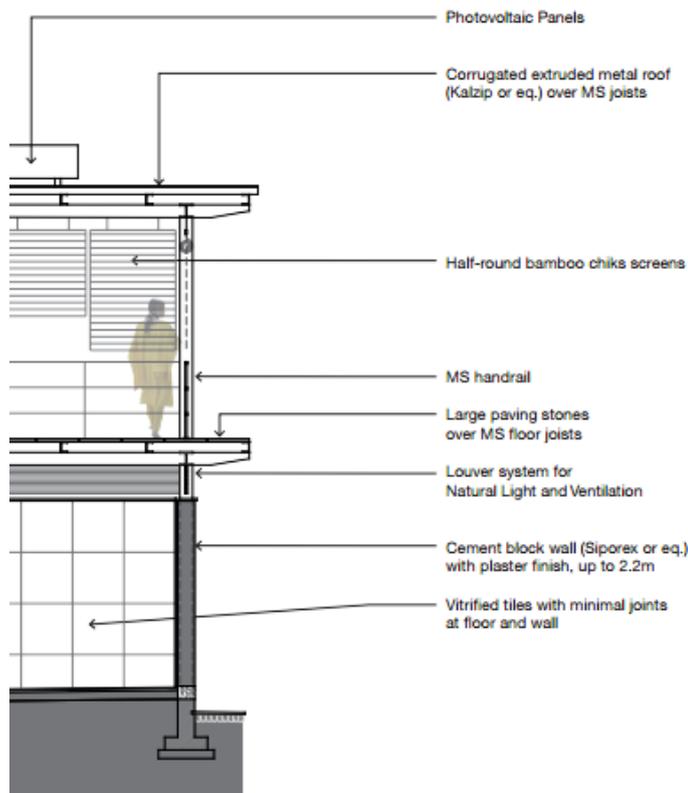


Figure: 5.22: Detail section (RMA; 2012:10)

Summation

Through the realization that public toilets built in the slum areas of India (Mumbai) where being built by the state without any architectural input, RMA architects took complete advantage in challenging the norms. Traditionally, the prototype for sanitation provided by the Indian state was designed by engineers on a 9x14m platform. The typical prototype had no architectural input or any consideration for addressing the user's needs. Working within the same budget and area of building, RMA architects approached the facility with the community in mind.

That being, spatial adjustments to the prototype, materials, and social integrity and re-configuration to suite site conditions were introduced, not forgetting issues around maintenance, safety and privacy for women (fig 5.22). Adopting the cultural practice of the cast system in India, with the cleaner being the lowest cast, RMA architects

architecturally adapted the facility such that provisions to house the care-taker and a community space formulated the spatial arrangement. Designing a facility ‘off the grid’ without depending on electricity needed insurance that maintenance would sustain the facility at all times. In doing so, the architectural influence blurred within the social structural customs and beliefs systems by providing the care-taker with the penthouse in the slums.

The community terrace was provided to function as a platform for adult education and for children to use during the day and night. Issues related to queuing and privacy provided spaces that educated the users of hygiene and well-being within the facility and on the exterior. Provisions for incremental growth were also introduced by catering for small shops that promote a healthy social environment.

Ultimately the architectural influence of the public toilet functioned as a means that promote social sustainability within the slums of Mumbai. Architectural creativity challenged the issues of sanitation and at the same time produced spaces for the community.

5.4 PRECEDENT STUDY 03

Project Description – ‘Toigetation’ Bamboo Toilet Block

Location – Cao Bang Province, Vietnam

Project Area – 81.0m²

Architect- H&P Architects

Source - (www.dezeen.com)

Introduction



Figure: 5.23: Images of the Toigetation Bamboo toilet block (www.dezeen.com)

This case study entails the project for a community toilet block developed for a school in the Son Lap commune in Cao Bang, Vietnam. Coupled with the challenges of public toilet and shower facilities, (fig 5.23) the inhabitants of the Son Lap commune live in poverty with hostile standards of sanitation facilities (URL: 0005).

H&P architects when looking at the region of Cao Bang aimed to develop a low cost solution to meet the sanitation demands and at the same time could be rolled out throughout the country. This kind of achievement could only be made possible through quick construction of such a facility and through the use of locally available materials. This enables local labour and construction mechanisms that can easily be replicated.

The architects positioned the block at the edge of the school's site by leveling the sloped terrain and creating a platform. The structure was developed through a brick core, housing the 2 toilets and 2 showers and bamboo was used to support the roof with a frame linked to the ground that functions as a shading device while providing a screen.

Justification

The toilet block is developed through a self-sustaining system which recycles resources and waste as well as provide a source of food for the school community.

Water is collected via the roof and fed into water tanks where it is filtered and reused for washing and flushing the toilets. Dirty water is collected in a septic tank and filtered prior to watering the plants in the vegetable garden. The other features include solar panels for lighting at night and a facility that easily blends into the natural landscape (www.dezeen.com).

Architects Proposal – Motivation & Design Intentions

Design Concept

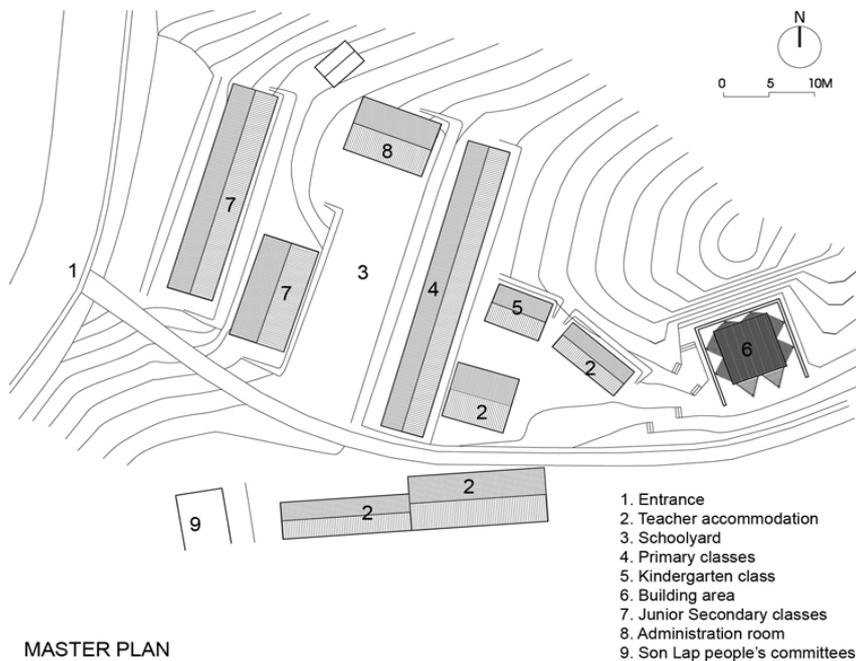


Figure: 5.24: architects site development plan of the toilet block relative to the context (www.dezeen.com)

With the ambition of developing a successful facility, and within the constraints as mentioned above, the facility was inspired by, “the iconic image of a large tree with a wide canopy giving shade for the space below and within”, (www.dezeen.com). In using this concept the shower and toilet facilities, enclosed by a brick structure, also supported the roof structure (bamboo frameworks and galvanized metal sheeting) evoking the ‘iconic tree canopy’.

The bamboo roof frame is than submerged into the ground with bamboo poles which provide a frame for planting herbs as well as improve privacy, shade and enhance the visual impact of the toilet block. The project was given the name ‘Toigetation’, meaning that the toilet facility was covered in vegetation, helping it to merge with its forest surrounding landscape.

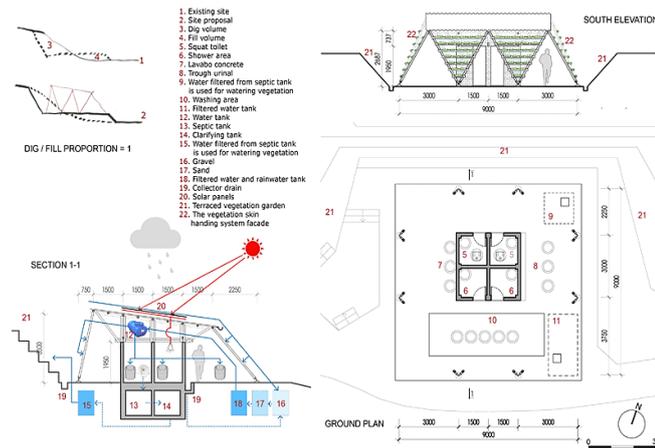


Figure: 5.25: Architectural floor plans and section and sustainable design concept (www.dezeen.com)



Figure: 5.26: Materials selection and tectonics (www.dezeen.com)

Figure: 5.27: quality of spaces developed in the toilet block (www.dezeen.com)

Summation

In terms of sustainable architectural solutions related to toilet facilities ‘Toigetation’ clearly addresses the environmental aspects of sustainability. The project and the architects had used natural and raw materials to develop a prototype typology covered in vegetation. Toigetation is also a prototype that address the social aspects and is a social asset in the school as the bamboo treelike structure integrates the concepts of the environmental and social aspects. The structure is designed for planting herbs and providing food to the inhabitants in the school. The tectonics of the structure is also designed to be self-sufficient with regard to water reticulation and the conservation of natural assets. Here as well the overall design integrity of the structure is meant to function off the grid, harvesting resources such as sunlight and rainwater. Moreover the vertically inclined green walls relate to more than just planting herbs but rather addressing the social issues of the aesthetic appeal of the facility, provides privacy and shade.

