

**CRITICAL ANALYSIS OF WATER-RELATED PRACTICE
AND BEHAVIOUR INFLUENCING WATER RESOURCE
POLLUTION IN PODING TSE ROLO**

By

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DECLARATION

I, Velile S. Dywili declare that this study: ***Critical Analysis of water-related practice and behaviour influencing water resource pollution in Poding Tse Rolo***, represents original work by the researcher and has not otherwise been submitted for any degree or diploma to any tertiary institution including universities. Where references have been made and quoted they are duly acknowledged in the text.

VS Dywili

Date

DEDICATION

This study is dedicated to my lovely wife Mookgo who has supported and encouraged me through hard times. My two children, Siyabonga and Sibongile you are so dear to me, I love you so much. The biggest thank you goes to my Lord Jesus Christ from whom I gathered spiritual strengths during my years of study. You are my Lord forever.

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ABSTRACT

Providing adequate sanitation facilities to the poor is a major challenge facing developing nations such as South Africa. Increasing population pressure adds to the problem of providing sanitation in many of these countries, especially in urban areas. As a result of increased pressure on infrastructure there has been a disturbing increase in the number of poorly designed and poorly operated waterborne sewerage systems, especially in densely populated settlements in South Africa. When sanitation fails or is inadequate the impact on the health of the community and on the receiving water environment can be extremely serious. The population issue and urbanisation have placed pressure on local authorities to provide adequate sanitation facilities, and just as importantly, educating people using these facilities regarding proper maintenance and use of these facilities.

The study is aimed to determine how and why the sanitation and water related practices or behaviour of Poding Tse Rolo community contributes to the sewer and manhole blockages. This community was chosen because the Department of Water Affairs and Forestry (DWAF) Free State region received several complaints of sanitation problems from the community members such as farmers, and individual members who are directly affected by the wastewater overflows in this area. Through discussions with some of the community members and municipal officials an interest was expressed in finding possible solutions to the above problem.

The majority of people in Poding Tse Rolo are using waterborne systems that are situated in-yard (not in-house) with only a small portion of the township, still using bucket systems. The samples collected indicated that 42 percent of the breadwinners in Poding Tse Rolo are domestic workers with only 25 percent working as general workers or in government departments. Manhole blockages are due to foreign objects such as spoons, cloths and plastics. Although the findings indicated that households remove all solid materials before disposing of grey water into the drains, the drains seemed to have defective sieves and solid objects could pass through into the sewers.

The community is mostly using toilet paper for anal cleaning and were aware that other types of material such as newspapers could block the toilet especially if used in large quantities. However, during the observations newspapers were found in the toilets and about 22 percent of the toilets were without any anal cleaning paper. Children between

one and three years of age normally do not use the toilet because they are afraid of falling in and using too much paper.

The study found that the sustainability of the waterborne system is on the borderline due to the low socio economic status of the people, the insufficient community participation at ward meetings and the lack of employment opportunities in Poding Tse Rolo.

ABSTRAK

Die verskaffing van sanitêre fasiliteite aan die armes is 'n uitdaging vir ontwikkelende nasies soos Suid-Afrika. Verhoogte populasiedruk dra by tot die probleme wat ondervind word in verskeie lande, veral in stedelike gebiede. As gevolg van die verhoogte aanvraag in infrastruktuur is daar 'n kommerwekkende verhoging in die aantal swak ontwerpte en disfunksionele waterdraende afvalstelsels veral in digter bevolkte woongebiede in Suid-Afrika. Wanneer sanitasie ontbreek of onvoldoende is kan die gesondheid van die gemeenskap en die opvangsomingewing ernstig beïnvloed word. Die bevolkingskwasie en verstedeliking het druk op plaaslike owerhede geplaas om geskikte sanitasiefasiliteite te verskaf asook om die gemeenskap in te lig oor aspekte soos behoorlike onderhoud en die gebruik van hierdie fasiliteite.

Die studie is daarop gemik om vas te stel hoe en hoekom die sanitasie en verwante water praktyke of gedrag van die Poding Tse Rolo gemeenskap bydra tot die riool en blokasies van mangate. Hierdie gemeenskap is gekies omdat die Departement van Water Wese en Bosbou (DWAF), Vrystaat streek, verskeie klagtes ten opsigte van probleme met sanitasie ontvang het, onder andere van boere en individue wat direk geaffekteer word deur die oorfloei van afvalwater in die gebied. Tydens samesprekings tussen sommige gemeenskapslede en munisipale beamptes is belangstelling getoon om moontlike oplossings vir die bogenoemde probleme te vind.

Die meerderheid van mense woonagtig in Poding Tse Rolo gebruik waterdraende stelsels wat in die erwe aangetref word (nie in die huise nie) met slegs 'n klein gedeelte van die woongebied wat steeds die emmerstelsel gebruik. Die versamelde data dui aan dat 42 persent van die broodwinners in die woongebied huisbediendes is en slegs 25 persent wat as algemene werkers of in staatsdepartemente werk. Verstoppings van mangate word veroorsaak deur vreemde voorwerpe soos lepels, lappe en plastiek. Alhoewel die resultate aandui dat huishoudings al die soliede materiaal verwyder voordat die gryswater in die dreineringsstelsel ingaan, is daar aanduidings dat die stelsels oneffektiewe sifwe het en dat vaste voorwerpe nog steeds in die dreineringsstelsels beland.

Die meeste van die lede van die gemeenskap gebruik toiletpapier vir anale reiniging en is bewus dat ander soorte materiale soos koerantpapier die toilet sou blokkeer veral as groot hoeveelhede gebruik word. Tydens die studie is koerantpapier in die toilette gevind en in 22% van die toilette was daar geen anale skoonmaak papier beskikbaar nie. Kinders tussen een en drie jaar gebruik gewoonlik nie die toilet nie want hulle is bang hulle val in of dat hulle te veel toiletpapier sal gebruik.

Die studie het aangedui dat die onderhoud van die watergedraagde stelsel in die weegskaal is as gevolg van die lae sosio-ekonomiese status van die mense, die onvoldoende gemeenskapsdeelname aan streeksvergaderings en die tekort aan werkseleenthede in Poding Tse Rolo.

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CHAPTER ONE

THE PROBLEM AND ITS SETTING

1.1 INTRODUCTION

The study was conducted in the community of Poding Tse Rolo, Philippolis, which falls under the jurisdiction of Kopanong Local Municipality in the Free State Province of South Africa. Poding Tse Rolo is one of the wards in the historically black township of Philippolis, which is situated about 160 kilometres south west of Bloemfontein (Figure 1). Poding Tse Rolo has 745 households and about 4 000 residents (Kopanong Local Municipality, 2001:18-35). The majority of people in the township are using waterborne sewage systems. Only a small portion of the township, mainly in the informal settlement areas, is using the bucket system by the time the study was conducted.



Figure 1: Location of Philippolis (Kopanong Local Municipality) in the Free State (GIS-DWAF NC, 2009)

Poding Tse Rolo has experienced problems with the effective and efficient provision of sanitary services to the township. Wastewater, sewer and manhole blockages in 2004

resulted in sewage overflow into the streets and in the yards of the community. These blockages were mainly observed in the Poding Tse Rolo ward township (Table1).

Table 1: Number of blockages experienced per month in the Poding Tse Rolo (Voster, 2007: personal communication)

Months	Nov. 2004	Dec. 2004	Jan. 2005	Feb. 2005	Mar. 2005	Apr. 2005	Total
Number of blockages per month	5	3	4	6	15	14	47

The Department of Health (DoH) investigated the problem of sewage blockages in 2004 to 2005 as this was seemingly affecting the health of the community negatively. The DoH submitted a report to the Kopanong Local Authority in 2004, outlining the extent of the problem and health implications if it was attended to (Sewnarain, 2004: personal communication).

The Department of Water Affairs and Forestry (DWAF) intervened following the 2004 report of the DoH as the impact of the overflows was not only a local problem. Several complaints had also been raised by the farmers and individual members of the community who were directly affected by sewage overflows. When the DWAF conducted routine inspections in 2004 in Philippolis, the Department found that the oxidation pond system (ponds used to treat wastewater) was operating above its capacity. Raw sewage was spilling over the walls of the ponds into the environment. These ponds serviced the sewerage of both the Philippolis town and Poding Tse Rolo. According to the 2003/2004 records of the DWAF and the Unit Manager of Philippolis (Voster: 2004. personal communication), the number of blockages experienced in Poding Tse Rolo was increasing.

In 2005 the DWAF investigated whether any major industries in the Poding Tse Rolo ward were discharging any products that could have contributed to the blockages and overloading of the ponds system into the municipal sewer network. It was found that no major factory exist in Philippolis except an abattoir. According to Voster (2005: personal communication), the municipality had an agreement with the Philippolis abattoir to discharge its liquid effluent into the municipal sewerage lines. However, no written records granting permission to major factories and businesses to discharge effluent into the municipal sewer network exist. There were also two clinics, four schools, a municipal

office and a few shops in the Poding Tse Rolo ward that used the sewage system (Kopanong Local Municipality, 2005).

The main sewage line that conveys raw sewage from Poding Tse Rolo broke in 2005 and was repaired and upgraded two months later. The municipality believed that the pipe was old and too small to handle the sewage load from the township. However, according to the Kopanong Local municipality, blockages were still being experienced even after the main sewage line had been upgraded (Voster, 2005, personal communication). Numerous complaints reached the offices of the DWAF in 2004/2005 and it was realised that an alternative approach, other than repairing and unblocking the manholes, was needed to provide a long term solution to the problem. The DWAF proposed an approach that would focus on the community's cultural and behavioural habits as well as on other practices that were related to sanitary and personal hygiene. It also became necessary to understand how the community would react to environments and non-functional systems that could affect their health and safety (Figure 2)

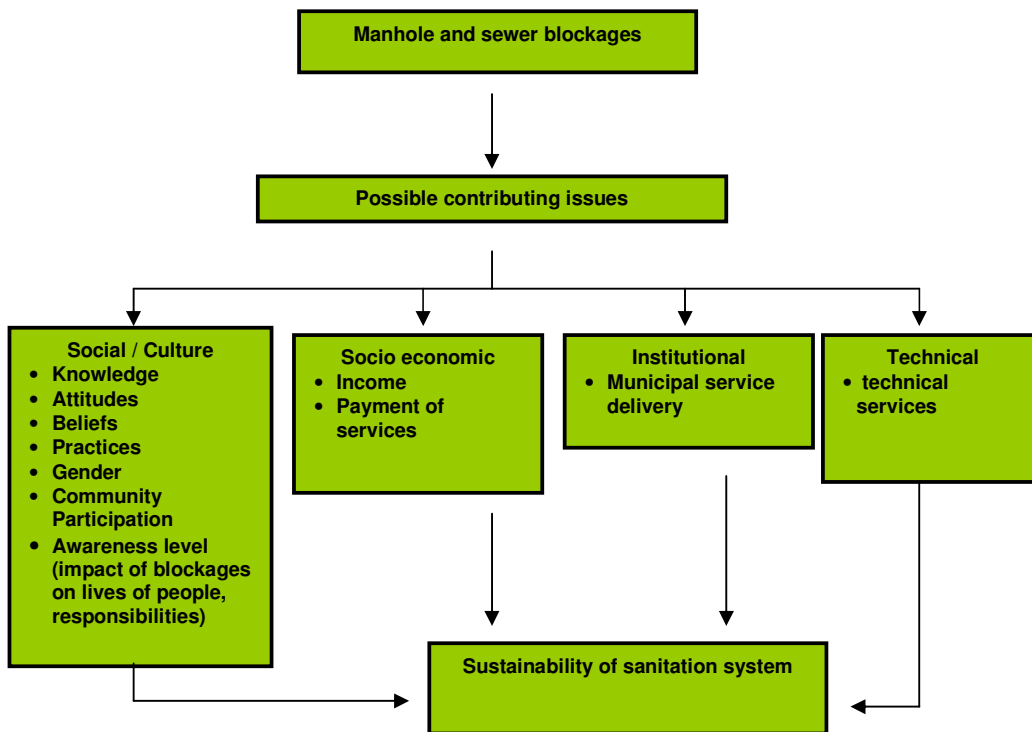


Figure 2: Breakdown of the components contributing to the problems which are related to the provision of sanitary services to Poding Tse Rolo.

1.2 THE AIM OF THE STUDY

The study aimed to determine to what extent the sanitation, water provision practices and the behaviour of the Poding Tse Rolo community contributed to the sustainability of the provision of sanitation services to the area. Sanitation-related practices and behaviour of the community were included in this study for two reasons:

1. According to Pickford, Barker and Load (1993), water and sanitation projects do not adequately take individual and community behaviour into account. When the social and cultural practices that influence sanitation systems are understood, the authorities might be in a better position to address the sanitation problems.
2. In sanitation projects, goals have tended to focus on the number of toilets constructed or number of people given access to sanitation and not on the exploration of people's cultural and social behaviour towards proper handling of these facilities (Jagals, 2001:1-40).