5.5 PRECEDENT STUDY 04

Project Description – Productive Infrastructure

Location – Cape Town

Architect - Noero Architects

Source - (www.saia.com)

Introduction and Justification

In architecture and within the built environment, integrating architectural design with building technology, imagination, and creativity can produce innovative ideas in the human scale. An example of self-sufficiency in building is the “tree-like energy machine” created by Cape Town-based Noero Architects and exhibited at the MAXXI Museum in Venice (2013), under the title “Energy: oil and post-oil architecture and grids” (Noero, 2013:16-18). This exhibition was featured in the “Productive Infrastructure” section of the South African Institute of Architecture (SAIA)’s 2013 green Buildings issue. This precedent study is set within the Local South African context. This precedent deals with three variant scales of providing water and sanitation infrastructure to the household, street and public scales of peri-urban and rural settings.

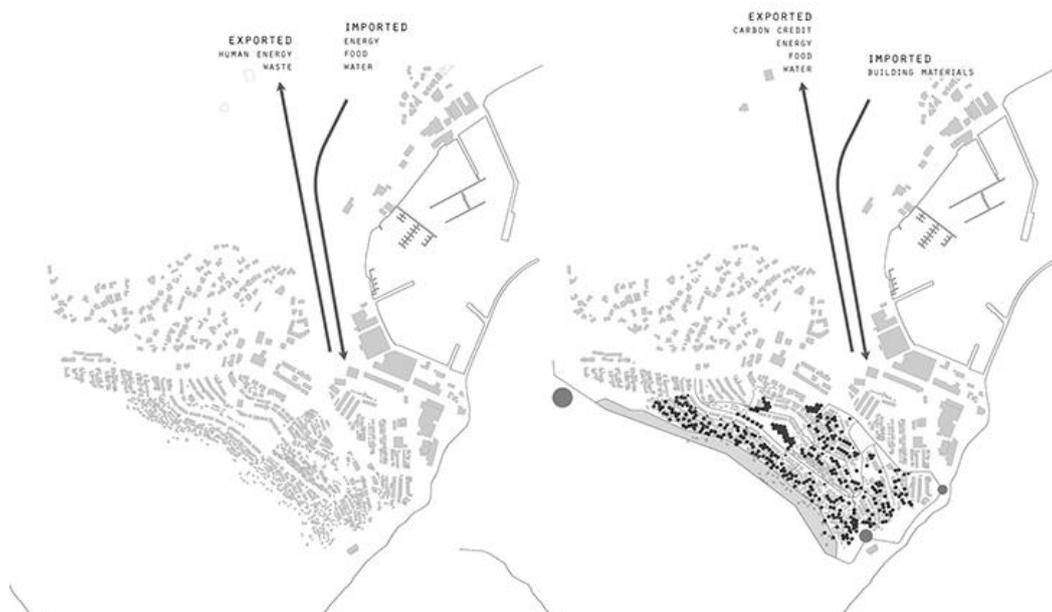


Figure: 5.28: Noero Architects design concept for site establishment and sustainable characteristics (Noero; 2012:10)



Figure 5.29: Site context of the design concept (Noero, 2013:17)

Architects Design Concept

Productive infrastructure combines the themes of energy, architecture and landscape. Noero Architects' design proposition, in response to these themes, adopted a global perspective on the stability of the global economy and the current state of unemployment in developing countries (fig 5.28 and fig 5.29). With a growing population living conditions in densely populated regions impose health and safety hazards on communities. The design concept therefore seeks to find new ways of living that need to adopt by communities, in order to find ways of liberating the most renewable and plentiful energy resources available. The project explores the spatial forms of sustainability that would be shaped by the new productive infrastructure at both household and community scales that infrastructures are designed to be used locally that generates systems of energy production (Noero, 2013:16). The sustainability structure is compact and effective, and requires a small carbon footprint, with minimal interference on the ground; it provides shelter as well as the means for harvesting food and water. Employing architectural design strategies, the “tree machine” uses bio-gas as a primary source of generating energy that is then distributed to households.

Sustainable Characteristics

The design functions programmatically on the various scales at ground level maintain itself as a social asset on many levels. The household level of production allows for integrated community building and social gatherings that are sustained by water harvesting activities, reed bed filters for waste water filtration, roof gardens in the

form of urban agriculture and farming that reuses the biogas as a source for off-the-grid energy. The street typology on the other hand allows for a more spatial measure of sustainability that also maintains a high social aspect. The street typology is similar to the household however it varies in the sense of providing energy and a social component for gathering whilst providing a place for informal trade, a platform for access to drinking water if situated close to a public transport hub. People also socialize under the structure whilst waiting for transport or trading. On a public level the infrastructure is equipped with aquaponic farms for agriculture at a community scale and a shelter for community events to take place.

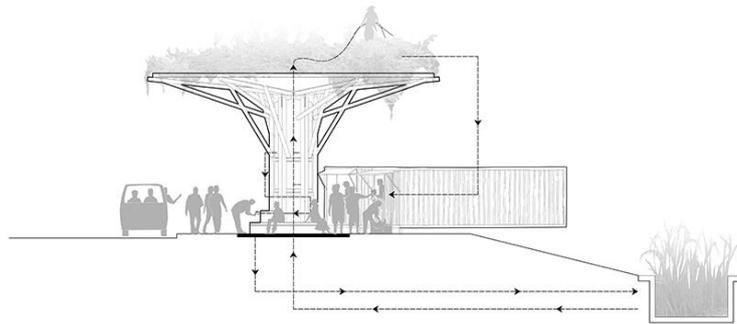


Figure 5.30: (Left) street typology with roof garden, water collection and informal trade, social gathering, and reed bed filter. (Noero, 2013:17)

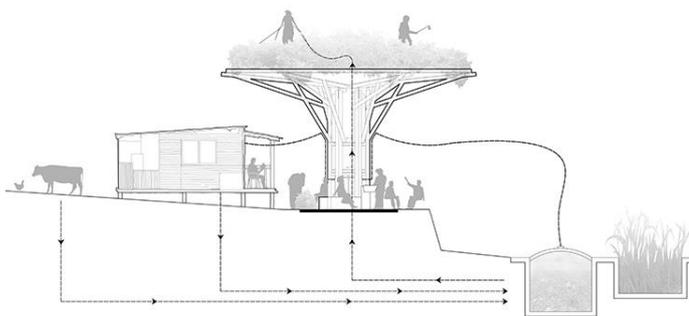


Figure 5.31: (Left) household typology with roof garden, water collection, social gathering, biogas digester and reed bed filters (Noero, 2013:17)

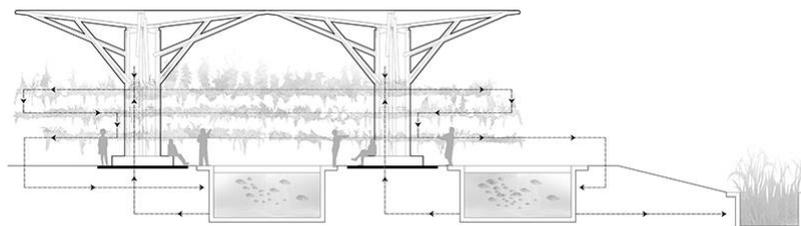


Figure 5.32: (Left) Public space technology with aquaponic farms (Noero, 2013:17)

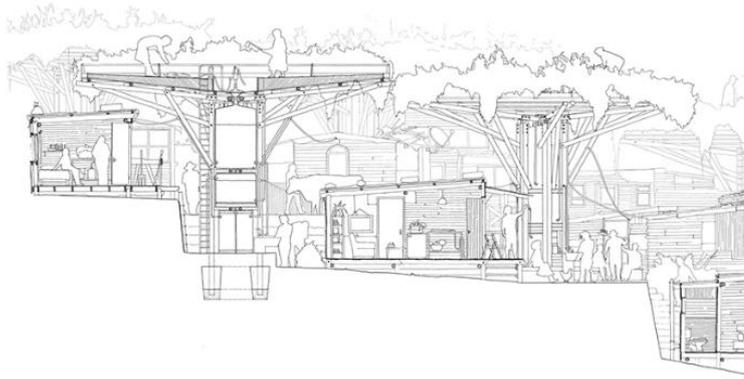


Figure 5.33: (Left) section through the house typology model within context (Noero, 2013:17)

Summation

The design typology is equipped to service the social and community needs at various levels whilst adopting a new way of living. The design response is also further developed to address the current and future needs and demands for food, energy, water, shelter and food. The design concept also functions to minimize waste. Overall the design is sensitive to the environmental and social aspects to rural or peri-urban communities. The typology of the productive infrastructure furthermore plays a crucial role in the role of sustaining the livelihoods, health and well-being from a bottom up approach. The design is compact yet addresses the key issues from a social and community standpoint.

5.6. Analysis and Discussion

Through the analysis and discussion of the precedents discussed, the key ideas obtained, address the issues surrounding the concept of social sustainability. Community toilets as the catalyst for social integration in both, the spatial and programmatic are the key components when designing and providing communal water and sanitation. The choice of material selection is also critical for the deployment of sanitation facilities to ensure that the facility is able to sustain community livelihoods aesthetically and culturally. However in each study, the analysis for discussion further challenges the notion that water and sanitation facility is a social asset and deals with multiple levels for community building.

Chapter 6

ANALYSIS AND DISCUSSION

Comparative Findings and Summary

6.0 Analysis and Discussion

In order to avoid repetition, this section is exclusively dedicated to answering the research question against the literature reviewed in this document. The research question and problem will be restated, for ease of reference:

What is the role of architects towards facilitating appropriate, suitable and sustainable architecture for communal water and sanitation facilities?

Architects play a critical role towards the creation of sustainable community development in both, as citizens and professionals. As the role of the architect is to create, develop, preserve and improve the quality of life for people in communities as well as individuals experiencing the physical built environment and as citizens the role of the architect should be to become sustainable members of their own community. Furthermore the role of architects should be extended to enhance the environment in which people live by understanding the quality of life from both the cultural and social aspects of daily life. A clear understanding of this can be achieved only through public participation and engagement with communities. The role of the architect is to build communities rather than just buildings. Engagement with communities effectively outline an understanding of their needs and problems people face and hence allow the design process to be formulated from the ground up. Communal water and sanitation facilities are social assets to communities, especially in peri-urban or poor communities. Such facilities allow communities to improve the quality of life, health and hygiene practices on a day to day basis, eliminating the threat of diseases and sickness and improving health immensely. In order for architects to achieve appropriate, suitable and sustainable water and sanitation amenities, the architect needs to engage and understand the social and cultural needs as they vary between different communities, sexuality, culture and age. Therefore the design and development for suitable social assets and community building exercises must be developed with the community it is being designed for.

How can improved water and sanitation facilities contribute towards and improve quality of life for the women of Inanda?

Improved communal sanitation and water facilities can function as core social spaces and places within the community that allow for women, a platform to exchange daily routines and ideas while carrying out their immediate daily activities. Through the creation and development of a community centre or platform for women (and men) in the community in which discussions surrounding issues around public health, safety, education, day-care centres, clinics, schools, common spaces for youth development and privacy for women, can be tackled whilst defining the communal facility as a social public space in the community. Such a facility can not only be used as a platform for accessing water and sanitation, but it can also be accompanied by facilities which offer assistance towards adult-education, child education, classes for children, small markets, agriculture and urban farming, skills-development centres for artisans, day-care facilities, social spaces for community building activities and healthcare facilities. Therefore, socially sustainable and appropriate architectural design strategies that are informed spatially and programmatically through public and community engagement can foster institutional responsibility and sense of ownership for women in the community through active participation, planning and engagement with architects and other professionals as well as contribute to the design process and the design outcome.

How can women overcome the barriers of inadequate sanitation facilities and enjoy a safe, healthy and sustainable living environment?

Proper education and training on health and hygiene issues for women in the community would improve their living conditions and personal development. Social sustainability when adopted as an architectural intervention can inform buildings and urban-planning regulations for future facilities and transform beliefs, traditions and taboos surrounding water and sanitation facilities. The Architectural intervention firstly, must be adopted through participation and respond to the social problems in a community. The objective of which should be to design a facility that addresses women in poor communities and which blurs the polarities that exist. The key idea however is to not only provide supporting facilities to common water and sanitation

facilities but also to develop a design that treats people as people through the use of appropriate materials, its location and participation through the engagement process involving women from the community. Improved pathways and nodal connections will increase visibility and density in the community facilities. By creating a platform of engagement for women in communal facilities, mobility is encouraged through active routes networks, and issues of safety, health and social sustainability are enhanced.

What type of amenities and architectural planning principles are mandatory, to warrant safety and accessibility for women in the community?

The sustainable architectural intervention required for new structures of communal facilities is one that is capable of growth and transformation as discussed through the examples in chapter five. The on-going symbiosis between people and a socially sustainable built environment is crucial during the process of transformation. Therefore, within the built environment and peri-urban settlements, patterns of growth and change are inevitable and come to act as a living whole. If the organic nature of appropriate structures and human interactions within a building are understood, niche points of engagement can be developed for women. As such, between the structures of design there emerges a dynamic relationship that is capable of adjustment. Structures that are designed to offer a network of shared social spaces for women in the Inanda community and within the specific site context manifest a sense of purpose, identity and justice and have rules and routines that offer continuity and stability for the community, ensuring a sustainable outcome. The concept of social sustainability is therefore the catalyst to provide a dignified means for women and communal satiation hotspots, and practical interventions with strong strategic objectives are the key points of departure. The building of sustainable prototypes will encourage the implementation of such interventions for the women of Inanda.

Chapter 7

PART 11 DESIGN REPORT

CHAPTER 1

7.1 INTRODUCTION

eThekwini municipality, Water & Sanitation Unit (EWS) has acknowledged the water shortage crisis that is inevitable to hit South Africa in the near future. With water becoming a rare commodity, the EWS has opened an invitation for innovative and creative architectural practitioners to develop a sustainable model for conserving water and sanitation options to save water in developing regions across South Africa. With the current trends of water and sanitation services in developing communities the latter model and prototype does not support a bottom up approach for developing communities.

7.2 PROJECT DESCRIPTION

The Client

The EWS has set a goal towards empowering women living in impoverished rural and peri-urban areas. The intention is to establish a sustainable solution at individual household and community levels of service. The criteria for the design should be to generate a model that supports the idea of community building and design for a prototype community ablution block that serves communities in peri-urban and rural areas but also functions as a social asset to poor communities within the Durban metropolitan. The innovative use of materials and the structure of the prototype must be used creatively and innovatively such that the prototype can blend into the existing social and cultural context and that can be implemented anywhere in South Africa that can improve the quality of life as well as serve as a catalyst for social and cultural growth.

The client would further like to get the public interested in sustainable day to day practices from a community point of view and down to the individual standpoint. The new developmental scheme should be developed such that it could function as a vehicle to educate the local community in self -help green building. Although the public and community may fear change in their daily practices regarding sustainable practices the design and building project should be geared towards developing knowledge about sustainable practice. The result in making the transition to sustainable practice should be made more likeable to the general public.

7.3 THE CLIENTS REQUIREMENTS

The EWS has set a target towards eradicating poverty and inequality in peri-urban settlements and has begun with the initiative taken and upgrade of the Inanda heritage route. The initiative is to provide informal settlements along the route with feasible and sustainable ways to construct clean, efficient, and safe zones for households to access communal water and sanitation facilities. The client has thus sited that proceedings focal principals by insisting that the prototype of the building should:

- Establish facilities that deal with technical, social and cultural development
- Develop a model for appropriate aesthetics within the design
- Provide an agricultural component to further enhance the communities faring skills
- Provide a platform for community building exercises, such as a stage for community cultural education and entertainment
- Provide facilities that impact and enhance the social and cultural structures in the community
- Link the component to supporting and existing facilities in the community
- Carefully consider incremental growth and phase development to better suit curative development budgets
- Additionally, the client requests aim to develop strategies which respond to the local and global problems of conserving, recycling and reusing:
 - water and natural assets
 - Energy conservation
 - Social development

CHAPTER 8

8.1 Introduction history and background

Inanda has a rich background linked to the political history of South Africa. It was home to many renowned South African politicians and freedom fighters during Apartheid. Situated along the M25 highway, Inanda has a population of 158 619 residents (Census: 2011). Development has recently begun along the Inanda heritage route, which follows a trail of historic landmarks and places of interest. The Ohlange Institute was established in 1903 by Dr John Langalibele Dube, the founding member of the ANC, and is the place where Nelson Mandela cast his first democratic vote in 1994 in South Africa (Metro, 2015:7). Inanda is also home to the first Nazareth Baptist church and the Shembe culture, founded by Isiah Shembe in 1910. The Gandhi settlement in Phoenix is yet another site of interest, founded and established in Inanda in 1904 (Metro, 2014:7). In addition, the first black African lawyer in South Africa, Dr Pixley Ka Isaka Kaseme, was born and raised in the Inanda Township (Metro, 2014:7).



Figure 8.01
The Ohlange Institute situated at the Dube residence in Inanda (enanda.com)



Figure 8.02
Nelson Mandela casting his first Vote in 1994 located at the Ohlange institute in Inanda (enanda.com)

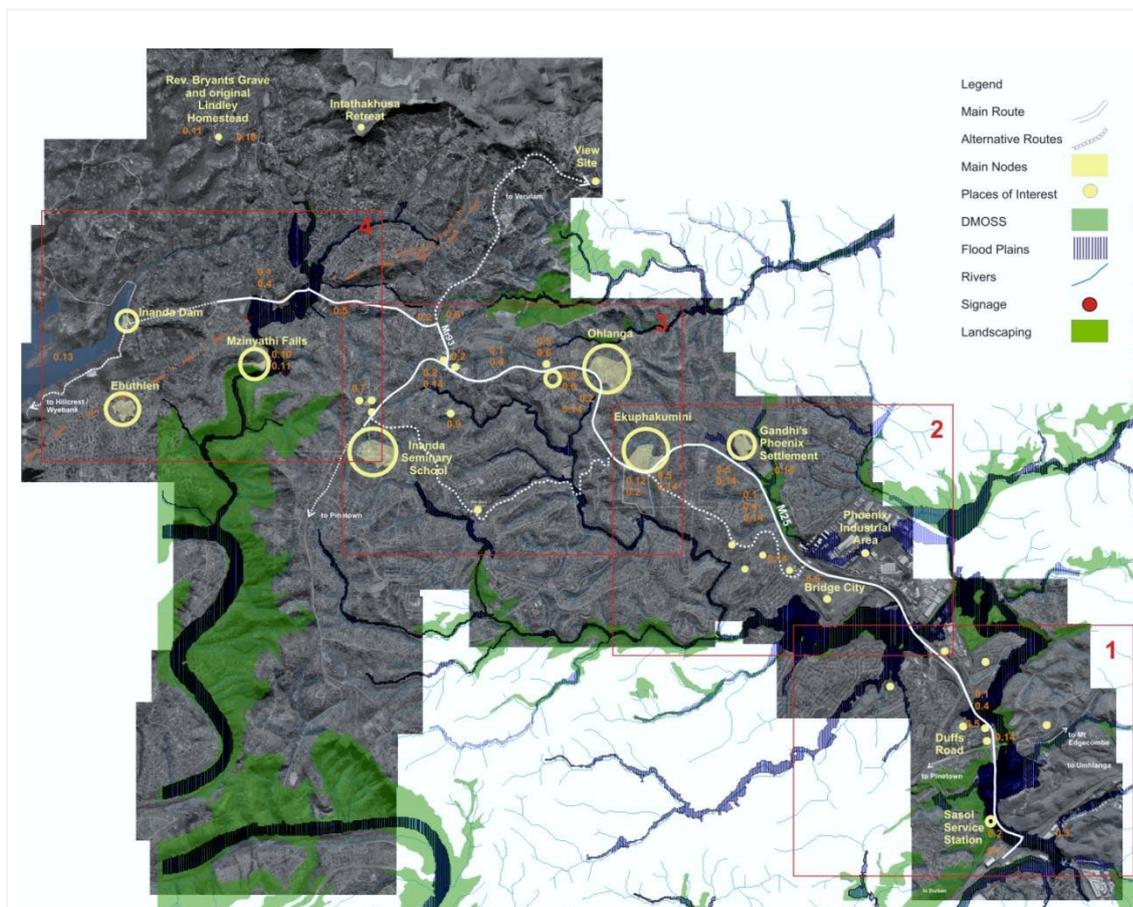


Figure 8.03

The Inanda heritage tourism route planned development along the M25 highway heading north. The development is planned in four stages (source: southafrica.net)