1.3 OBJECTIVES OF THE STUDY

In view of the variables as shown in the problem tree (Figure 2), the following objectives of the study are listed;

- To determine the role that the human social and cultural behaviour played in the occurrence of sanitation-related malpractices;
- To investigate the extent of the personal cleansing practices of the community which might have lead to blockages in the wastewater sewer systems in Poding Tse Rolo;
- To evaluate the knowledge and level of awareness that existed in the community regarding sanitation and hygiene education; and
- To assess the potential to sustain the sanitation system in the presence of socio-cultural and behavioural practices.

1.4 OPERATIONAL HYPOTHESES

It was hypothesised that the behavioural and cultural practices of the community of Poding Tse Rolo negatively influenced the sustainability of the sanitation systems.

A second hypothesis was that the Poding Tse Rolo community was not aware of how the occurrences of sewerage overflows and manhole blockages influenced their lives.

1.5 ASSUMPTIONS

The following assumptions were made in this study:

- When blockages in a sewage network are reported, efforts are usually made to rectify the problem. It was therefore assumed that there was co-operation and communication between different municipal directorates in terms of issues affecting the maintenance of sanitary systems.
- Because brochures and community health education programmes promote health orientation issues, it was assumed that environmental health practitioners were conducting the inspections and that they reported their findings to the local municipality.

1.6 DELIMITATIONS

The community of Poding Tse Rolo was chosen for this study after the Water Quality Section of the DWAF in the Free State had received several complaints related to sanitation in 2004. The community included those residents who were farmers as well as individual township residents directly affected by the manhole, sewer blockages and wastewater overflows in Poding Tse Rolo.

The study was therefore limited to the Poding Tse Rolo ward and excluded the town Philippolis. No investigations were done regarding the budgeting or cost to replace infrastructures by the Water Services Authority, namely Kopanong Local Municipality.

1.7 DEFINITIONS

Access to water supply means a distance of less than 200m and quantity of 25 litres per person per day (Ward, Hall and Clacherty, 2000:14).

Free Basic Water (FBW) means provision of 6000 litres of portable water per household per month (South Africa, 2002d:3-4).

Sanitation refers to the principles and practices relating to the collection, removal or disposal of human excreta, household waste water and refuse as they impact upon people and the environment. Good sanitation includes appropriate health and hygiene awareness and behaviour, and acceptable, affordable and sustainable sanitation services (South Africa, 2002d:3).

Sustainability means that the future is not mortgaged for the sake of the gains of the present and also not wasting what is presently available. In the context of development, activities for sanitation improvement imply improvement to the quality of life, health and nutritional status, equity in access to resources and services per capita income and the perceived quality of the human environment (Jagals, 2001:3).

Basic Level of Service means an ongoing programme of easy to understand information about correct hygiene practices. A Ventilated Improved Pit (VIP) toilet in its variety of forms, or its equivalent, as long as it meets certain minimum requirements in terms of cost, sturdiness, health benefits and environmental impact. This definition reinforces the notion that sanitation is not only about physical infrastructure but that information on health and hygiene are essential (South Africa, 2001).

Reconstruction and Development Programme (RDP) is an integrated coherent socio economic policy framework that seeks to mobilize all the countries resources towards final eradication of apartheid and building of a democratic non racial and non sexist future (South Africa,1994)

1.8 OVERVIEW OF THE CHAPTERS

Chapter one is a statement of intent with regards to the aims and objectives of the investigation. A determination of the sustainability of the waterborne sanitation system in Poding Tse Rolo is presented, and the relationships between the environmental power bases for example social, technical and economic factors, are discussed. The need to establish correlation between the attitudes, knowledge, beliefs and practices of communities is presented.

Chapter two reviews the literature. The relationship between the existing knowledge regarding sewage removal problems as reported in the literature and the realities of the problem as it manifested in the Poding Tse Rolo are shown. The gaps in the existing knowledge are highlighted.

Chapter three deals with the study methodology. It outlines different operational phases followed to gather information related to the behaviour, practices, beliefs and attitudes of the community which influenced the sustainability of sanitation services in the area.

Chapter four reports the findings of the investigation into the cultural and behavioural practices of the community regarding the use of sanitation systems and how these practices might have influenced the manhole and sewer blockages.

Chapter five describes the relationships between the findings of the study and highlights the realities of what was happening in terms of the sewage situation in Poding Tse Rolo at the time of the study.

The chapter also identifies some of the gaps between the literature reviewed and the outcomes of the study.

Chapter six includes a survey of the problem and presents a number of recommendations.

CHAPTER TWO

REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

The chapter reviews local and international literature on the role which the socio-economic status of communities plays in the selection and sustainable management of sanitation systems. It also gives an overview of the sanitation provision processes as they were addressed in the past, the current situation and the impacts emanating from unhygienic behavioural practices of communities. This chapter discusses some of the factors that led to the fragmented water and sanitation service delivery during the apartheid regime. It also reviews a number of water and sanitation legislations and policies that were developed pre- and post the first democratic elections in 1994.

A summary is provided of the history of community's water and sanitation management and the role that community participation played in prompting communities to deal with sanitation challenges. Amongst the challenges presented in the chapter are the operational issues in areas where sewerage systems are installed. The literature review indicates how the participation and the involvement of children and women in the sanitation projects are key to the sustainable operation and maintenance of sanitation services.

2.2 THE ROLE OF LEGISLATION RELATED TO WATER AND SANITATION IN SOUTH AFRICA

2.2.1 Legislation pre-1994

Before 1994, 14 million South Africans were without access to clean and basic water supplies. Another 21 million people, half the country's population, did not have basic sanitation (South Africa, 2004:1). This backlog was due to the past apartheid regime that did not address the water and sanitation inequity between the various groups in South Africa. The Water Act (Act 54 of 1956) governed the management of water in South Africa. This act entrenched two principles:

The riparian principle which linked water rights to ownership of land and the distinction between public and private water.

Previously the Republic of South Africa was divided into different administrative and political areas. South Africa had four independent states, namely Transkei, Bophutatswana, Venda and Ciskei. There were ten homelands and a number of rural areas that were managed by tribal authorities. This situation resulted in a fragmented approach to service provision with no cohesive strategy, guidelines or support structures to guide the provision of sanitation (South Africa, 2002a:2). Aziz, Hogue, Huty, Minnatullah, Hasan, Patwary, Rahaman and Cairncross, 1999, discussed the relevant legislation and policies related to water supply and sanitation and concluded that those policies could not:

- improve the health of the communities;
- reduce human suffering; or
- introduce systems to establish an economic infrastructure.

Water policies were designed to meet the needs of the white population and white-owned industry and agriculture, with a lenient disregard for the needs of the rest of the population, especially in rural areas. Official policies and approaches focused on source development and the building of new water schemes.

The Department of Development was at the time of apartheid responsible for water and sanitation service provision. Limited or no services were available in the former black urban or rural areas. Where services were provided, these were often in a bad state of disrepair and were characterised by a lack of consultation and buy-in from the different stakeholders (South Africa, 2004:8-10). There was also a proliferation of institutional structures, with unclear institutional framework and responsibilities that failed to make provision for water and sanitation available where it was needed most (South Africa, 2002a:2). Mr Helgard Muller, Chief Director of Water Services of the DWAF, explained, "The Department of Water Affairs was concerned only with water resources, there was no national department responsible for water services" (South Africa, 2004:8). Delivery of water and sanitation to ordinary people was solely in the hands of local government. This was usually well managed in white areas, but facilities and infrastructure were markedly worse in urban black areas and fell away further in rural parts, where there would often be no basic water supply. As a result, prior to 1994 there were as many as 14 million South Africans without access to a clean basic water supply and at least another 21 million without basic sanitation.

Sanitation policies were not in place to guide the services delivery and to ensure that people's needs were considered and enshrined in legislation. People had no free basic water and no subsidization in the form of capital cost, maintenance and operational cost for the construction of toilets.

2.2.2 LEGISLATION AFTER 1994

This section highlights some of the policies and legislation that the first South African democratic government formulated after the 1994 elections. The DWAF inherited the Water Act, Act no. 56 of 1956 before 1994 and as a result did not treat water as a fundamental right and social priority. In 1995, the National Sanitation Task Team (NSTT) comprising of representatives of the national departments was formed. After consultation with the national departments, the process was further taken to three levels of government, non-governmental organisations (NGOs), community based organisations (CBOs) and other stakeholders. The specific objective of the NSTT was to provide a coherent framework for addressing the sanitation backlog (South Africa, 2004:11)

When the Constitution of South Africa was published in 1996, the local government was assigned with the responsibility of providing water and sanitation services to all communities. People's rights were also endorsed in Section 24 of the Constitution (1996) which states that "everyone has the right to an environment that is not harmful to their health and well being and to have an environment protected for the benefit of present and future generations through reasonable legislative and other measures". The responsibilities of ensuring these rights were assigned to different government institutions in accordance to their level of authority (South Africa, 2002a:3).

The DWAF further developed policies and legislation in support of basic water and sanitation services. The following were amongst the legislation developed, such as;

- Water Supply and Sanitation Policy, White Paper, November 1994;
- National Water Policy for South Africa, White Paper, April 1997;
- Norms and standards in respect of tariffs for water services in terms of section 10 (1) of the Water Services Act (Act no. 108 of 1997);
- Water Services Act (Act. no. 108 of 1997);
- National Water Act (Act. no. 36 of 1998);
- Strategic Framework for Water Services (2003); and the

- Draft Water Services Act Amendment Bill, June 2004.

The White Paper on Basic Household Sanitation indicates that the local authority is responsible for driving the process at local level, for the creation of an enabling environment through its municipal by-laws and for taking responsible decisions on the level of services to ensure that they are both appropriate and affordable. The Water Services Act (Act no. 107 of 1997) further requires the local government to develop an Integrated Development Plan (IDP) which is aimed at an integrated development and management of services in its area of jurisdiction. One component of this plan is a Water Service Development Plan (WSPD) that reviews service level and backlogs and which sets clear objectives with quantifiable performance indicators (Abrams, [n.d]:10-11).

Municipal legislations were also developed and implemented to transform the local government. This municipal legislation includes the Local Government Municipal Demarcation Act of 1998 (Act no. 27 of 1998), which provides the criteria for the determination of municipal boundaries. Section 24 of the Act provides for the demarcation of the municipal boundaries and the election of the board that will establish an area that will enable the municipality to fulfil its constitutional rights of equitable and sustainable services provision. With the change from apartheid to democracy there was also a change of municipal legislation and the demarcation processes. Bhagwan (2002:16-23) acknowledged that these changes had a major impact on the manner in which municipalities function.

2.3 SANITATION

A number of definitions exist for sanitation which describes sanitation as the maintenance of sanitary conditions and basic sanitation as the provision of sufficient hygiene, hazard free toilets, the effective removal and disposal of household waste and effective waste disposal (South Africa, 2001). The United Children's Fund (cited in South Africa, 2002a:10) considers sanitation as a part of a broader environmental issue including excreta disposal, silage disposal, drainage and refuse disposal. Sanitation is also defined as a package of services and actions that are taken together which can influence the health of a person and the health status in a community.

Sanitation also includes:

- safe disposal of human excreta, particularly the faeces of young children, babies and people with diarrhoea;
- keeping water free from faecal contamination in homes and at the source; and

- hand washing after defecation and after handling babies' dirty nappies, before feeding, eating and before preparing food.

The definition of sanitation according to the DWAF (2004) therefore signifies the importance of involving the community when water and sanitation services are provided. Previously, sanitation service provision in South Africa was primarily focused on toilet building, wastewater sewers and maintenance, with little consideration given to communities' needs or health and hygiene education. As a result, those who had inadequate sanitation were forced to continue using the rudimentary systems such as pit latrines or buckets (South Africa, 2002a:2).

2.3.1 The impact of poor sanitation

According to an article entitled 'Estimating the burden of disease attributable to unsafe water and lack of sanitation and hygiene in South Africa' (Lewin, Norman, Nannan, Thomas and Bradshaw and the South African Comparative Risk Assessment Collaborating Group (2007), unsafe water and lack of sanitation and hygiene are risk factors for diarrhoeal and other diseases. All people who lack adequate sanitation facilities are exposed to unpleasant and unhealthy daily routines. However, the impact on women and girls is the greatest. In their household role, they may more readily spread disease-causing pathogens from being exposed to the faeces of other family members. Restricted toilet opportunities cause discomfort and increase the likelihood of health problems such as urinary track infections and chronic constipation, as well as causing unnecessary mental stress. Sick, pregnant and post-partum women particularly suffer from lack of sanitation. Unless the importance of the relationship between the sanitary needs of communities and health and hygiene education is clearly understood, sustainability of any sanitary programme will not be possible (Jaffe, Dartnall and Torr, 2003:6-17).