8.2. SITE SELECTION AND DISCUSSION

The criteria set forward for the site selection is discussed below. Also the problems associated to communal water and sanitation with regard to the number of households being serviced was discussed in (Chapter 3).

Understanding the nature and context of the site through the significance of place and history as well as future planning intended for the Inanda. .



In order to begin selecting a site, a set of guidelines that relate to the discussion in the document need to be explored and applied in an analysis of the urban environment. The site criterion is as follows:

- The site must be in an area that is easily accessible by those whom will benefit from it.
- The site had to exist within a neighbourhood
- The site should display a variety of issues such as topography, wetlands, river / stream, etc.
- The site should be centrally located along route
- Site should be able to connect to similar communal facilities within close proximity
- The site should consist of an existing CAB
- The site should have some infrastructural coverage

The other vital requirements were considered, such as proximity to transport nodes, social facilities, access from primary route to secondary routes of movement. The site must be a bridge intervention that acts as a catalyst within the urban frame.

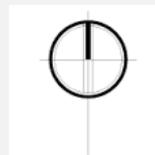
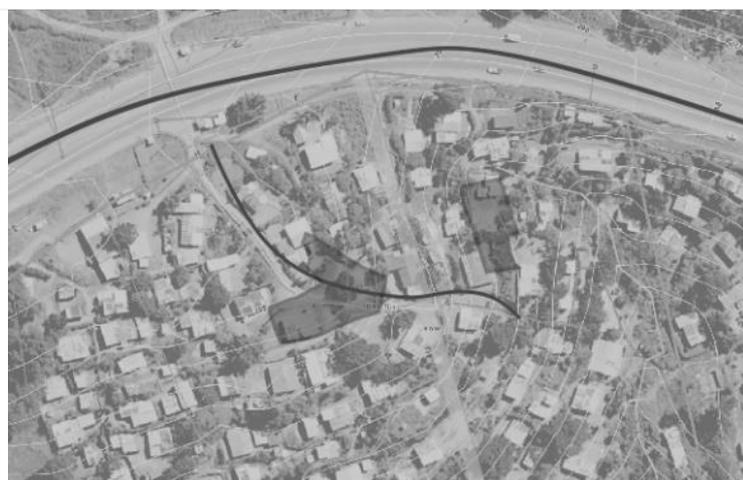


Figure 8.05
Site selection choices A
(Google Earth)

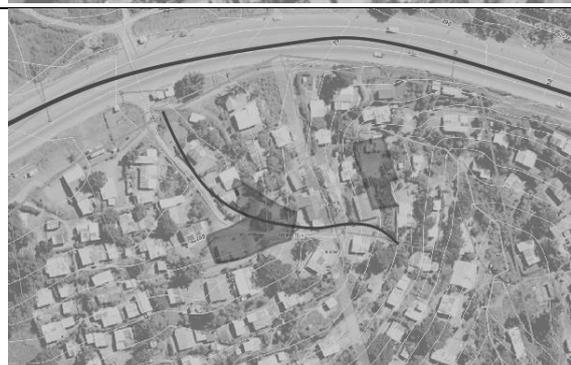


Figure 8.06
Site A (Google Earth)



Figure 8.07
Site B (Google Earth)

SITE A

STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
North facing	No primary streets	Possible to make use	Too close to highway
Centre of households	No natural watercourse		
Off highway	Little connection to other facilities		
Easy to find	Site is flat		

SITE B

STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
North facing	No primary streets	Possible to make use across highway	Too close to highway

Centre of households and facility across highway	No natural watercourse or wetland	Triangulation of facilities could provide public square on both sides of highway	Poor penetration into under-developed areas of settlement
Off highway	Settlements of households are sparse		
Easy to find with direct access	Site is flat		

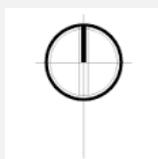


Figure 8.08
Site selection choice C (Google Earth)

SITE C

STRENGTHS	WEAKNESS	OPPORTUNITIES	THREATS
North facing	Set on awkward gradient	Can be integrated into urban fabric	Potential flooding
Centre of neighbourhood hierarchy of street	Poor road and wetland	Activate street edge	Poor penetration into under-developed areas of settlement
Along route to neighbouring facilities	Settlements of households are sparse	Can be developed into a place for community	
Can function as an intervention	Abandoned structures along road	Can extend beyond its boundaries	

Variety of elements (wetland and river)		Harvesting of water for agriculture	
Dense neighbourhood			
Pedestrian pathway			
Site is not flat			
Pedestrian path connect facilities			

8.3 SUMMATION

Analytical conclusion and choice

CRITERIA	SITE A	SITE B	SITE C
Site area	xxx	xx	x
Availability of Infrastructure	Xx	xx	x
Orientation	xxx	xxx	xxx
Gradient	x	x	xxx
Frontage	xxx	xxx	xx
Access – pedestrian and vehicles	x	x	xxx
Urban context	x	xx	xxx
History	x	x	xxx
Cultural opportunity	x	x	xxx
Social value	x	x	xxx
Supporting social facilities	x	x	xxx
Accessibility	x	x	xxx
TOTAL	15	17	31

8.4 CONCLUSION ON SITE SELECTION

The table above indicates the sites potential to meet the criteria for site selection. Site C has the most strengths and a variety of elements to consider in the design approach. As a result, site C will be fully analyzed and documented with regard to further development in the area and as an architectural intervention. Moreover it is important to understand from the discussion in part one and the precedent studies that sites A, B and C present different social conditions. Therefore all three site should be examined and analyzed too address the various social conditions in relation to its context. As each site is different the proposed intervention should be able to remodel itself to suite the different conditions.

BIBLIOGRAPHY

Alexander, C. 1977. *A Pattern Language*. New York: Oxford University Press.

Architecture SA. 2013. Journal of the South African Institute of Architects: *Productive Infrastructure*. July/August 2013. Pp. 16-17

Barton, H.; Grant, M. & Guise, R. 2010. *Shaping Neighbourhoods for Local Health and Global Sustainability* (2nd edition). London & New York. Routledge

Basiago, A.D. 1999. *Economic, Social, and Environmental Sustainability in Development Theory and Urban Planning Practice: The Environmentalist*. Netherlands. Kulwer Academic publishers. Vol. 19, Pp. 145-161

British Medical Journal, 2007. "BMJ readers choose the "sanitary revolution" as greatest medical advance since 1840". Retrieved from:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1779856/>

Callicott, J.B. & Mumford, K. 1997. 'Ecological Sustainability as a Conservation Concept', *Conservation Biology*. USA. Vol.11 No, 1. February 1997. Pp. 32-40

Carmona, M. & Tiesdell, S. 2007. *Urban Design Reader*: Architectural Press, Great Britain

Crous, A.P. 2014. *Communal Ablution Facilities as Interim Measure or the Upgrading of Informal Settlements*. University of Johannesburg

Cullen, G. 1971. *The Concise Township*, Second Edition. Architectural Press, London. Pp. 7-17 (first Edition 1961)

DWAF, 2012. 'Sanitation Services – Quality of Sanitation in South Africa', Report on the Status of Sanitation in South Africa: Executive Summary. Pretoria, South Africa

Dimmer, K. 2013. *A Bold New African Model, Explained: Incremental Infrastructure*. Earthworks: For a Sustainable Built Environment. Issue 16. October/November 2013. Pp. 87-96

Drewko, A. 2007. *Resource-Oriented Public Toilets in Developing Countries: Ideas, Design, Operation and Maintenance for Arba Minch, Ethiopia*. Germany: Hamburg University of Technology.

Dobrev, V.D. 2001. *Adaptive Reuse in Context: Towards Sustainable Mixed-Use Housing in Durban*. M. Arch. Thesis. Durban: UKZN

Gallion, A.B. & Eisner, S. 1986. *The Urban Pattern; City Planning and Design*, 5th ed. USA: CBS Publishing

Gershenson, O. & Penner, B. 2009, *Ladies & Gents: Public Toilets & Gender*, Temple University Press. Philadelphia

- Gounden, T; Pfaff, B; Macloed, N; & Buckley, C.** 2006. *Provision of Free Basic Sanitation: The Durban Experience*: Paper Presented at the Conference on Sustainable Development of Water Resource, water Supply and Environmental Sanitation. 32nd WEDC International Conference. 6 November 2006. Colombo & Sri Lanka. Pp. 22-25
- Gehl, J. 1971.** *The Types of Outdoor Activities & Outdoor Activities and Quality of outdoor Space*; **Gehl, J.** 1996. *Life between Buildings: Using Public Space*, Artikektens Forlag, Skive, Pp. 11-16; 17-31; 32-40
- Hellberg, S.** 2015. *The Biopolitics of Water: Technology, Subjectivity and Lifestyle in eThekwini Municipality, South Africa*. University of Gothenburg.
- Fowler, H. W. & Fowler, F. G.** 1964. *The Concise Oxford Dictionary of Current English*, 5th ed. London: Oxford University Press
- Galli, G; Nothomb, C; & Beatings, E.** 2014. *Towards Systematic Change in Urban Sanitation*. IRC Working Paper. Netherlands. November 2014
- Hellberg, S.** 2015. *Water, Life & Politics: Exploring the Contested Case of Ethekwini Municipality Through a Governmentality Lens*. *Geoforum*. Vol 56. 6 March 2014. Pp. 226-236 <http://www.elsevier.com/locate/geofoum>
- Jayes, K.** 2014. *When Every Drop Counts, Special Report: Water Part I*, *Earthworks: For a Sustainable Built Environment*. Issue21. August/September 2014. Pp. 97-108
2014. *Don't Water Down Quality, Special Report: Water Part II*, *Earthworks: For a Sustainable Built Environment*. Issue21. October/November 2014. Pp. 85-94
2014. *The Big Three, Special Report: Water Part III*, *Earthworks: For a Sustainable Built Environment*. Issue23. December/January 2014/15. Pp. 87-94
- Koen, G. & Barnard, J.** 2014. *Why We Need a Report on Water & Sanitation*. Mail & Guardian: SA Human Rights Commission Advertising Supplement. March 7 to 13. p.1. <http://www.sahrc.org.za> Accessed: 30.October .2014 01:00am
2014. *Homeland Still Suffer, Report Finds*. Mail & Guardian: SA Human Rights Commission Advertising Supplement. March 7 to 13. p.2. <http://www.sahrc.org.za> Accessed: 30.October .2014 01:00am
2014. *The Water Bearer: Women & Children*. Mail & Guardian: SA Human Rights Commission Advertising Supplement. March 7 to 13. p.2.
2014. *Water: Economic Commodity or Human Right*. Mail & Guardian: SA Human Rights Commission Advertising Supplement. March 7 to 13. p.3. <http://www.sahrc.org.za> Accessed: 30.October .2014 01:00am

2014. *Parliament Oversight Key to Affective Delivery*. Mail & Guardian: SA Human Rights Commission Advertising Supplement. March 7 to 13. p.4.

- Larkin, B.** 2013. *Targeting the Poor - an Analysis of Free Basic Services & Municipal Indigent Policies in South Africa*. Economic Rights Institute of South Africa (SERI). Johannesburg. July 2011
- Mara, D. & Evans, B.** 2011. *Sanitation & Water Supply in Low-income Countries*: Ventus Publishing Aps. New York.
- McGregor, D; Simon, D; & Thompson, D.** 2006. *The Peri-Urban Interface: Approaches to Sustainable Natural and Human Resource Use*. London: Earthscan
- McKenzie, S.** 2004. *Social Sustainability: Towards Some Definitions*. University of South Australia. Hawke Research Institute. No27. Pp. 1-29
- Morelli, J.** 2011. 'Environmental Sustainability: A Definition for Environmental Professionals', *Journal of Environmental Sustainability*: Vol. 1. Issue 1, Article 2. Pp. 1-9
- Macloed, N.** 2014. 'Sanitation Critics Ignore the Facts', *The Mercury*. September 16. p.8
- Makoba, G.** 2013. 'Water & Sanitation Become a Living Nightmare in Durban's Inanda Township', *The Mercury*. September 3.
- Pacey, A.** 1980. *Rural Sanitation: Planning and Appraisal*. London: Intermediate technology Publications Ltd.
- Palmer, R.** 1973. *The Water Closet: A New History*. Great Britain: D&C Publishers
- Roma, E. & Pugh, I.** 2012. *Toilets for health: A Report by the London School of Hygiene & Tropical Medicine in Collaboration with Domestos*. London School of Hygiene and Tropical Medicine. November 2011.
- Rulseh, T.J.** 2007. 'The Sanitary Revolution'
- Roma, E; Buckley, C; Jeferson, B; & Jeffery, P.** 2010. *Assessing user's experience of Shared Sanitation Facilities: A Case Study of Community Ablution Blocks in Durban, South Africa*. WaterSA, Vol.36. No 5. 5 October 2010. Pp. 589-594 -
<http://www.wc.org.za>
- Stock, A.** 2011. *The Human Right to Water & Sanitation, Training Material*. WEFC, Women in Europe for a Common Future. WEFC, Netherlands, France, Germany. February 2011
- South Africa.** 'National Sanitation Policy Paper 1996', White Paper: *The National Sanitation Task Team*. Joint Policy Paper: Pretoria
- Sutherland, C; Hordijk, M; Lewis, B; Meyer, C; and Buthelezi, S.** 2014. *Water and Sanitation Provision in eThekweni Municipality: a Spatially Differentiated Approach*. Environment and Urbanization: International Institute for Environment and Development

(IIED). Vol 26 (2). October 2014. Pp. 469-488
 accessed January 7, 2015

[Downloaded from eau.sagepub.com.](http://eau.sagepub.com)

Sutherland, C. & Lewis, B. 2012. *Water and Sanitation Provision in eThekweni Municipality: a Spatially Differentiated Model*. Chance2sustain. Opinion Paper No 6. 6 December <http://www.chancesustain.eu>.

Thiele, L. P. 2013. *Sustainability: Key Concepts*. Cambridge: Polity Press.

Taylor, K., Parkinson, J. & Colin, J. 2003. *Urban Sanitation: A Guide to Strategic Planning*. London: ITDG

Tissington, K. 2011. *Basic Sanitation in South Africa: A Guide to Legislation, Policy and Practice*: Economic Rights Institute of South Africa (SERI). Johannesburg. July 2011.

eThekweni Municipality. 2013. *Integrated Development Plan 2013/14 to 2016/17*, eThekweni Municipality, Durban

UNICEF, 2009. *Community Approaches to Total Sanitation*. Based on case Studies from India, Nepal, Sierra Leone, Zambia. UNICEF, New York.

UN, 2013. UN Water Report. Retrieved from:
http://www.unwater.org/fileadmin/user_upload/unwater_new/docs/sanitation.pdf

UN, 2014. 'The Millennium Development Goals Report 2014', *We Can End Poverty 2015*. New York

UN, 2014. 'The Millennium Development Goals Report 2014'. *Momentum Builds to Achieve More Millennium Development Goals by end of 2015*: UN Report. New York

UN, 2014. 'The Millennium Development Goals Report 2014', *Steady Progress on Many Millennium Development Goals Continues in Sub-Saharan Africa*: UN Report. Lagos, Nairobi, New York.

UN, 2006. *Water, a Shared Responsibility*. The United Nations World Water Development Report 2. WWAP. New York & USA.

UN, 2014. *World Urbanization Prospects: 2011 Revision*. Department of Economic and Social Affairs, Highlights. New York .

UNDP, 2006. *Rural Sanitation in South Africa: A Focus on Institutions & Actors*. Human Development Report. Southern Africa, Zimbabwe, UK

UN, n.d. International Human Rights Law and Sexual Orientation. Retrieved from:
https://www.unfe.org/system/unfe-6-UN_Fact_Sheets_v6_-_International_Human_Rights_Law_and_Sexual_Orientation__Gender_Identity.pdf

Van De Merwe, C. 2015. *It's a Human Right, Project: Rwandan Community Centres*. Earthworks: For a Sustainable Built Environment. Issue25. April /May 2015. Pp. 50-60

Vuorinin, H.S., Jutti, P.S., Katko, T.S. 2007. *History of Water & Health from Ancient Civilizations to Modern Times - Water Science and Technology: Water Supply*. Vol. No. 1, Pp. 49-59. IWA Publishing, Finland

WHO & UNICEF, 2014. Progress on Drinking Water & Sanitation -2014 Update. Joint Monitoring Programme for water Supply & Sanitation. UNICEF, New York, USA; WHO, Geneva, Switzerland

WHO & UNICEF, 2008. *A Snapshot of Sanitation in Africa*. A special tabulation for AfricaSan Based on Preliminary Data from the WHO/UNICEF Joint Monitoring Programme for Water Supply & Sanitation. USA. 18-20 February.

Wilson, Z; Malakoana, M; Gounden, T. 2008. *Trusting Consumers: Involving Communities in Municipal Water Service Decision Making in Durban, South Africa*. WaterSA, Vol.34. No 2. 2 April 2008. Pp. 141 - 146 - <http://www.wc.org.za>

White, E. 1999. Path-Portal-Place, *Appreciating Public Space in Urban Environments*, Architectural Media Ltd, Tallahassee, Pp. 57-96

INTERNET SEARCH

<http://www.archdaily.com/61393/delwara-community-toilets-vir-mueller-architects/>

22.03.2015 1:00

<http://inhabitat.com/locally-built-green-toilet-facilities-provide-safe-sanitation-for-india/delwara-community-toilets-5/>

22.03.2015 4:00

<http://rmaarchitects.com/architecture/community-toilets-for-sparc/>

23.03.2015 20:00

<file:///C:/Users/sr/Desktop/chapter04/rma/Mehrotra-Samaan-design.pdf>

23.03.2015 22:00

<http://www.dezeen.com/2015/01/06/toigetation-hp-architects-bamboo-toilet-block-vietnam-plant-covered/> 03.04.2015 15:30

http://www.undp.org/content/dam/undp/library/MDG/english/UNDP_MDGReport_EN_2014_Final1.pdf 19 July 2015

<http://www.unilever.com>, (Accessed 09 Nov 2014)

<http://www.sahrc.org.za> Accessed: 30.October .2014 01:00am

-LIST OF ILLUSTRATIONS

CHAPTER 2

Figure 2.01: Diagram representing possible social activities with the communal facilities at the core (Barton et al., 2010)

Figure 2.02: Locating the communal at the centre of a community will not necessarily enable the site as a place for social activity (Barton et al., 2010: 240)

Figure 2.03: Consideration of locating communal facilities along a visible node to attract more users (Barton et al., 2010:240)

Figure 2.04: The best location is at a tangent to pedestrian pathway (Barton et al., 2010:240)

CHAPTER 3

Figure 3.01: The Indus Valley (3200-1900BC), domestic mechanisms for the disposal and transportation of wastewater (URL0001)

Figure 3.02: Sewerage and drainage mechanism during the early Mycenaean periods in Greece: (a), (b) and (c) are types of vertical ducts, and (b) sedimentation basin leading rainwater to the cistern (URL0001)

Figure 3.03: Illustrations of a section and ground floor plan of a residential toilet quarter in the Minos palace (Angelakis et al., 2005:212).