2.4 WATER SECTOR DEPARTMENTS: THEIR ROLES AND RESPONSIBILITIES

2.4.1 The Department of Water Affairs and Forestry

The DWAF's mandate is to ensure that all South Africans have equitable access to water and sanitation services. Where local government is unable to carry out the functions of water and sanitation services, the DWAF has to support the municipalities to effectively provide these services to communities (Jones and Williamson, 2005:7-35). Support is in the form of building capacity and ensuring that the municipalities compile comprehensive

business plans that address the water services within their areas of jurisdiction (National Community Water and Sanitation Training Institute [NCWSTI], 2000:4-10). Two sector targets have been set by the government, namely to provide access to a basic water supply for all by 2008 and access to basic sanitation by 2010 (Mvula Trust, 2007:11). In this context basic water means that each individual should have access to at least 25 litres of potable water per day within 200 metres of their home (South Africa, 2000b:6).

The DWAF, together with other national role players, is responsible for:

- developing norms and standards for the provision of sanitation;
- co-ordinating the development by the municipalities of Water Services Development Plans (WSDP's) as a component of their Integrated Development Plans (IDP);
- providing support to the provinces and municipalities in the planning and implementation of sanitation improvement programmes;
- monitoring the outcome of such programmes and maintaining a data base of sanitation requirements and interventions;
- providing capacity building support to provinces and municipalities in matters relating to sanitation;
- providing financial support to sanitation programmes until such time as these are consolidated into a single Department of Provincial and Local Government programme; and
- undertaking pilot projects in programmes of low cost sanitation.

(South Africa, 2002a:7)

The DWAF is currently focusing on the sanitation backlog as there are numerous far-reaching socio-economic and environmental benefits to be enjoyed from better household sanitation. The Department's success in the area of basic services delivery is noticeable, having provided basic water services from 1994 to 2004 to ten million people in the rural areas. In 2005 the government of South Africa reported that 2 522 54 buckets were then being used in established settlements. President Thabo Mbeki, in his state of the nation address in 2006, announced that by 2007 all bucket systems in pre-1994 settlements had to be eradicated. The Minister of the DWAF, Ms Lindiwe Hendricks cited in WISA (2008:27-28) reported that during the launch of the Bucket Eradication Programme at Sunday River Valley in the Eastern Cape, the Department had come close to achieving the goal of eradicating the bucket systems (Table 2).

Table 2: Progress with the bucket eradication programme in the Free State (WISA, 2008:28)

Locality	Bucket		VIP Sanitation	
	2001	2007	2001	2007
Free State	150 415	85 117	348 437	266 256

2.4.2 Department of Provincial and Local Government (DPLG)

The Department of Provincial and Local Government (DPLG) is the custodian of the Municipal Systems Act (Act no. 32 of 2000) and the Municipal Structures Act (Act no. 117 of 1998). All matters relating to provincial and local government systems and structures fall within the ambit of this department.

The DPLG takes primary responsibility for:

- promoting the development of the Integrated Development Plans (IDP) by the municipalities;
- ensuring that provincial and local governments have the capacity required to fulfil their functions; the co-ordination, together with the National Treasury, of the provincial and local governments equitable share and municipal infrastructure grants;
- provision of financial support to sanitation programmes; and
- monitoring of such programmes and maintaining a data base (South Africa, 2001:22-27).

In the Free State Province the Department of Local Government and Housing (DLGH), in partnership with the DWAF, launched Project Consolidate in December 2004. The aim of Project Consolidate was to assist the local authorities in rendering water and sanitation services. The most common shortcomings of the municipalities as identified in the main report regarding National Wide Sustainability Audit of Sanitation Facilities was the lack of skilled personnel to do the operation and maintenance of the sanitation systems and financial assistance for the installation of water and sanitation systems (South Africa, 2005b:51). DPLG recognised that for effective service delivery and sustainable operation and management of sanitation systems a participatory approach is crucial. DPLG and DWAF acknowledged the importance of an integration approach to service delivery instead of working in isolation. The Minister of Local Government and Housing, Mr Sydney Mufamadi, as cited in South Africa, DPLG (2007), highlighted that only those municipalities

which had more resources at their disposal and collected more revenues, stood a better chance of delivering better service.

2.4.3 Department of Health (DoH)

The vision of the Department of Health is a caring and humane society in which all South Africans have access to affordable, good quality health care.

The Department of Health, in co-operation with the provinces, takes primary responsibility for:

- co-ordinating information relating to public health (this includes media liaison and communication);
- co-ordinating the planning and interventions aimed at influencing the health and hygiene behaviour of communities and creating a demand for sanitation services through health and hygiene awareness and education programmes;
- standardising existing and preparing new norms and standards relating to health aspects of sanitation and water supply;
- preparing educational curricula relating to health and sanitation;
- supporting municipalities in employing sufficient and appropriately skilled environmental health practitioners (EHPs);
- providing development orientated training and other capacity building interventions to EHPs;
- monitoring compliance with health legislation, regulations and norms and standards;
- co-ordinating interventions when a crisis poses a regional or national health risk (such as a cholera epidemic); and
- providing a systematic approach to the provision of sanitation facilities in clinics, hospitals and other health installations (South Africa, 2001:23)

2.4.4 Department of Public Works

The Department of Public Works acts as the implementing agent on behalf of national and provincial government departments when facilities, including schools and clinics, are constructed or rented.

This Department manages the following functions as the implementing agent:

- planning of projects to construct facilities (usually buildings);
- administering projects; and
- managing facilities for client departments (South Africa, 2001:23).

The Department of Public Works has an important responsibility in ensuring that adequate provision is made for sanitation facilities in government and public buildings, especially in schools, and for ensuring that norms and standards are complied with. It is however acknowledged that departments such as the police, correctional services and defence remain responsible for the sanitation services within their installations. At local level, the municipality and at national level, the Department of Water Affairs and Forestry, will assume responsibility for public networks where they exist. The Department of Public Works is also responsible for implementing the community based public works programme.

2.4.5 Department of Education

The National Department of Education is responsible for the development of curricula while the Provincial Departments of Education are responsible for the provision of school facilities which include school toilets and other sanitation facilities. The responsibilities of the National Department of Education in the improvement of school infrastructure, of which adequate sanitation is an important component, are:

- development of norms and standards for school infrastructure;
- improving the funding levels for capital development;
- development, implementation, co-ordination, alignment and monitoring of policy for capital investment in education;
- development of support systems as well as capacity building at provincial level; and
- development and maintenance of information systems to support the planning, implementation, monitoring and evaluation of capital investment in education.

The Department of Education, together with the Department of Health, develops curricula, guidelines and other support mechanisms required by teachers and other educators to take up the important issues relating to health, hygiene and sanitation in their classrooms.

Furthermore, the Department of Education, in collaboration with the Department of Health, introduced the Health Promoting Schools Programme in South Africa.

The provincial departments of Education and Health are responsible for implementing the health promoting schools strategy. The following strategies provide a framework for developing health and promoting schools and sites of learning such as;

- developing education and school policies which support health development and well-being;
- creating safe and supportive teaching and learning environments;
- strengthening community action and participation through enhancing and expanding the relationship between sites of learning and the community. (South Africa, 2001:21-25).

2.4.6 National Treasury

The responsibility of the National Treasury relates to the funding of the different departments and spheres of government.

Treasury takes primary responsibility for:

- funding arrangements such as the allocation of an equitable share and the various grants to provinces and municipalities;
- monitoring of the financial policies and performance of national departments, provinces and municipalities; and
- development of financial policies, norms and standards and guidelines (South Africa, 2001:25-26).

2.4.7 The private sector

Government cannot effectively address the huge sanitation backlog alone (South Africa, 2002a:3-4). A lack of capacity in the government departments has led to the involvement of the private sector and non-governmental organisations to ensure that sanitation problems are addressed.

Private sector involvement includes:

- planning, design and construction of sanitation infrastructure;

- the water services provider or municipal services partner function;
- manufacturing and supplying toilets; and
- financing higher levels of infrastructure than government is prepared to fund.

2.4.8 Non-governmental organisations

The non-governmental organisations include:

- health and hygiene awareness promotion and education;
- training and capacity building;
- facilitating community participation;
- implementing community-based sanitation improvement projects;
- developing community-based construction teams; and
- monitoring the implementation of programmes.

(South Africa, 2001:21-29)

Jones and Williamson (2005) emphasise that different types of collaboration are needed at different levels. Reviewing these collaborative structures will make them stay relevant in a context of change. It is evident that there is interdependency between the roles and responsibilities of the above mentioned institutions. Their co-operative partnership to ensure the sustainability of the sanitation systems cannot be overestimated. Moreover, the coordination of activities between the institutions can assist in effectively addressing the challenges of providing water and sanitation services by local governments.

These departments have had a practical working relationship in the Free State Province where Philippolis is situated. The Departments of Health and Education and the DWAF work together during national events such as Arbour Week, National Water Week, World Water Monitoring Day and water sanitation and health campaigns to raise awareness amongst communities on issues such as water conservation, sanitation and water resource pollution. The co-ordinated activities have been successful despite challenges of capacity faced by these departments (Mohapi, 2005, personal communication).

2.5 LOCAL GOVERNMENT SETTINGS

The Municipal Structures Act (Act 33 of 2000) provides for the establishment of municipalities in accordance with the requirements relating to categories and types of

municipality. The Act also provides for an appropriate division of functions and powers between categories of municipalities; for example, the act allocates the responsibility for water services to district municipality or the local municipality. Depending on the size and financial strength of the municipality, authorisation is needed from the Minister of Provincial and Local Government to allocate water services responsibilities to district or local municipality (South Africa, 2005a:4).

2.5.1 Categorisation of municipalities

Water Services Authorities of South Africa are divided into the three categories, namely:

1. Metropolitan areas;
2. District municipalities; and
3. Local municipalities.

2.5.1.1 Metropolitan Areas

The metropolitan areas are those municipalities with economically strong urban areas and adequate capacity to cross-subsidise poor consumers.

They have relatively strong single administrations for water supply. Although there may be a 'rural periphery' within the metro municipal boundary, the capacity of the authority is typically sufficient to cope with this. These metros generally manage the complete water system, except for bulk supply where a water board manages the distribution.

2.5.1.2 Districts and Local municipality categorisation (B1-B4)

The institutional option of municipalities as Water Service Provider (WSP) is set against the core function and the capacity of the municipalities. Two major categories are used:

1. Local Municipality (Category B); and
2. District Council (Category C) municipalities.

(1) Large town or city as core (B1)

Category 'B1' municipalities represent a medium or large town municipal areas, for example Durban or Cape Town, as its core. It is therefore likely to be feasible for the municipality to take over the full WSP function for the whole area of responsibility.

Although there may be a 'rural periphery' within some of the Category B municipal boundaries, the capacity of the authority will typically be sufficient to cope with this.

(2) Medium town as core (B2)

A Category 'B2' municipality represents a medium sized town, for example Philippolis or Christiana in North West province as its core. It may not be feasible for the municipality to take over the full WSP function for the area. Where capacity is low in relation to the demand for services, the municipality may look at contracting other WSPs.

(3) Small town as core (B3)

The capacity to manage water services in Category B3 municipalities is reduced to operating activities only, for example Moshaweng in the Northern Cape province. A number of options for providing water services need to be considered before any services are provided.

(4) No town-no viable core (B4)

The Category B4 municipalities are small and are unlikely to have any role other than one of representation. Although there is a strong role to be played by the community, they need support with basic operations and with high level activities. Most of the support is usually from the support agents managed by the Category C Municipalities (South Africa. 2001:21-33).

2.6 FUNCTIONS OF THE WATER SERVICES AUTHORITIES (WSA's)

Local authorities play the most important role in providing urban informal settlement services such as water supply, sanitation, solid waste (refuse) removal and storm water management. These local authorities however have financial, administrative, social and political constraints that often mitigate against effective service delivery (Wood, Uchronska and Valashiya, 2001:12). Water and sanitation service delivery has historically not been discussed in detail with the community until the settlement has been established.

The Water Services Act (1997) states that the local government is the first institution for the provision of water and sanitation services and through its Environmental Health Practitioners promote health and hygiene awareness and monitor the health of its communities. The local authority must also take responsibility for driving the process as set out in the White Paper on Basic Household Sanitation (2001) at the local level, for the

creation of an enabling environment through its municipal by-laws and for taking responsible decisions on level of services to ensure that they are both appropriate and affordable (Lagardien and Cousins, 2004:46-48),.

The WSA further requires that the local government should develop an Integrated Development Plan (IDP), which is aimed at an integrated development and management of services at its area of jurisdiction. One component of this plan is a Water Service Development Plan (WSPD) that reviews service level and backlogs and sets clear objectives with quantifiable performance indicators (Abrams, [s.a]:10-11).

Amongst other functions that the Water Service Authorities are responsible for are the:

- provision of water and sanitation services;
- planning;
- financial management; and
- monitoring and evaluation of water and sanitation provision.

2.7 SANITATION SYSTEMS

Sanitation systems must contain human waste in such a manner that they do not pose a threat to other people through normal disease transmission routes, nor to the environment (South Africa, 2002b). There are a number of approaches to and requirements for construction of physical sanitation facilities. The approach adopted can also lead to increased community participation and ownership of maintenance of the system. If properly managed, the enhancement of job creation and skills development can contribute to the long-term sustainability of the facility. However, a holistic approach to the establishment of sanitary systems is needed because if the approach is not well managed, it would lead to poor quality facilities that will be found inferior and unacceptable by the households in the communities.

2.7.1 Types of sanitation systems

Different types of sanitation systems are used in South Africa. For the purpose of this study, only two systems which are commonly used in the Free State and particularly in Philippolis will be discussed, namely *ventilated improved pit (VIP)* latrines and waterborne sewerage systems. The operational requirements of these toilet systems are summarised in Table 3.

Table 3: Sanitation system options and their operational requirements (South Africa, 2002b:1-13)

Sanitation Scheme	Operation and Maintenance tasks	Skills level	Comments
VIP latrines	Cleaning vent pipe	None	Easily undertaken by home owner by pouring water down vent pipe
	Maintaining structure and pedestal	Minor maintenance skills	Usually done by home owner or small contractor
	Emptying pit	Brief training	Usually disposed of in municipal sewage works, but can be composted
Bucket System	Vandalism and placing unsuited material in the bucket. Shortage of human resource	Brief training required	Usually disposed of in municipal sewage works, cause damage and blockages. cause flies and bad odour
Full waterborne sanitation	Repairs to pipes	Pipe sills	Usually municipal maintenance team
	Sewer blockages	Minor training	Usually municipal maintenance
	Operating and maintaining wastewater treatment works	Full training to diploma level	This can provide permanent job positions for four to ten people

Table 3 shows the comparison between the VIP latrine and the waterborne sewerage system, similar to the system commonly being used in Poding Tse Rolo. Joubert and the WHO, cited in Matji (2003:4), indicate that the standard of operations and maintenance is the primary indicator of the capacity of an operator to sustain the functions of a water supply system. The proper operation and maintenance must be an integral part of the strategy of providing an adequate sanitation system to any community (Palma Development Group [PDG], 1995:51). This principle applies to all sanitation systems, but becomes increasingly significant as one moves up the sanitation hierarchy. According to Water Sewage and Effluent (WSE) (2007:12-13), insufficient attention had been given to the operation and maintenance of the waterborne sanitation systems and this resulted in serious health and environmental consequences. The President of the Water Institute of South Africa (WISA), Professor Fred Otieno, cited in WISA (2008:7), mentioned that the conventional sewerage system had in many cases been the solution for removal of liquid waste over a broad front. He further postulated that with the increase in the global population, changes in consumers' habits and an increased pressure on freshwater resources and other resources, conventional sewage systems would no longer meet the increasing global sewage disposal needs.

According to the Water Sewage and Effluent [WSE] (2007:12-13), sewerage systems are expensive and require large volumes of water. Shaw (1999:1) describes maintenance as periodic inspection of the installation and replacing parts that are worn or showing signs of deterioration. Careful maintenance of the toilet, the sewer network and wastewater treatment works is essential. Correct toilet paper is required in order to avoid blockages. The volume of water used to flush the toilet is normally treated according to drinking water standards. This volume of water can be a major constraint, especially to the poor in rural settings (Shaw, 1999:1-2). However, the cost can be reduced if proper maintenance programmes can be instituted. Wood, Unchroska and Valashiya (2001:37) suggest that the responsibility to operate and maintain this system should involve households as well. They argue that, should households not recognize or accept the responsibility, the problem will not go away but will escalate, the result being unhygienic conditions within settlements.

Jagals (2001) emphasises that even though people come from different cultural backgrounds, they will have to work together to ensure optimal performance of the waterborne systems.

Table 1 (Chapter 1) summarizes the frequencies of blockages or sewerage spillage in Poding Tse Rolo. The problems experienced with the sewerage blockages indicate the difficulty of operation and maintenance of the sewerage system. The cost incurred by the municipality to repair the 14 blockages that occurred in Poding Tse Rolo in March 2005, including the cost of labour, rods, transport and overtime, was in the region of R15 000 – R20 000 (Voster, 2008, personal communication).

Operation and maintenance principles are the foundation to ensure sustainability in sanitation services in South Africa. In theory, users of sanitation facilities should fully understand their role in operating and maintaining their sanitation facility as well as the associated hygiene and health practices (Municipal Training and Development Institute (MTDI), 2006:1-10). Users of sanitation facilities are often not educated in the importance of health and hygiene when the facilities are constructed. Research has shown that this negligence has created operational and maintenance problems that have left many sanitation systems broken, resulting in the spillage of raw sewage into the settlements.

In 2002 the DWAF presented a comparison between the operation and maintenance of intermediate (partial sanitation system) and full waterborne sewerage systems as part of the Reconstruction and Development Programme (RDP) (Table 4).

Table 4: Operation and maintenance (O and M) costs of intermediate versus full waterborne sewerage systems (South Africa, 2002).

Unit cost	RDP levels	Intermediate	Full waterborne
O and M	R200	R400	R900
*Capital cost (Physical structure) (Rand)	R4 000	R6 500	R11 800

There is a considerable difference in what these systems cost to maintain today. The cost that can realistically be expected to be recovered from the lower income communities lies between that of the ability to pay and that of encouraging a responsibility and willingness to practise good hygiene. According to Wood et al. (2001:8), the willingness to pay is generally higher than the ability to pay. Most of the communities understand the importance of paying for services and are therefore willing to pay for water and sanitation services. However, due to their socio economic status they are unable to pay. The Kopanong Local Municipality [KLM] (2005) has shown that the socio-economic status of the population of Poding Tse Rolo is very low, as there are few job opportunities and low household income.

2.8 FACTORS AFFECTING SUSTAINABILITY OF SEWERAGE SYSTEMS

Jagals (2001:3) explains that sustainability means that the future is not mortgaged for the sake of the gains of the present and also not wasting what is presently available. In a context of development which includes activities for sanitation improvement it implies improvement to:

- the quality of life;
- health and nutritional status;
- equity in access to resources and services;
- per capita income; and
- perceived quality of the human environment.

When the definition provided by Jagals is applied to the sustainability of sewerage systems, cognisance must be taken of the impact of political-legal, social-cultural (knowledge, attitude, beliefs and practices), technological and economical environmental power bases that impact on the survival of the inhabitants in Poding Tse Rolo. One of the critical aspects of sustainable sanitation is the involvement of targeted communities where sanitation programmes are to take place. Community involvement plays an important role in that people will take ownership of the sanitation facilities even after the implementers of the sanitation programmes have left.

2.8.1 Political-legal perspective

From a political-legal perspective most communities are relying on the government to make sure that their water and sanitation projects are sustainable. The national budgets made provision for funds to provide water also to rural communities before 2008 and to rectify the sanitation backlog before 2010 (Mvula Trust, 2008:1-11). The national government thus made funds available to ensure that the maintenance of blocked sanitation systems could be sustained. The political will to address this problem therefore exists and the legislation to regulate its implementation is already in place. It is therefore necessary for the community to contribute to the sustainability of its water and sanitation initiatives as well as to the development of appropriate hygiene education programmes.

2.8.2 Economic perspective

The literature review indicated that most affluent families are in a better position to pay for their water and sanitation services when compared to poor families. Poor families sometimes cannot afford to buy toilet paper for anal cleaning material, nor can they afford to buy soap to improve their personal hygiene. They would rather spend all their money on food. In a study conducted in Bhutan (India), it was found that drains were permanently clogged and the flush pans were full. This terrible state of affairs was not as a result of faulty design or construction. That study revealed that the price of one small roll of toilet paper was equivalent to a half-day's wages for an unskilled labourer. As a result, unsuitable substances were used to replace proper, degradable toilet paper.

2.8.3 Choice of technology

When the water decade commenced in 1981, there were major issues regarding the management and development of sanitation systems. One issue was that rural water

facilities in the developing world fell rapidly into disrepair and disuse shortly after installation (Duncker, 2000b:9). The following were among the causes of this problem:

- The technology used did not withstand the demands of the users; and
- The financial costs and logistics of maintaining and servicing the systems exceeded the limited economic and human resources available.

The water and sanitation provision has been most applicable to the population of rural and peri-urban areas where factors such as greater need, more limited financial resources and the types of physical and social environments demanded higher levels of community participation to ensure sustained performance of the systems (Phaswana-Mafuya, 2006:21).

Most management techniques for the maintenance of rural sanitation systems have been based on the operational requirements of western industrialised societies. They therefore reflect the culture and the practices of westernised lifestyles that have little in common with those of the rural settings on the African continent. According to Sanitation Connection, (2006), some of these technologies do not reflect the inhabitants' needs or their ability and willingness to pay. This invariably leads to disagreement and mistrust when those techniques do not blend with local cultural practices.

Bester and Austin (2000:1-40) emphasise that irrespective of the technology chosen as being the most appropriate, the construction method of sanitation systems should be done in such a manner that it promotes community ownership and job creation. The technology must also be of a high standard so that communities will be proud of the quality of the end product and its function over a long period of time. The Department of Provincial and Local Government (2007) indicates that the choice of technology is influenced by factors such as the ability of households to afford the system. Two factors will ensure the sustainability of rural sanitary systems (South Africa, 2007).

1. the system must be affordable to the service provider; and
2. payment for the service provided by the user is essential to ensure sustainability.

Whilst cost of service infrastructure can be readily be calculated, it is difficult to quantify the impact on human health and the environment as a result of poor sanitation, waste and greywater management (Bester and Austin, 2000:27-30).

Improvement of human health in developing countries through the provision of sanitation systems and water supply has been a goal of health-related agencies for the past ten

years. In 2005, the DWAF called for universal access to basic sanitation to be the first priority in developing countries. However, the choice of technology for sanitation has had a polarising effect on some communities. This was caused by communities living in the same areas with different cultural preferences which, in turn, had an impact on the sanitary technology chosen. The DWAF (2004) emphasised that basic services is a human right. If services are not affordable, it cannot be expected of the community to provide the system required to ensure their health, or to invest in an inadequate or inappropriate services provision process which can put their health at risk (South Africa 2004: 34-35).

2.8.4 Level of training of communities

Hazelton and Harris (1999) conducted a pilot study on rural village water usage and sanitation in South Africa. This study showed that there is a need for skilled people to operate and maintain water systems adequately. The DWAF found that local authorities were lacking the skills to maintain water and sanitation systems. The WRC indicated that people with plumbing, bookkeeping and pump care skills were needed. In rural areas people need to be capacitated and trained in the proper ways of handling and managing their water and sanitation systems (South Africa, 2006:6).

Cain, Ravenscroft and Palmer, cited in Water Research Council (2002:4), consider training to be one of the factors that will determine the successful implementation of the water and sanitary objectives of the government. One of the objectives is to redress the backlog in the provision of water and sanitary systems. In 2002 the DWAF (South Africa, 2002:12) emphasised that it was not possible to reduce backlogs unless communities acquired the necessary plumbing and pump management skills through training and experience. The DWAF concluded at the time that the enormous backlog of basic water and sanitation services to rural communities would not be reduced unless the communities themselves were empowered to undertake their own development (Jaffe, Dartnall and Torr, 2003:6-17).

The DWAF through its water conservation and sanitation programmes has reached numerous communities, especially in regions where operation and maintenance of sanitation systems were failing. However, it was found that during those programmes waterborne sanitation increased water consumption and concurrently raised the water bills of low-income consumers. Some poor households were not in a position to pay an additional amount for water and sanitation. Non-payment of these services lead to blocked manholes and sewers not being attended to. Therefore, the impact of low income should not be underestimated. Lagardien and Cousins (2004:22-28) define poor

households as those with a total income lower than R800 per month. The estimated costs of sanitation and water provision are taken to be R86 per month, based on an average household size of 4.5 people (Lagardien and Cousins, 2004: 22-28). According to the Unit Manager of Philippolis municipality, the cost of one kilolitre of water is R5.28 and refuse collection charges are R37.32 per month, whilst sewage removal costs R52.32 per month (Voster, 2008: personal communication).

2.9 SANITATION PRACTICES

Good sanitation is as much about people and their personal dignity as it is about health, infrastructure provision or environmental management. Basic sanitation is a human right and this emphasises the importance of involving ordinary people when choosing, planning and implementing sanitation improvements (WRC, 2002:4). Poor sanitation can negatively impact on people's lives. The following are a few examples of the impact of poor sanitation on the lives of people:

1. Health effects

Solsona (1998:1) emphasises that lack of adequate sanitation services in developing countries has resulted in high infant mortality rates. The impact of bad sanitary conditions and practices on the health of people is significant in terms of quality of life, education and development opportunities of the communities. Some of these practices are:

- Throwing dirty wash water in the yards where flies can be attracted;
- Leaving children's and dogs' faeces uncovered in yards; and
- Disposal of solid material in toilets and manholes that result in blockages which in turn can cause spillage of raw sewage in the environment.