Figure 3.04: Cross sections of the various drainage duct typologies during the ancient Mycenaean period adopted to suite the Greek arenas (URL0001)

Figure 3.05: Street-side openings to the Roman Sewers (Source: www.waterhistory.org/histories/rome)

Figure 3.06: South Africa: 30.0000⁰S, 25.0000⁰E (www.phespirit.info)

Figure 3.07: Simple pit latrine/bucket (www.lboro.ac.uk)

Figure 3.08: Stats produced by the South African Human Rights Commission indicating the lack of access to water and sanitation (Mail & Guardian, March 7 to 13, 2014)

Figure 3.09: Illustrations representing the basic role of women in South Africa's informal settlements (M&G, 2014)

Figure 3.10: The 'drop and store', single pit latrine section (URL0006)

Figure 3.11: Typical VIP found in most rural and peri-urban areas (URL0007)

Figure 3.12: Typical Urine Diversion toilet bowl, with a compartment for separating urine and faeces (Susana.org).

Figure 3.13: The UDDT dehydration vaults in plan and section (sswm.org)

Figure 3.14: Use and maintenance of a two chamber UD dry toilet (www.hersperian.org:132)

Figure 3.15: The typical proposed CAB site establishment

Figure 3.16: The typical CAB plan configuration for male and female container (Pieter, 2014)

Figure 3.17: A typical section and configuration of the biogas chamber for human and animal waste (www.sswm.info)

CHAPTER 4

Figure 4.01: Exterior photograph of CAB

Figure 4.02: Google image of the Inanda Township indicating the site location of the community ablution block

Figure 4.03: The site in relation to its context

Figure 4.04: The typical proposed CAB site establishment found within the eThekweni municipal area (Pieter, 2014)

Figure 4.05: The typical CAB plan configuration for male and female container (Pieter, 2014)

Figure 4.06: The average daily water usage at the CAB (Pieter, 2014)

Figure 4.07: Planning and construction time line for a CAB

(Crous, 2014: 129)

Figure 4.08: The waste water pipes are external and easy to vandalise

(Crous, 2014:180)

Figure 4.09: The container requires external maintenance and re-paints every 22 months (Crous, 2014:168)

Figure 4.10: Taps are cheap and weak; leaking taps often flood the floor (Crous, 2014:171)

Figure 4.11: Toilets are cheap and often break, leak or have blockages (Crous, 2014:168)

Figure 4.12: Wastewater is not reticulated and discharged into the surrounding environment, which becomes a breeding ground for insects (Crous, 2014:177)

Figure 4.13: The laundry facilities are poorly managed and limited for the amount of users (Crous, 2014:176)

Figure 4.14: Vandalism of the CAB with broken windows (Crous, 2014:162)

Figure 4.15: The consequence of blockages (Crous, 2014:176)

Figure 4.16: Broken door and locks, invasion of privacy (Crous, 2014:162)

CHAPTER 5

Figure: 5.01: Architectural Site development plan (www.archdaily.com)

Figure: 5.02: Architects Ground floor plan (www.archdaily.com)

Figure: 5.03: Delwara, male toilet facility (www.archdaily.com)

Figure: 5.04: Delwara, female toilet facility (www.archdaily.com)

Figure 5.05: Community Toilets Facility (www.archdaily.com)

Figure 5.06: Orchid Courtyard surrounding the toilet facilities (www.archdaily.com)

Figure: 5.07: Section through the sanitation facility (www.archdaily.com)

Figure: 5.08: Delwara public toilet South East elevation (www.archdaily.com)

Figure: 5.09: Delwara, male toilet facility (www.archdaily.com)

Figure: 5.10: Delwara, female toilet facility (www.archdaily.com)

Figure: 5.11: Community terrace (www.archdaily.com)

Figure: 5.12: Community terrace (www.archdaily.com)

Figure 5.13: Typical spatial layout of toilet and shower facility for men and women maintaining the same dimensions 9x14m. The facility also contains a universal toilet (shower & toilet) as well as a children's toilets and shower.

Figure: 5.14: Community Terrace (RMA; 2012: 07)

Figure: 5.15: Massing Model (RMA; 2012: 07)

Figure: 5.16: Sketch configuration for rearranging building to suite site conditions (RMA; 2012:15)

Figure: 5.17: Sketch Design (RMA; 2012:08)

Figure: 5.18: Alternate A (RMA; 2012:16)

Figure: 5.19: Alternative B (RMA; 2012:17)

Figure: 5.20: Alternate C (RMA; 2012:18)

Figure: 5.21: Exploded Diagram illustrating material use for the facility (RMA; 2012:19)

Figure: 5.22: Detail section (RMA; 2012:10)

Figure: 5.23: images of the Toiletation Bamboo toilet block (www.dezeen.com)

Figure: 5.24: architects site development plan of the toilet block relative to the context (www.dezeen.com)

Figure: 5.25: Architectural floor plans and section and sustainable design concept (www.dezeen.com)

Figure: 5.26: Materials selection and tectonics (www.dezeen.com)

Figure: 5.27: quality of spaces developed in the toilet block (www.dezeen.com)

Figure: 5.28: Neuro Architects design concept for site establishment and sustainable characteristics (Noero; 2012:10)

Figure 5.29: Site context of the design concept (Noero, 2013:17)

Figure 5.30: (Left) street typology with roof garden, water collection and informal trade, social gathering, and reed bed filter. (Noero, 2013:17)

Figure 5.31: (Left) household typology with roof garden, water collection, social gathering, biogas digester and reed bed filters (SAIA, 2013:17)

Figure 5.32: (Left) Public space technology with aquaponic farms (Noero, 2013:17)

Figure 5.33: (Left) section through the house typology model within context (Noero, 2013:17)

CHAPTER 8

Figure 8.01

The Ohlange Institute situated at the Dube residence in Inanda (enanda.com)

Figure 8.02

Nelson Mandela casting his first Vote in 1994 located at the Ohlange institute in Inanda (enanda.com)

Figure 8.03

The Inanda heritage tourism route planned development along the M25 highway heading north. The development is planned in four stages (source: southafrica.net)

Figure 8.04:

Site selection choices (Image: Author)

Figure 8.05

Site selection choices A (Google Earth)

Figure 8.06

Site A (Google Earth)

Figure 8.07

Site B (Google Earth)

Figure 8.08

Site selection choice C (Google Earth)

APPENDICES

A – INTERVIEW QUESTIONNAIRE

B – INTERVIEWS

ANNEXURE A – INTERVIEW QUESTIONS
Interview Questions for Persons Involved In the Research
3.3.1 General

1. How long have you been a community member of the Inanda Township?

.....

(Ward Number).....

2. Since the 1994 democratic elections,
- a) Has Inanda seen any improvement from Local government in terms of delivery regarding the provisions of services?
- YES
 - NO

If you answer yes, please state why

.....

.....

.....

- b) Has there been a reduction in crime since 1994?

- YES
- NO

3. Do you have access to a toilet at your home?

- YES
- NO

If you answer yes, please indicate what system you have

.....

.....

.....

4. How satisfied are you with the current toilet facilities provided?

- Extremely satisfied
- Quite satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Quiet dissatisfied
- Extremely dissatisfied

5. Who provided the present toilet system?

- Municipality

- NGO
- Community
- Self

6. What system is the toilet?

- Flush
- VIP
- Urine Division
- Other

7. Did/do you pay towards the installation of that system?

- YES
- NO

2. What are your comments about the condition of the toilets you use?

.....

.....

.....

8. Do you have clean household tap water?

- YES
- NO

If you answer no, where do you get clean water from?

.....

.....

.....

9. What are your comments about the quality of the water service you receive?

.....

.....

.....

○ Do you feel safe to use the toilet at night?

- YES
- NO

If you answer yes, please state why

.....

.....

.....

10. Are the toilets clean and hygienic?

.....
.....
.....

11. How would you describe, are the issues related to safety?

.....
.....
.....

12. Would you be willing to play an active role within the community to improve existing water and sanitation conditions for women?

- YES
- NO

If you answer yes, how would you go about doing so?

.....
.....
.....

13. What would you suggest to improve the existing conditions of water and sanitation services?

.....
.....
.....

14. What do you feel, needs to be adopted surrounding the sanitation facility to make it practical and safe for women?

.....
.....
.....

Health

1. Are the toilets kept clean after use from others?

- YES
- NO

2. Is there anyone responsible in ensuring that the toilets are always kept clean?

- YES
- NO

If you answer yes, who is responsible?

.....
.....