2. Economic impact

Poor sanitary conditions can initiate a vicious cycle of poverty. The poor appreciation of basic sanitary etiquette and illness related to non-functional sanitary systems result in loss of income. The illness in turn places a further financial burden on poor families who spend money on medication instead of buying food for their households.

3. Environmental impacts

Sanitation is seen as a major issue in environmental protection. Improper disposal of human waste can pollute surface and groundwater bodies as well as land surfaces,

causing great risks to health and the local economy. These practices can adversely affect general aesthetic and overall quality of life for those living in the vicinity (Solsona, 1998:1).

2.9.1 Community behaviour

A broad recognition has been accorded to the value of community-based hygiene education and awareness programmes as an essential component of any water and sanitation project. Once the communities have participated in and acquitted themselves with the water and sanitation projects, the next question is whether these projects are accessible and affordable to the community. Lima Rural Development Foundation (2001:41-47) states that the improvement in health through improved sanitation is likely to be achieved when the majority of households in a community are involved. Maintenance of sanitary standards is therefore a community responsibility and this must be emphasized through sanitation awareness programmes. Although health and hygiene education is important, it is however acknowledged that without the improvement of the socio economic status of the community it will not be effective in changing behaviour (Zeinalabdeen, Shahindullah, Muhammad and Omer, 2000:51-57).

A Palmer Development Group (PDG) study of 1999 indicated that people were deliberately placing solid objects in sewers which had to be removed at considerable cost. The reasons why it was done were not clear, since it was assumed that every individual would have the desire to live in a healthy environment. The study furthermore revealed that the major constraints from the service provider's perspective were cost recovery as a result of low rates charged, and non-payment. In addition, there was a shortage of skilled staff to do maintenance and provide health education, which further exacerbated an already difficult situation (PDG, 1999:A1-A11).

Pickford, Barker and Load (1993) emphasise that toilet facilities must be adequate at home, at schools and at work places. Where there are adequate toilet facilities an understanding is created of why it is important to use the toilets and maintain them. The WHO (World Health Organization, 2004) raises the importance of encompassing all behaviour of communities as a barrier to faecal transmitted diseases. The behavioural practices of people affecting the sanitation facilities can therefore not be isolated when talking of sanitation.

2.9.2 Cultural practices

The cultural settings in some communities where basic sanitation is lacking are often a constraint. Women and girls often have to get up before dawn and make their way in the darkness to fields, railroad tracks and roadsides. It is then often necessary for them to defecate in the open, knowing they may risk rape or other acts of violence in the process (UNICEF and WHO, 2004:21). In such circumstances, women and girls often go the whole day without relieving themselves until night affords them the privacy of darkness. Sometimes, they limit their daytime intake of food and water so that they do not have to use sanitation facilities until evening. Without toilets in schools, girls must go in the open – that is, if they are even allowed to attend school. For many girls, the onset of adolescence means the end of school. Men are often regarded by most of the communities as superior to women (Monyai, 2002:18-22). This belief has led to men feeling uncomfortable when women are allowed to participate in meetings and in decision making process (Duncker, 1999:49).

Modification in human behaviour and the way in which people interact with their environment, especially at the level of the household, has been shown to exert a greater influence on morbidity and mortality than the simple provision of sanitation facilities. The health impacts of water and sanitation improvements have been shown to be complemented by factors such as educational attainment or family income. According to Duncker (2000b:10), participatory programmes in which community members assume a key role in the identification, design and the implementation of simple cultural-sensitive health messages, have proven more effective in modifying behaviour than previous didactic approaches.

According to Emmet *et al.* (cited in Duncker, 2001:2), misconceptions regarding sanitation and the origin of diseases affect perceptions and attitudes towards water and sanitation facilities and related community health issues. In a study of water and sanitation-related illnesses in South Africa, Duncker (2001:2) concluded that even when appropriate hygiene practices were known through health education, there were still many factors that prevented the application of health practices. This study found some obstacles to be politically, culturally and economically related.

Another cultural behaviour practice which is related to communities, is the method used to do anal cleaning. Some people can be washers, i.e. they use water for anal cleaning, whilst in other cultures they are wipers; i.e. people use solid materials like grass, leaves,

paper, sticks, corncobs, mud balls or stones. The health education programme should take cognisance of the cultural options that exist and adapt the sanitation system accordingly.

Part of changing behaviour is by understanding traditional values that are accompanied by constraints that challenge changes. Bagbiele, Sarpong and Kidd cited in Pickford, Barker, Elson, Ferguson, Parr, Saywell, Shaw and Skinner (1995:45) state that many communities believe that diseases are caused by angry ancestors, gods and inadequate sacrifices, and not by environmental issues. For example, many sanitation-related illnesses may occur as a result of polluted water, but in some cultures these illnesses are perceived to be due to angry ancestors that cause people to contract water or sanitation-related illnesses. Some communities also believe that it is taboo to bury the faeces of a child if one has never lost a child. To them, burying the faeces is like burying the child (Fact sheet) In many cultures it is believed that children's faeces are harmless and do not cause diseases (Fact sheet 3.10: n.d.). The reality is the opposite. The faeces of a child contain as many pathogens as an adult's and it is therefore important to collect and dispose of children's faeces quickly and safely. When people defecate in an open space, flies will feed on the faeces and can carry small amounts of excreta away on their bodies and feet. In this manner clean areas where they land are infected. In the same manner infections can be transferred by children who play in polluted water.

2.9.3 Personal hygiene

Access to water and sanitation must be accompanied by the promotion of hygienic behaviour (South Africa, 2002a:10). Health benefits from sanitation programmes will not be fully realized unless hygiene behaviour is promoted and achieved. To achieve the health impacts of environmental health intervention, the concept "behaviour" first needs to be adopted. This means that before initiating environmental health interventions or facility improvements, there is a need to identify behaviour associated with sanitation-related illnesses in the target area (Environmental Health Project: 2006). Sanitation connection (2006) suggests that there is a strong perception among communities that their inability to practise good sanitary practices is related to their poor economic circumstances. On the other hand, in a water and sanitation study conducted in Hitherto, Uganda, communities were considered as users or beneficiaries, and participated in the planning, maintenance, management and effective use of the sanitary systems. As a result of the effective utilisation of the community's involvement, it was possible to broaden financing for these services.

It is a fact that poor health resulting from unclean water and poor sanitation facilities and inappropriate hygiene practices keeps families in a cycle of poverty and lost income. As a consequence, the national economy is affected by reduced productivity and diminished educational potential. Very low levels of formal employment, particularly in rural areas and poor urban fringes, have rendered it difficult for some to access basic water and sanitation services due to comparatively expensive costs. Public institutions are unable, because of poverty of individuals and corporate private environments, to raise sufficient funds from taxes and revenues (Abrams, 1999).

In identifying the practices and the health hazards that pose health risks, one needs to have an appreciation of which water and sanitation-related diseases are prevalent in communities. There is a need to uncover how local people respond to their health-related problems. The information can be sourced from the existing health practices as well as from traditional health practices.

Hygiene education is an indispensable part of water and sanitation projects and if effective, ensures improved health and sustainability of the system after the assistance of the technical experts has been withdrawn. It informs the community members about the correct use, storage and disposal of water whilst practising general hygiene. An added benefit of effective health education programmes is that the community can also recognise deviations of the norm and their timeous reports can help to prevent a health catastrophe.

According to a study on hygiene awareness for rural water supply and sanitation projects conducted in the Eastern Cape, Kwa-Zulu Natal and the Northern Province, 66,7% of the respondents treated their water by boiling, using Jik or alum stone and filtering after collection in rivers (Duncker, 2000a:iv). However, the observation component of the study indicated that the majority of households did not treat their water before drinking it. The study found that although the knowledge to practise proper hygiene existed, this knowledge was not applied in most cases. The major reason seemed to be the lack of economic means to ensure a more hygienic life style. The people in the rural areas did not have the money to buy disinfectant or to maintain the sanitation system. The second reason was that sanitation was not a high priority in these rural areas but electricity and jobs were articulated as the major needs above sanitation. The lack of the Local Authority's capacity to manage hygiene processes in these communities also contributed to low levels of hygiene awareness (Jagals, 2001:31-40).

2.9.4 Manhole blockages

In 1999, Palmer Development Group (PDG) and the University of Cape Town undertook a survey of local authorities in order to obtain operational information in areas of South Africa where waterborne sewerage systems had been installed. According to this study, only 13% of the 288 local authorities that responded to a questionnaire on sewer blockages did not experience any sewer blockages. In Mdantsane in Kwazulu-Natal, an average of ten blockages was reported on a daily basis, which was widely distributed over sewer networks. The escape of raw sewage had an environmental impact on the Bridge dam. The PDG (1999) found high levels of system misuse such as vandalism, and throwing of stones and solid materials into manholes. These problems occurred mostly in residential areas and were partly due to poverty and lack of user education. The majority of the residents did not use toilet paper, but relied on newspaper, rags, stones and other materials for anal cleaning (PDG, 1999).

Grey water from washing clothes and kitchen utensils, shower, bath water and other domestic water also contributes to sewer blockage and manhole overflows in densely populated areas of South Africa. This water is sometimes not properly checked when disposed of in drains. Shirts and solid material such as spoons can be discharged and pass through the basins and ultimately end up in the main sewers. According to Voster (2006: personal communication), this material causes manhole and sewer blockages as well as the fouling of pump stations, and as a result the raw sewage is spilled into the environment.

Many municipalities in South Africa have experienced problems in reacting timeously to the sewage blockage problems, with some municipalities taking up to a month to rectify blockages. The long response times cited by the community when asked about the time taken by the local authority to repair blockages supports the negative perceptions of the community regarding the local authority's capacity to support their own long term health strategies (Theron, 2000:58-62).

2.10 SUMMARY OF CHAPTER TWO

Chapter two outlined the history of community water and sanitation management and the role that community participation played in addressing sanitation challenges. Amongst the challenges presented in the chapter were the operational issues in areas where sewerage systems are installed. The role of legislation played in meeting sanitation issues before and after the democratic South Africa in 1994. The reviewed literature indicated that the

involvement of women and children in the sanitation projects are key to the sustainable operation and maintenance of sanitation services.

CHAPTER THREE

MATERIALS AND METHODS

3.1 OVERVIEW

Chapter three outlines the methods and operational phases followed to gather information related to the behaviour, practices, beliefs and attitudes of the community that influenced the sustainability of the sanitation services in Poding Tse Rolo. A simple random sampling method was used to select one household from every 745 households. Thereafter, systematic sampling was used to select a total of 75 households for participation in the study. Two interviewers were contracted from the community and trained to administer the questionnaires. The interviews were conducted using a structured questionnaire with a few open ended questions to enable more freedom for the respondents to express their thoughts and opinions. Provisions were made for categories not specified in the questionnaire, i.e. space was left to fill in the answer provided by respondents in cases where they could not choose from the answers provided.

3.2 OPERATIONALISATION OF THE STUDY

The objective of the methods used in the study was to gather information related to the behaviour, practices, beliefs and attitudes of the community that could influence the sustainability of sanitation systems.

The project was undertaken in six phases and was completed over a 36-month period (2005 to 2007). Since a “bottom-up” approach was used, all role players had to be consulted in the process. This resulted not only in meetings with the community, but also with the management of the local authority. As a result, the design of the project involved a number of phases which had to be completed before the next could be attempted. The background on the importance of each phase with regards to the aim of the study is given. There were however a number of factors that caused delay between some phases of the study, which included the unavailability of the councillors, work-related commitments, community gatherings and events such as pension days that coincided with the dates set to meet with the community and stakeholders, the 2006 local government elections and the change of political office bearers in the Kopanong Local Municipality. Figure 3 presents a flow diagram of the methodology employed:

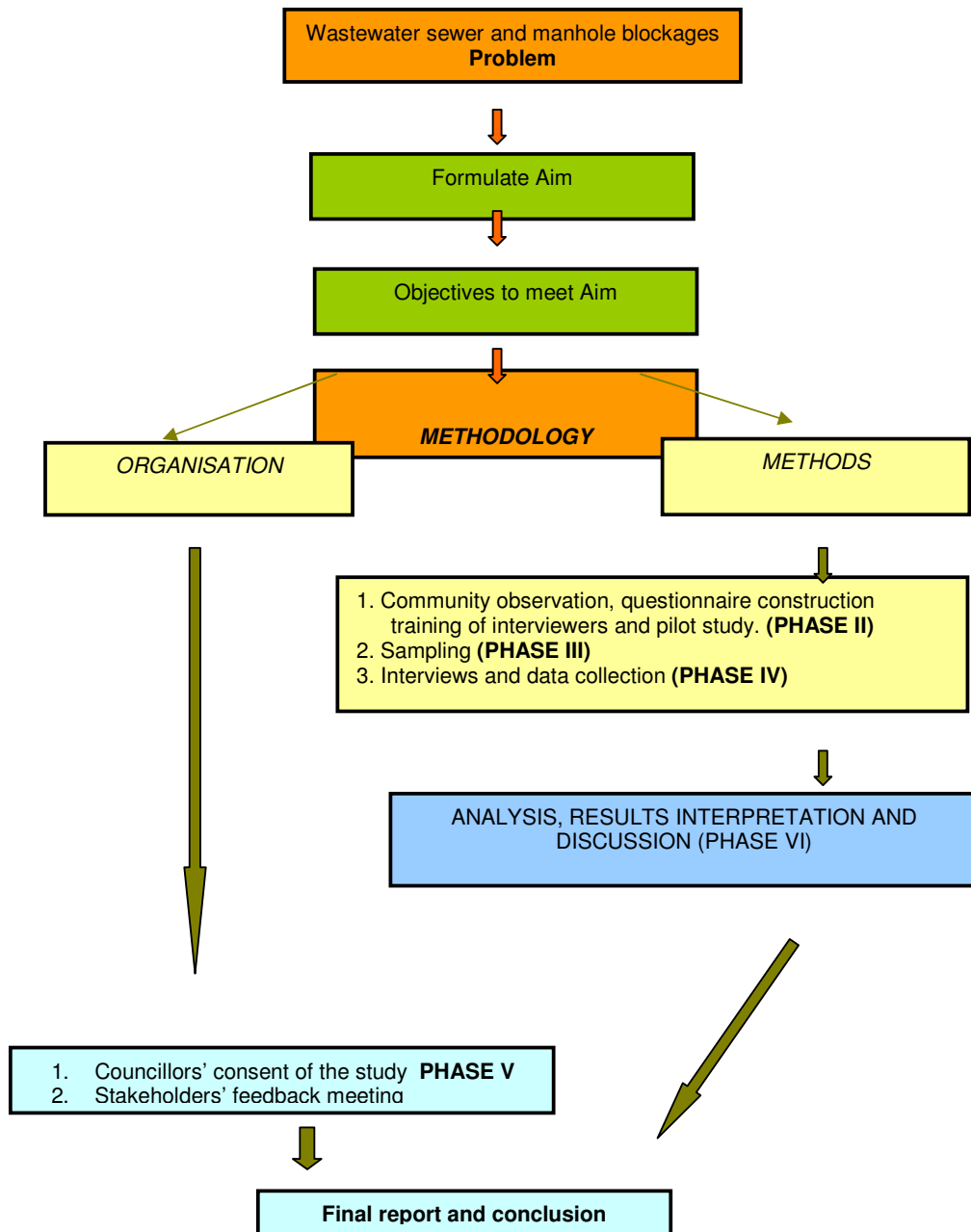


Figure 3: Flow diagram of the methodology used to develop the investigation.

3.2.1 Introductory meeting – Local Authority

An introductory meeting was organised in October 2004 with the Speaker of Kopanong Local municipality, Mr Vuyisile Jonas. The purpose of this meeting was to introduce the aim and the objectives of the project. The speaker gave assurances that the study would be supported (Jonas, 2004: personal communication).

3.2.2 Meeting with stakeholders

The Speaker of Kopanong Local municipality provided the list of all active stakeholders and their relevant contribution to the sanitation programmes in Philippolis. These stakeholders ranged from community-based organisations, concerned groups, members of a youth league and individual farmers. The stakeholder meeting was held on 1 November 2004 in the City Hall of Philippolis. Amongst the stakeholders that were provided on the list, the following organisations confirmed and attended the meeting:

- African National Congress (ANC) Youth League;
- ANC Women's League;
- Local farmers and
- Community Based Organisations.

The purpose of the meeting was to introduce the study to the stakeholders and to alleviate all the expectations such as improvement of service delivery, job creation, and more importantly to ensure representativity of stakeholders (Appendix 2). The questions asked at the meeting formed the basis for the design of the questionnaire.

Stakeholder discussions were important to explore a range of opinions on hygiene in the community and to explore the extent of community co-operation and willingness to change. As suggested by Duncker (2001:24), the process also helped to identify local vocabulary and expressions used to describe cultural taboos, diseases and values among the members of the community.

The meeting was attended by all the stakeholders invited. No negative reactions were received and every attendee welcomed the study. However, the group emphasised the importance of feedback to explain the outcomes of the study to the broader community.

Pearson, Bagwan, Karuiki and Banda, cited in WRC (2002:4), explained that a partnership approach to sanitation promotion does not assume ignorance on the part of the people. It should seek to widen ownership and to increase the number of stakeholders who are actively involved in the study from the start. In this regard, the participation of the stakeholders in Poding Tse Rolo would not only provide endorsement for collecting data in the community, but they would also accept responsibility for the implementation of the recommendations of the study. Their commitment would ensure their support for the study with an objective to collectively find a solution to the problem of manhole blockages and sewerage overflows in their settlement.

The Department of Health (DoH) was also contacted. A meeting was held with the Environmental Health Directorate on 1 November 2004. They welcomed the proposed study. The DoH meeting was held separately as they had previously asked for the intervention by the DWAF. According to Environmental Health Practitioner working in Philippolis, sewerage overflows and manhole blockage problems were increasing and posed a potential impact on the health and well being of the community, especially of children and immuno-compromised individuals in Poding Tse Rolo (Sewnarain, 2005: personal communication).

3.2.3 Community observation

Observations of the community's behaviour and practices with regards to sanitary health practices were conducted for a period of six months prior to the distribution of the questionnaires. The purpose of this observation was to:

- quantify the extent of the sanitation problem (Table1);
- establish accessibility to the homes of potential respondents;
- refine and gather additional information to be captured in the questionnaire; and
- establish the basis to interpret findings at the end of the information gathering stage.

The observations were done concurrently with the bi-monthly inspections at Philippolis. The Environmental Health Practitioners were also asked to observe some of the community behaviour, especially during the morning and evenings when people were doing their domestic chores.

A morning and late afternoon drive during operations in the area was also undertaken. Duncker (2001:23) refers to this technique as "community walk observation". The purpose of this technique was to familiarise the research team with the physical environment where the hygiene practices occurred. This technique also assisted in visual observation regarding:

- the location of the sanitation facilities;
- use of facilities;
- status of the public toilet facilities; and
- interaction of people as they went about their daily activities.

3.2.4 Questionnaire construction

The questionnaire was constructed in line with the aims and objectives of the study. Every question asked in the questionnaire was formulated with the view to contribute to the solution of the problem of the study. Questionnaires were also based on the discussions held with the stakeholders. The questionnaire sought to explore the main sanitation problems and the related behaviour of the community that contributed to manhole blockages. The design of the questionnaire had to meet two objectives, namely:

1. To understand how the community experienced the provision of sanitary services by the local authorities. To reach that goal it was important to collect biographical data of the residents and to determine the knowledge residents had on issues related to sanitation as well as their perceptions of the services provided. It was also important to establish the attitudes of the people towards the strategies for providing sanitary services and how the people behaved in view of their experiences of the services that were provided.
2. To make in-house observations regarding the status of the sanitation situation of the households during interviews. The purpose of the onsite observation was to determine any relationships between participants' responses to the questions and the observations made by the interviewers.

The construction process of the questionnaire involved redesigning it, and testing and rephrasing some questions to meet the objectives of the study. The final questionnaire was printed in both English and Sesotho and administered to the selected households. All the selected households agreed to participate and cooperated well in the study. The questions which were asked explored issues regarding the knowledge, beliefs, practices and attitudes of the community that might affect the sustainability of the sanitation system of the area.

The following questions were categorised to meet the objectives of the study:

Questions 1 - 8 (biographical data)

Biographical data are necessary for exploring residents' age distribution, the spread of gender in the households, the type of employment of the breadwinner, number of people employed within a household and their combined monthly income. According to the literature review, there is a perception among communities that their inability to practise good sanitary practice is related to their poor economic circumstances. Specific questions on the socio economic status of households were posed to find any possible links between

the level of household poverty and the willingness to pay for water and sanitation services. The results are presented in Figures 5 to 10.

Questions 9 - 20 (sanitation and blockages)

Questions on sanitation and blockages were included to explore the behaviour of the community when they came in contact with the sanitation system provided. This information was necessary to determine how the residents responded when experiencing sewer blockages and manhole overflows. The results are reported in Table 6 and Figures 11 to 13.

Questions 21 - 29 (knowledge and usage of sanitation facilities, and practices)

The questions explored information regarding the type of material used for anal cleaning, use of toilet facilities by children, material used for cleaning at home, sites where residents disposed of their domestic waste water and the knowledge of the community on how to improve the usage of sanitation systems. The results are presented in Figures 14 to 18. The information was important in determining the behaviour and practices of households that might affect the normal functioning of the sanitation systems.

Questions 30- 33 (water and sanitation service payment)

The questions explored whether, and if so, how much, the households paid for their water and sanitation services per month. The questions also determined whether the households experienced water cut offs and, if so, the frequencies thereof. The results are presented in Figures 19 and 21.

Questions 39- 50 (awareness of community regarding sanitation)

Questions 39 to 50 explored the awareness of the community regarding sanitation at the time when the sanitary systems were installed. To achieve this objective, questions regarding health education, collection of domestic waste and the perceived effectiveness the service provider were asked. The results of community awareness are presented in Figures 22 to 27.

Questions 34 - 38 (community participation in sanitation initiatives)

The questions were asked to determine the level of participation of households in community ward meetings and whether sanitation issues were discussed at these meetings. The questions also explored the level of involvement of health education in the

sanitation orientation programme. According to the literature reviewed, women are usually the persons with the best knowledge of health matters and activities in and around the households (Monyai, 2002:1). The results are presented in Figures 28 to 30.

Observations

During the interviews (i.e. the administration of the questionnaire to 72 of the 75 originally selected households), the interviewees also made the following observations, with the knowledge and approval of the occupants of the household:

- the type of toilet facility in use;
- the condition inside the toilet;
- the flushing status of the toilet;
- the general cleanliness of the yard; and
- whether the manhole was covered or uncovered.

The information gathered by observation was compared with the data collected based on the questionnaire. The results are reported in Table 7.

3.2.5 Selection of interviewers

Two interviewers were identified with the assistance of a Ward Councillor of Kopanong Local municipality. Three criteria for selection were used to select the interviewers. Interviewers should:

1. be a natural resident of Poding Tse Rolo (born and live in the township);
2. be able to speak at least two indigenous languages (Xhosa or Sotho) of that community; and
3. have passed English (grade 12 standard).

This criteria were discussed with the Ward Councillor, Mrs G. Mqaliso . She identified a male and female from a list of individuals who had submitted their names to the municipality for any possible job.

A training manual was compiled and used as a guide and training tool for the fieldworkers (Appendix B). A training session was held on 31 September 2005 at the Philippolis Community Hall. The training started at 12:00 and ended at 14:00. The training comprised of practical interviewing techniques, the responsibility of the interviewers and

how they should conduct themselves during the interviewing process. A photo of each interviewer, which was placed on a letter of introduction to the participants, was taken during the training session (Appendix B).

3.2.6 Pilot study

The pilot study was conducted in the community of Philippolis for the period of six months prior to the commencement of the study. The purpose of the pilot study was to:

- gain experience in order to assist the interviewers to deal with common problems they might experience during the interviews;
- to create opportunities for the fieldworkers to gain experience and to standardise the administration and reporting methodology; and
- to process the collected data to confirm the data analysis methodology to be used later.

3.3 LIMITATIONS

There were limiting factors that could influence the responses of the households during the interview. The interviewers were made aware of the following factors that could affect the responses during interviews, such as;

- the attitude of interviewers when asking people questions;
- the time it takes and the time when the interviews were conducted;
- the level of understanding of the respondents which might lead to over explanation or compensation by the interviewers; and
- the sensitive nature of some of the questions if not asked correctly by the interviewers.

3.4 CRITERIA FOR ADMISSIBILITY OF DATA

Only data that had been collected by trained interviewers during surveys were used in the study.

3.5 SAMPLING METHOD

Sampling means looking closely at a part of something in order to learn more about the whole thing (Katzenellenbogen, Joubert and Yach, 1991:35-40). Simple random sampling

was used to select a representative sample from the 745 stands in Poding Tse Rolo, totalling 75 households to be interviewed.

Duncker (2001:12) states that the use of a random technique is the preferred means of gathering data for the Knowledge Attitude Beliefs and Practices (KABP) of the community. According to Katzenellenbogen *et al.* (1991:35-40), every individual household has an equal chance of being selected for the sample through this method. The sampling unit, which was the households, was used instead of the individual members of the community. Katzenellenbogen *et al.* (1991:35-40) argue that if the sample of respondents is chosen carefully, there is an expectation that it will be representative of the entire community. Therefore, due to the practical impossibility of observing and talking to everyone, one person per household was interviewed.

3.5.1 Sample selection

Prior to the selection of a sample population, a meeting was organised and held on 31 September 2005 with Mr Voster, the Unit Manager of Kopanong Local Municipality in Philippolis. The meeting was held to request a map of Poding Tse Rolo used for selecting the households to be sampled (Figure 4).