3. Have you experienced any illness or contamination from using the community toilets?
- YES
 - NO

If you answer yes, what type of contamination?

.....

4. Do you know of anybody that has been ill as a result of using the toilet?
- YES
 - NO
 - MAYBE

If you answer yes, what type of contamination?

.....

5. What would you improve to ensure healthy conditions are maintained in the toilets?

.....

6. Are there any provisions for educating people about basic health and hygiene practices?
- YES
 - NO

7. Do you think that educating women about health practices is important for the Inanda community?

- YES
- NO

Safety

1. Do you go alone to use the toilet facilities at times?

- YES
- NO

2. Do you feel vulnerable to attack?

- YES
- NO

If you answer yes, when are you most vulnerable?

.....

3. Have you seen or heard of any person being a victim of crime whilst using the toilet?

- YES
- NO

If you answer yes, what time of the day?

.....

.....

.....

4. What measure do you take to ensure you safety if you feel unsafe using the toilet at night or during the day times?

.....

.....

.....

5. Is the toilet facility along any busy or is it isolated?

.....

.....

.....

6. To ensure safety for all citizens an appropriate location for the facilities should be encouraged, do you agree to this idea?

- YES
- NO

7. Where do you think, is the most appropriate place for the water and toilet facility?

.....

.....

.....

I would like to thank you sincerely for taking time and participating in this research. ...

QUESTION 3.3 - ANNEXURE A

Interview Questions for Persons Involved in the Research

3.3.1

General

1. How long have you been a community member of the Inanda Township?

15 years
SS
(Ward Number)

2. Since the 1994 democratic elections,

a) Has Inanda seen any improvement from Local government in terms of delivery regarding the provisions of services?

YES
 NO

If you answer yes, please state why

Roads and new houses. Lights, water and toilets

b) Has there been a reduction in crime since 1994?

YES
 NO

3. Do you have access to a toilet at your home?

YES
 NO

If you answer yes, please indicate what system you have

VIP

4. How satisfied are you with the current toilet facilities provided?

- Extremely satisfied
- Slightly satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Dissatisfied
- Extremely dissatisfied

5. Who provided the present toilet system?

Municipality

- NGO
- Community
- Self

6. What system is the toilet?

Flush

- VIP
- Other

7. Did you pay towards the installation of that system?

YES
 NO

8. What are your comments about the condition of the toilet you use?

We are happy to have toilets but they can be better and cleaner

9. Do you have clean household tap water?

YES
 NO

If you answer no, where do you get clean water from?

We walk to the tanks at Inanda. Tanks from municipality also drop off water from pipes

10. What are your comments about the quality of the water service you receive?

We would like running water in the house for cooking and cleaning

11. Do you feel safe to use the toilet at night?

YES
 NO

If you answer yes, please state why

3.3.3 Health

1. Are the toilets kept clean after use from others?
 YES
 NO

2. Is there anyone responsible in ensuring that the toilets are always kept clean?
 YES
 NO
 If you answer yes, who is responsible?

3. Have you experienced any illness or contamination from using the community toilets?
 YES
 NO
 If you answer yes, what type of contamination?
 But my daughter has.

4. Do you know of anybody that has been ill as a result of using the toilet?
 YES
 NO
 MAYBE
 If you answer yes, what type of contamination?
 Infections.

5. What would you improve to ensure healthy conditions are maintained in the toilets?
 Someone assigned to clean.
 Better toilets.

6. Are there any provisions for educating people about basic health and hygiene practices?
 YES
 NO

7. Are the latrines clean and hygienic?
 No. The smell is bad.

8. How would you describe the issues related to safety?
 Safety is a problem. At night, there is no lights and we must walk far.

9. Would you be willing to play an active role within the community to improve existing water and sanitation conditions for women?
 YES
 NO
 If you answer yes, how would you go about doing so?
 Help friends and family get water services. Share what I have.

10. What would you suggest to improve the existing conditions of water and sanitation services?
 More toilets. Toilets closer to homes. More clinics.

11. What do you feel needs to be adopted surrounding the sanitation facility to make it practical and safe for women?
 Day care for children. Job opportunities and access to water or medicine.

7. Do you think that educating women about health practices is important for the Inanda community?

YES
 NO

3.3.4 Safety

1. Do you go alone to use the toilet facilities at times?

YES
 NO

2. Do you feel vulnerable to attack?

YES
 NO

If you answer yes, when are you most vulnerable?

Late at night. But it is unsafe even in the day.

3. Have you seen or heard of any person being a victim of crime whilst using the toilet?

YES
 NO

If you answer yes, what time of the day?

Sometimes in the morning
Always at night.

4. What measure do you take to ensure you safety if you feel unsafe using the toilet at night or during the day times?

I only go to the toilet with light on. My toilet is close to my house.

5. Is the toilet facility along any busy or is it isolated?

Very busy. 5 people live in my house.

6. To ensure safety for all citizens an appropriate location for the facilities should be encouraged, do you agree to this idea?

YES
 NO

7. Where do you think is the most appropriate place for the water and toilet facility?

Close to the houses that don't have water. Close to the road. More paths.

I would like to thank you sincerely for taking time and participating in this research.

QUESTION 3.3 - ANNEXURE A

Interview Questions for Persons Involved in the Research

3.3.1

General

1. How long have you been a community member of the Inanda Township?

2 yrs

(Ward Number)

2. Since the 1994 democratic elections.

a) Has Inanda seen any improvement from Local government in terms of delivery regarding the provisions of services?

YES NO

If you answer yes, please state why

.....

b) Has there been a reduction in crime since 1994?

YES NO

3. Do you have access to a toilet at your home?

YES NO

If you answer yes, please indicate what system you have

.....

4. How satisfied are you with the current toilet facilities provided?

- Extremely satisfied
- Quite satisfied
- Somewhat satisfied
- Neither satisfied nor dissatisfied
- Somewhat dissatisfied
- Quite dissatisfied
- Extremely dissatisfied

5. Who provided the present toilet system?

Municipality

NGO

Community

Self

6. What system is the toilet?

Flush

VIP

Urine Divison

Other

7. Did you pay towards the installation of that system?

YES

NO

2. What are your comments about the condition of the toilets you use?

.....

8. Do you have clean household tap water?

YES

NO

If you answer no, where do you get clean water from?

Fetch from river + bore

9. What are your comments about the quality of the water service you receive?

We have a stand pipe for everyone.

10. Do you feel safe to use the toilet at night?

YES

NO

If you answer yes, please state why

.....

3.3.3 Health

1. Are the toilets kept clean after use from others?

- YES
- NO

2. Is there anyone responsible in ensuring that the toilets are always kept clean?

- YES
- NO

If you answer yes, who is responsible?

3. Have you experienced any illness or contamination from using the community toilets?

- YES
- NO

If you answer yes, what type of contamination?

4. Do you know of anybody that has been ill as a result of using the toilet?

- YES
- NO
- MAYBE

If you answer yes, what type of contamination?

Coughing, weight loss.

5. What would you improve to ensure healthy conditions are maintained in the toilets?

Make it bigger.

6. Are there any provisions for educating people about basic health and hygiene practices?

- YES
- NO

11. Are the toilets clean and hygienic?

Sometimes. When lot people use.

12. How would you describe, are the issues related to safety?

At evening is scared.

13. Would you be willing to play an active role within the community to improve existing water and sanitation conditions for women?

- YES
- NO

If you answer yes, how would you go about doing so?

Better light for street.

14. What would you suggest to improve the existing conditions of water and sanitation services?

Had water at home.

15. What do you feel, needs to be adopted surrounding the sanitation facility to make it practical and safe for women?

Security guard. Shop.

7. Do you think that educating women about health practices is important for the Inanda community?

- YES
- NO

3.3.4 Safety

1. Do you go alone to use the toilet facilities at times?

- YES
- NO

2. Do you feel vulnerable to attack?

- YES
- NO

If you answer yes, when are you most vulnerable?

Late night and early morning.

3. Have you seen or heard of any person being a victim of crime whilst using the toilet?

- YES
- NO

If you answer yes, what time of the day?

Night.

4. What measure do you take to ensure you safety if you feel unsafe using the toilet at night or during the day times?

Go with my sister.

5. Is the toilet facility along any busy or is it isolated?

Busy place.

6. To ensure safety for all citizens an appropriate location for the facilities should be encouraged, do you agree to this idea?

- YES
- NO

7. Where do you think, is the most appropriate place for the water and toilet facility?

Close to where we stay.

I would like to thank you sincerely for taking time and participating in this research.

Vinolia thoda. (30).

QUESTION 3.3 - ANNEXURE A

Interview Questions for Persons Involved in the Research

3.3.1

General

1. How long have you been a community member of the Inanda Township?

35

ward 44

(Ward Number)

2. Since the 1994 democratic elections,

a) Has Inanda seen any improvement from Local government in terms of delivery regarding the provisions of services?

YES

NO

If you answer yes, please state why

rip non-sing, shops

b) Has there been a reduction in crime since 1994?

YES

NO

3. Do you have access to a toilet at your home?

YES

NO

If you answer yes, please indicate what system you have

Container toilet

4. How satisfied are you with the current toilet facilities provided?

Extremely satisfied

Quite satisfied

Somewhat satisfied

Neither satisfied nor dissatisfied

Somewhat dissatisfied

Quite dissatisfied

Extremely dissatisfied

5. Who provided the present toilet system?

Municipality

NGO

Community

Self

6. What system is the toilet?

Flush

VIP

Urine Diversion

Other

7. Did you pay towards the installation of that system?

YES

NO

2. What are your comments about the condition of the toilets you use?

not like flushing

8. Do you have clean household tap water?

YES

NO

If you answer no, where do you get clean water from?