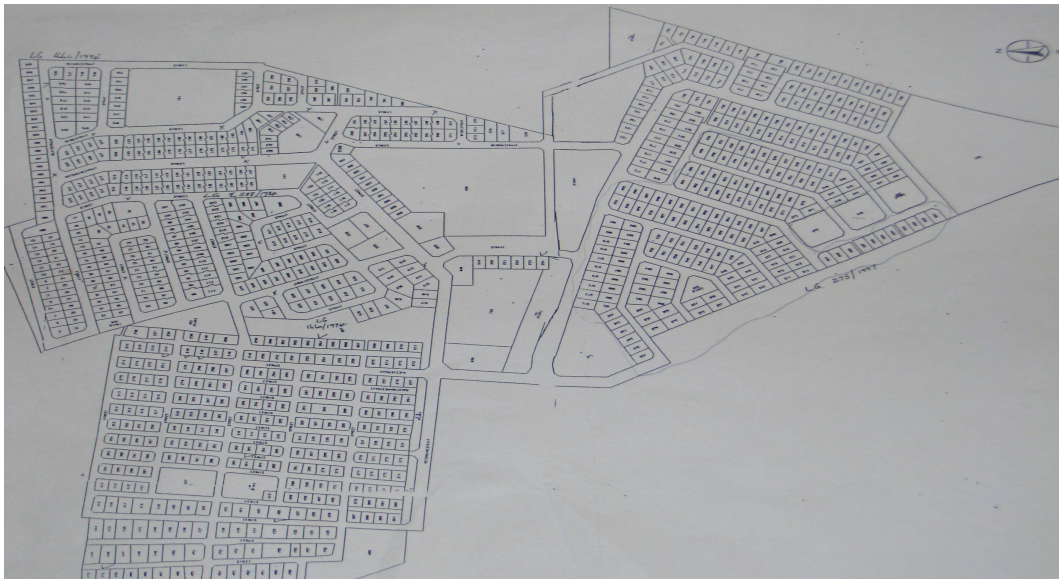


Figure 4: Site plan of Poding Tse Rolo ward where the systematic sampling was done on 745 households (Kopanong Local Municipality, 2005)

A random sample selection was performed to identify one of the households to be interviewed. Ten percent of the population was selected and found to be representative

because of the homogeneity of the community in terms of ethnicity and the use of sanitation systems. Almost the entire community has waterborne sewerage systems. A total number of 75 households was selected systematically from the household's first identified. The interviews were conducted successfully at 72 households due to the non-availability of the occupants at the remaining three selected stands. According to the information provided by the community, the owners of these three households were working in other cities and only came back periodically or during holidays.

The selection procedure was as follows: One of the first ten houses was selected at random. Thereafter a systematic sampling method was used and every tenth household was then selected until the 75th house was selected. The households were entered onto the spreadsheet (MS Excel 98), ordered by the respective streets and then assigned to two interviewers. One interviewer received 37 and the other received 38 questionnaires which were presented to the selected households.

3.5.2 Sample realisation

The total number of households in Poding Tse Rolo at the commencement of the study was 745 (Table 5). A sample of 75 households was selected but only 72 households were successfully interviewed. The remaining three sites were unoccupied at any time during the survey. In an effort to assure the participation of a 100% of the sample, the sites were even visited during the weekend; however, these houses were still devoid of occupants. These houses were situated in the new area where people had not yet settled. As explained above, the occupants mainly lived and worked in urban areas and only returned to their homes periodically.

Table 5: Realisation of sampling done in Poding Tse Rolo

Variable	Number (n)	Percentage (%)
Total number of households in Poding Tse Rolo	745	100
Sample selected (households)	75	10
Households successfully interviewed	72	96
Vacant stands	3	4

3.6 INTERVIEWS WITH RESIDENTS

The interviews were conducted between 7 and 19 November 2005. Interviewers visited the households between nine in the morning and six in the afternoon. The purpose of having the interviews until six in the evening was to ensure that people who were at work during the day were not excluded from the study. The interviews were conducted using the structured questionnaire presented in Appendix A.

3.7 ANALYSIS AND DATA INTERPRETATION

Since a descriptive survey was done, no sophisticated statistical analyses were necessary. Only averages and percentages were calculated. The analysis and interpretation of the data were done by using the Microsoft Excel 98 spread sheet programme. A spreadsheet was opened for every question. The questionnaire number was entered in the first column of the spreadsheet and the possible answers to the questions followed. All the positive answers were entered as the number one. The reason for entering a one was to enable the programme to calculate the final figures and percentages. However, there were open ended questions that required written comments and these were also taken into account during data processing.

3.8 SUMMARY OF CHAPTER THREE

Chapter three outlined the methodology used and operational phases followed to gather data related to the behaviour, practices, beliefs and attitude of community of that influences sustainability of sanitation systems in Poding Tse Rolo. Simple random sampling was used to select one household out of 745 household thereafter a systematic sampling was employed to select ten percent (75%) households. The chapter explained questionnaire construction and how the interviews were conducted. The study limitation was also discussed

CHAPTER FOUR

RESULTS

4.1 INTRODUCTION

Chapter three reported on the methods used to collect the data from the community of Poding Tse Rolo. This chapter reports the findings of the investigation on the cultural and behavioural practices of the community that might have an influence on the sustainability of the sanitation system. The information regarding the practices, beliefs and attitudes of the community towards the sanitation systems was analysed and are presented in the form of bar charts, followed by a brief clarification. The following results are presented:

- biographical data;
- extent of sanitation and blockages;
- knowledge and usage of sanitation facilities, and practices in this regard;
- extent of payment for water and sanitation services;
- awareness among the community regarding sanitation;
- community participation in sanitation initiatives; and
- observations of sanitation practices at households, compared to participants' views.

4.2 BIOGRAPHICAL DATA

The important biographical information of the selected households determined the age and gender distribution in the households, the type of job done by the breadwinner, the number of people employed within the household and their combined monthly income. According to the literature review, there is a perception among communities that their inability to practise good sanitary practices is related to their poor economic circumstances. Responses to specific questions on the socio- economic status of households were explored to try to find any possible links between the level of household poverty and the willingness to pay for water and sanitation services. The results of the biographical data and socio economic status of households are presented in Figure 5 to Figure 10.

4.2.1 Information on the age of the respondents

Responses to question 3 determined the age of the respondents. Determining the age of the respondents was necessary to confirm whether the respondent would be eligible to respond to the questions. No children under the age of 16 were questioned because they might provide unreliable information. The age distribution of respondents is presented in Figure 5. The results revealed that 50% of the respondents were above 50 years of age, with 28% between the ages of 31 and 49 and 21% were between 16 and 30 years of age. The results indicate that the highest percentage of respondents were middle-aged or elderly people (i.e. older than 50). Figure 6 indicates that the average number of occupants per household in Poding Tse Rolo was three at the time of the study.

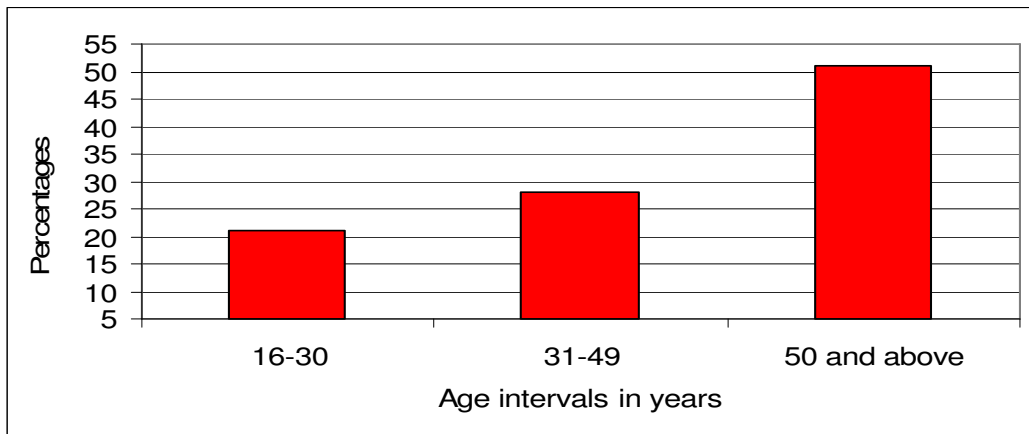


Figure 5: Age intervals of the respondents in Poding Tse Rolo

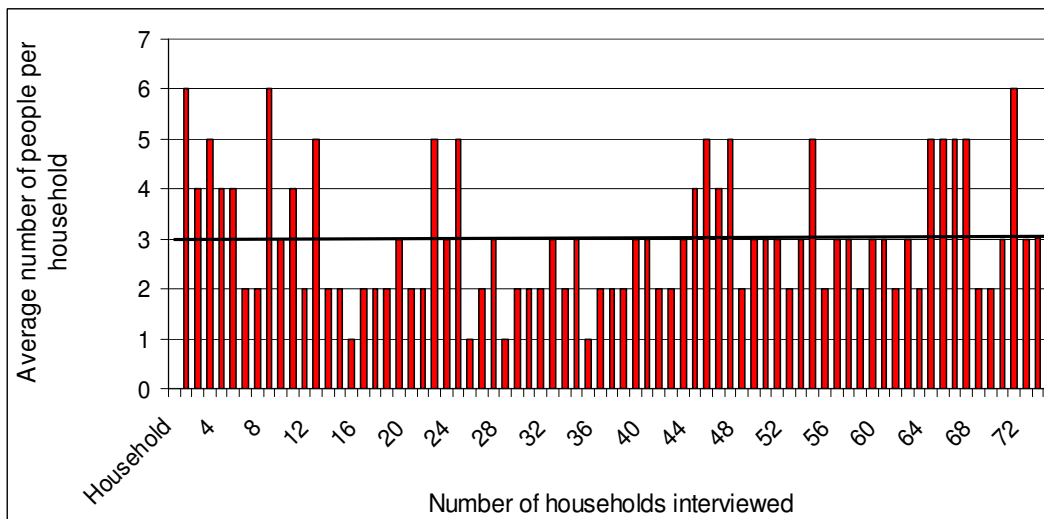


Figure 6: Average number of people per household in Poding Tse Rolo(line indicate averages).

4.2.2 Relationship of the respondents to the owners of the house

The results in Figure 7 indicate that 78% of the respondents were the head of the household and 5% of the respondents indicated that they were related to the head of the household, i.e. a brother/sister, or uncle/aunt. No questions were asked relating to the period that the respondents had resided in the house. Such information would have given valuable information regarding the knowledge of respondents, over a certain period of time, regarding the sanitation practices and related behaviours of the households. The results showed that 5% of the respondents were tenants in the household visited.

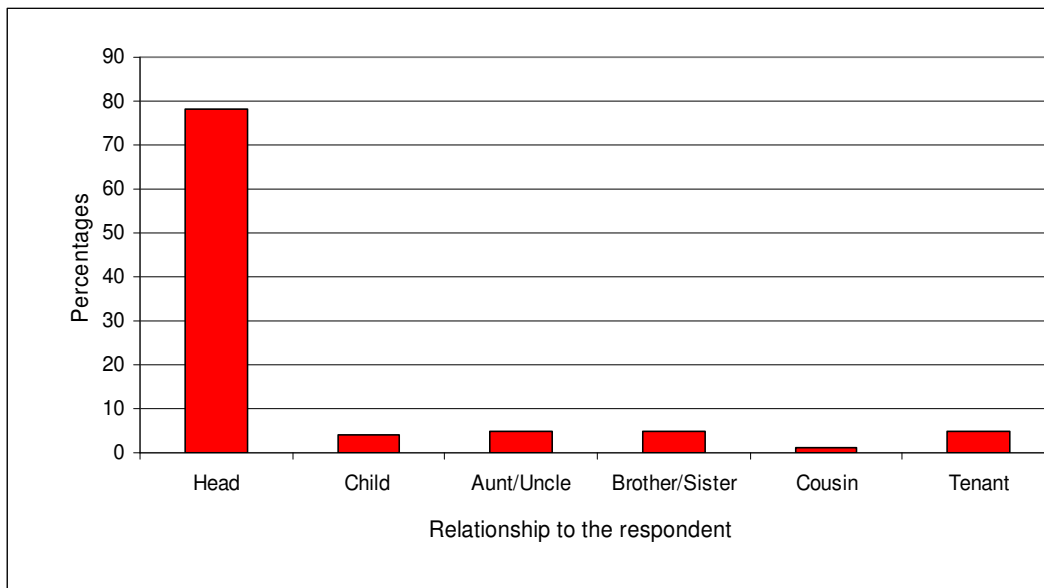


Figure 7: The relationship of the respondent to the head of the house

4.2.3 Socio- Economic Status

The findings in Figure 8 indicate that 83% of the sampled population was not employed. The study also found that only 12% of the population was receiving an income. Of this 12% of the population that received an income, only one or two people in a household had some form of income. It was also found that 8% of the respondents were self employed.