Container

9. What are your comments about the quality of the water service you receive?

good

10. Do you feel safe to use the toilet at night?

YES

NO

If you answer yes, please state why

3.3.3 Health

1. Are the toilets kept clean after use from others?
 YES
 NO

2. Is there anyone responsible in ensuring that the toilets are always kept clean?
 YES
 NO
If you answer yes, who is responsible?
cleaner

3. Have you experienced any illness or contamination from using the community toilets?
 YES
 NO
If you answer yes, what type of contamination?
/

4. Do you know of anybody that has been ill as a result of using the toilet?
 YES
 NO
 MAYBE
If you answer yes, what type of contamination?
Cough and stomach pain

5. What would you improve to ensure healthy conditions are maintained in the toilets?
cleaner

6. Are there any provisions for educating people about basic health and hygiene practices?
 YES
 NO

11. Are the toilets clean and hygienic?
not all the time

12. How would you describe, are the issues related to safety?
night crooks

13. Would you be willing to play an active role within the community to improve existing water and sanitation conditions for women?
 YES
 NO
If you answer yes, how would you go about doing so?
police

14. What would you suggest to improve the existing conditions of water and sanitation services?
private for women

15. What do you feel, needs to be adopted surrounding the sanitation facility to make it practical and safe for women?
better lighting

7. Do you think that educating women about health practices is important for the hands community?
 YES
 NO

3.3.4 Safety

1. Do you go alone to use the toilet facilities at times?
 YES
 NO

2. Do you feel vulnerable to attack?
 YES
 NO

If you answer yes, when are you most vulnerable?
night

3. Have you seen or heard of any person being a victim of crime whilst using the toilet?
 YES
 NO

If you answer yes, what time of the day?
night

4. What measure do you take to ensure you safety if you feel unsafe using the toilet at night or during the day times?
go with husband

5. Is the toilet facility along any busy or is it isolated?
somewhere

6. To ensure safety for all citizens an appropriate location for the facilities should be encouraged, do you agree to this? YES
 NO

7. Where do you think is the most appropriate place for the water and toilet facility?
close

I would like to thank you sincerely for taking time and participating in this research.

Victoria Mthethu
aug 5.
10' clock
DM

QUESTION 3.3 – ANNEXURE A

Interview Questions for Persons Involved In the Research

3.3.1

General

1. How long have you been a community member of the Inanda Township?

Ten yrs and above

(Ward Number).....55.....

2. Since the 1994 democratic elections,

- a) Has Inanda seen any improvement from Local government in terms of delivery regarding the provisions of services?

YES

NO

If you answer yes, please state why

We have many things such as water and toilet as well as house somewhere

- b) Has there been a reduction in crime since 1994?

YES

NO

3. Do you have access to a toilet at your home?

YES

NO

If you answer yes, please indicate what system you have

We uses the pit toilet for such as if the water is lacking

4. How satisfied are you with the current toilet facilities provided?

Extremely satisfied

Quite satisfied

Somewhat satisfied

Neither satisfied nor dissatisfied

Somewhat dissatisfied

Quiet dissatisfied

Extremely dissatisfied

5. Who provided the present toilet system?

- Municipality
 NGO
 Community
 Self

6. What system is the toilet?

- Flush
 VIP
 Urine Division
 Other

7. Did/do you pay towards the installation of that system?

- YES
 NO

2. What are your comments about the condition of the toilets you use?

We feel so happy. Our Samrahouse did not have toilet.

8. Do you have clean household tap water?

- YES
 NO

If you answer no, where do you get clean water from?

9. What are your comments about the quality of the water service you receive?

I would to thank Municipalipal that serves are clean and good.

10. Do you feel safe to use the toilet at night?

- YES
 NO

If you answer yes, please state why

11. Are the toilets clean and hygienic?

Yes

12. How would you describe, are the issues related to safety?

Water is there toilet paper are there

13. Would you be willing to play an active role within the community to improve existing water and sanitation conditions for women?

YES

NO

If you answer yes, how would you go about doing so?

I would to bring it into my house

14. What would you suggest to improve the existing conditions of water and sanitation services?

We would like tap water inside my house

15. What do you feel, needs to be adopted surrounding the sanitation facility to make it practical and safe for women?

We would like to be safety especially in morning or at night

3.3.3 Health

1. Are the toilets kept clean after use from others?

- YES
 NO

2. Is there anyone responsible in ensuring that the toilets are always kept clean?

- YES
 NO

If you answer yes, who is responsible?

One of our community

3. Have you experienced any illness or contamination from using the community toilets?

- YES
 NO

If you answer yes, what type of contamination?

4. Do you know of anybody that has been ill as a result of using the toilet?

- YES
 NO
 MAYBE

If you answer yes, what type of contamination?

5. What would you improve to ensure healthy conditions are maintained in the toilets?

By keeping it clean

6. Are there any provisions for educating people about basic health and hygiene practices?

- YES
 NO

7. Do you think that educating women about health practices is important for the Inanda community?

- YES
- NO

3.3.4 Safety

1. Do you go alone to use the toilet facilities at times?

- YES
- NO

2. Do you feel vulnerable to attack?

- YES
- NO

If you answer yes, when are you most vulnerable?

.....
Especial at noon
.....
.....

3. Have you seen or heard of any person being a victim of crime whilst using the toilet?

- YES
- NO

If you answer yes, what time of the day?

.....
.....
.....

4. What measure do you take to ensure you safety if you feel unsafe using the toilet at night or during the day times?

.....
I would use cellphone to call the
police
.....
.....

5. Is the toilet facility along any busy or is it isolated?

Its busy

6. To ensure safety for all citizens an appropriate location for the facilities should be encouraged, do you agree to this idea?

- YES
 NO

7. Where do you think, is the most appropriate place for the water and toilet facility?

We would like to put it into Centre
of the community

I would like to thank you sincerely for taking time and participating in this research. ...

Thandazile Alongware
In Inanda

[Signature]

2400

20 July

QUESTION 3.3 – ANNEXURE A

General Interview Questions for Persons Involved In the Research

3.3.1

1. How long have you been a community member of the Inanda Township?

Since was born

(Ward Number).....

2. Since the 1994 democratic elections,

- a) Has Inanda seen any improvement from Local government in terms of delivery regarding the provisions of services?

- YES
 NO

If you answer yes, please state why

Yes but is not enough.

- b) Has there been a reduction in crime since 1994?

- YES
 NO

3. Do you have access to a toilet at your home?

- YES
 NO

If you answer yes, please indicate what system you have

Community contain

4. How satisfied are you with the current toilet facilities provided?

- Extremely satisfied
 Quite satisfied
 Somewhat satisfied
 Neither satisfied nor dissatisfied
 Somewhat dissatisfied
 Quiet dissatisfied
 Extremely dissatisfied

5. Who provided the present toilet system?

- Municipality
- NGO
- Community
- Self

6. What system is the toilet?

- Flush
- VIP
- Urine Division
- Other

7. Did/do you pay towards the installation of that system?

- YES
- NO

2. What are your comments about the condition of the toilets you use?

The condition of the toilets you use
was clean.

8. Do you have clean household tap water?

- YES
- NO

If you answer no, where do you get clean water from?

stand pip 5 min

9. What are your comments about the quality of the water service you receive?

The feel bad because they was not
clean at all

10. Do you feel safe to use the toilet at night?

- YES
- NO

If you answer yes, please state why

Because have NO Electricity

Because have NO lock key

11. Are the toilets clean and hygienic?

No.

12. How would you describe, are the issues related to safety?

They very bad because other people
they throw the urine at the floor.

13. Would you be willing to play an active role within the community to improve existing water and sanitation conditions for women?

YES

NO

If you answer yes, how would you go about doing so?

Private toilet

Because the are unsafe at this community

14. What would you suggest to improve the existing conditions of water and sanitation services?

They wants Electricity

Separate men and women

15. What do you feel, needs to be adopted surrounding the sanitation facility to make it practical and safe for women?

* Drain From washing water stand

* Broke tap

3.3.3 Health

1. Are the toilets kept clean after use from others?

- YES
 NO

2. Is there anyone responsible in ensuring that the toilets are always kept clean?

- YES
 NO

If you answer yes, who is responsible?

.....

.....

3. Have you experienced any illness or contamination from using the community toilets?

- YES
 NO

If you answer yes, what type of contamination?

Because other people they use toilet with
wrong time & they do neatness

4. Do you know of anybody that has been ill as a result of using the toilet?

- YES
 NO
 MAYBE

If you answer yes, what type of contamination?

They get normal flu

5. What would you improve to ensure healthy conditions are maintained in the toilets?

SECURITY

Care take

6. Are there any provisions for educating people about basic health and hygiene practices?

- YES
 NO

7. Do you think that educating women about health practices is important for the Inanda community?

- YES
- NO

3.3.4 Safety

1. Do you go alone to use the toilet facilities at times?

- YES
- NO

2. Do you feel vulnerable to attack?

- YES
- NO

If you answer yes, when are you most vulnerable?

Because they many theft in this
area

3. Have you seen or heard of any person being a victim of crime whilst using the toilet?

- YES
- NO

If you answer yes, what time of the day?

4. What measure do you take to ensure you safety if you feel unsafe using the toilet at night or during the day times?

The are using early

5. Is the toilet facility along any busy or is it isolated?

Its along busy

6. To ensure safety for all citizens an appropriate location for the facilities should be encouraged, do you agree to this idea?

YES

NO

7. Where do you think, is the most appropriate place for the water and toilet facility?

centre of community

I would like to thank you sincerely for taking time and participating in this research. ...

I'm Nonkangiso Hlongwane

20 July 2015

3'oclock

~~Nonkangiso~~