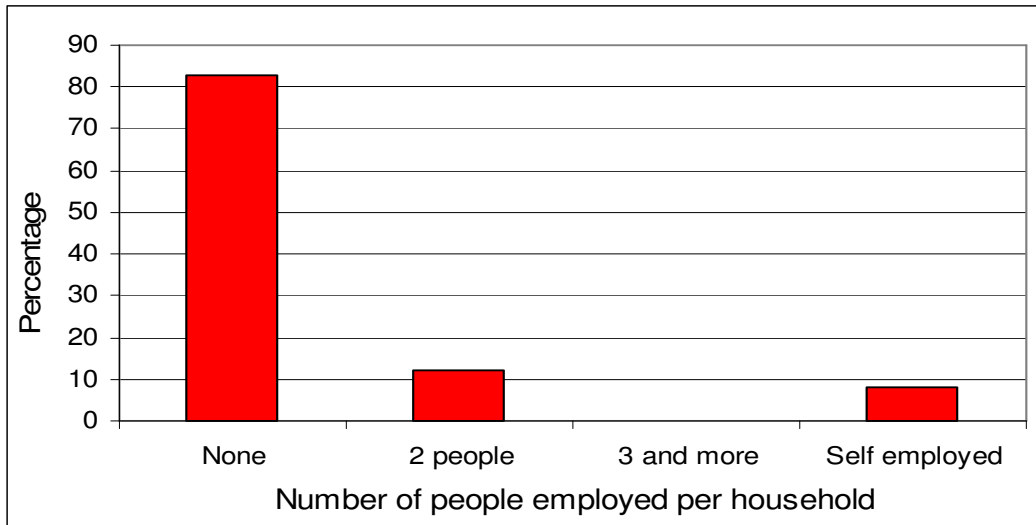


Figure 8: Number of people employed per household

4.2.4 Type of work done by breadwinner

Figure 9 shows that 42% of the breadwinners was working as domestic workers and 25% was working as general workers and in government departments (question 6).

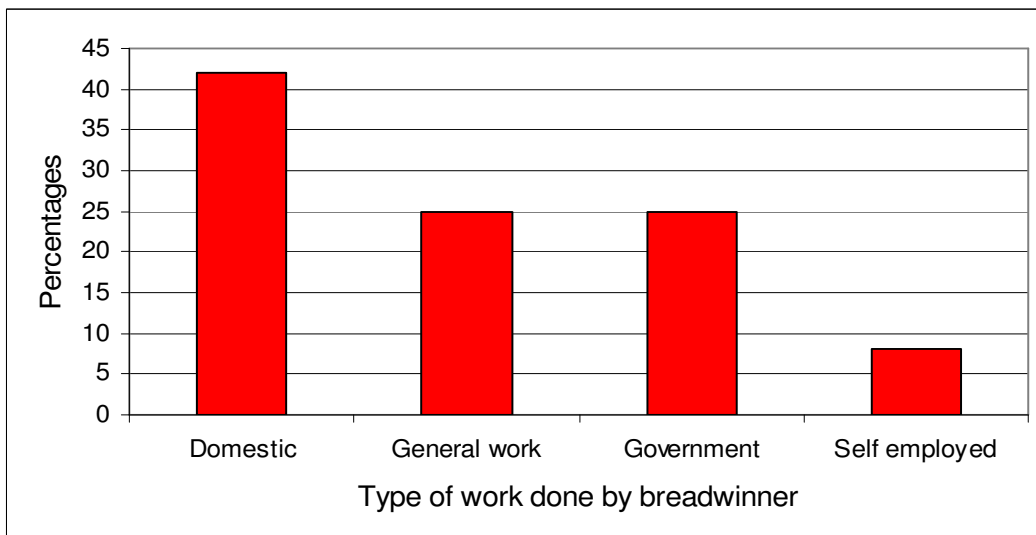


Figure 9: Type of work done by breadwinner (This is only the number of those earning income through employment)

4.2.5 Monthly income of individual households

Figure 10 indicates that 13% of the respondents' combined monthly income was between R1 to R500. Four percent of those interviewed earned between R501 to R1 500 with only 6% of the respondents earning between R1 501 to R3 000 per month. More significant is the fact that 75% of the respondents did not earn any income.

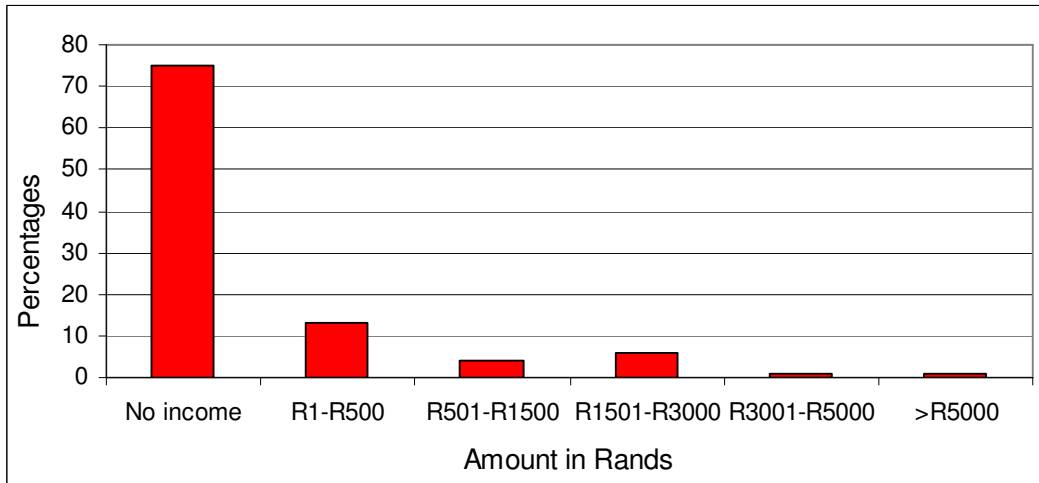


Figure 10: Income distribution of residents in Poding Tse Rolo

4.3 SANITATION AND BLOCKAGES

Questions 9 to 19 provided information on sanitation and blockages. The questions explored how the residents responded when experiencing sewer blockages and manhole overflows. The results are reported in Table 7 and Figure 11.

4.3.1 Information on sanitary systems used

Table 6 indicates that a large number of households interviewed used a waterborne sewerage system. Figure 11 shows that 53% reported that they had used this system for the five years preceding the survey. Of those interviewed, 97% were satisfied with this type of sanitation system and only 3% of the respondents showed dissatisfaction.

Table 6: The type, duration of usage of system and satisfaction level of the respondents

Type of sanitation system (n = 72)	Number	Percent
Bucket	0	0
Waterborne	72	100
Ventilated improved latrine	0	0
Total	72	100
How long has this system being used (n = 72)	Number	percent
Less than 6 months	1	1
One year	2	3
Two years	10	14
Three years	9	13
Four years	9	13
Five years and longer	39	54
Not specified	2	3
Total	72	100
Generally satisfied with the system	Number	percent
Satisfied	70	97
Unsatisfied	2	3
Total	72	100

4.3.2 Types of blockage experienced

Figure 11 indicates that 71% of the respondents have not experienced any toilet blockages during the two years preceding the survey. The other 29% claimed that they had experienced blockages. The responses of the respondents when asked who was responsible for unblocking the blockages in the streets or in the yards are presented in Figure 12.

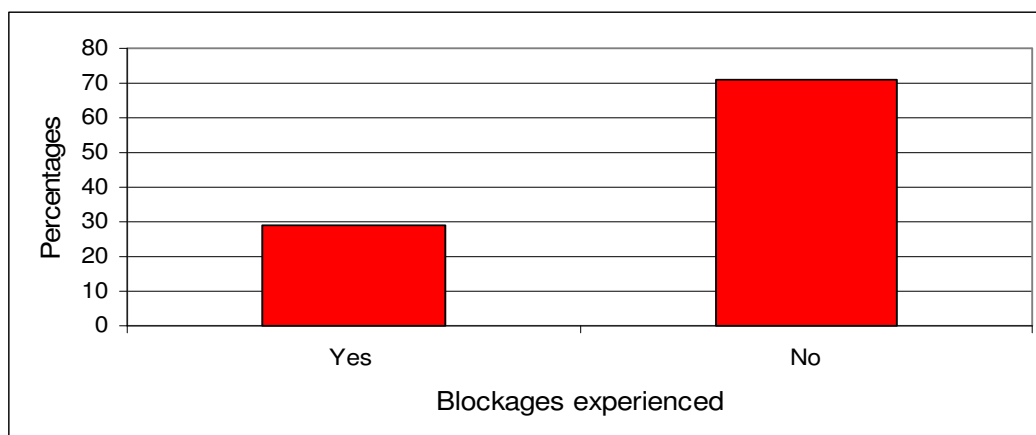


Figure 11: Response of respondents on whether there were any blockages experienced during the two years preceding the survey

4.3.3 Authority responsible for unblocking blockages

The results according to Figure 12 indicate that 97% of the community was aware that it was the local municipality's responsibility to unblock the blockages outside the yard, but of interest was the fact that 44% of the community indicated that it was the municipality's responsibility to unblock blockages inside the yards.

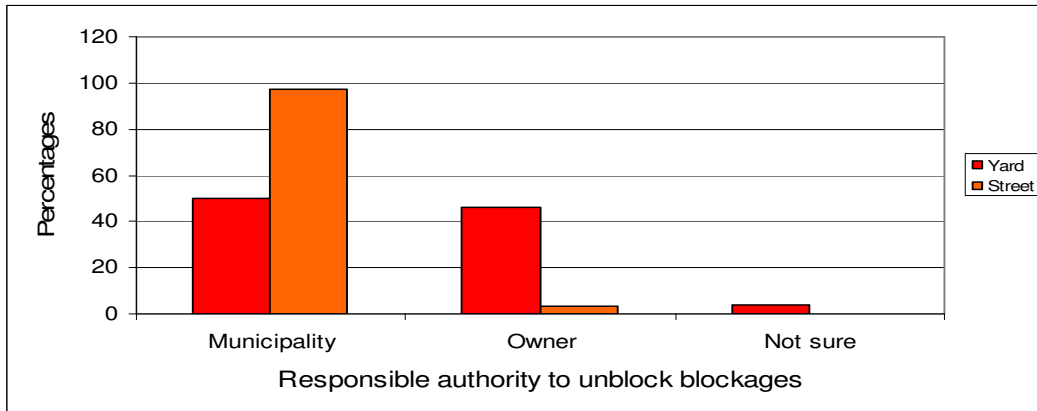


Figure 12: Authority responsible for unblocking of blockages inside or outside the yard

4.3.4 Community perceptions regarding response time to attend to blockages

Figure 13 shows that the unblocking rate of blockages ranged from a minimum of one to two days to a maximum of two to three weeks. Thirty six percent of the respondents indicated that it took the service provider one to two days to unblock the blockage, 8% indicated that it took the service provider a week to unblock a blockage, 24% said it took more than a month, 14% indicated that it took two to three weeks and 18% said they were not certain.

The results suggest that the municipality had in some instances an unacceptably slow response rate to blockages.

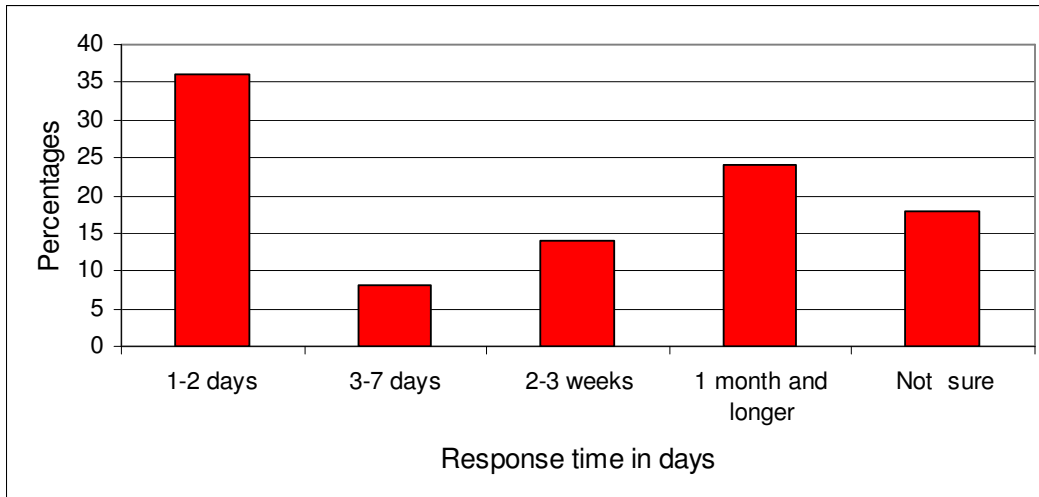


Figure 13: Community perceptions on response time of the municipality to attend to the blockages in the sanitary system.

4.4 KNOWLEDGE AND USAGE OF SANITATION FACILITIES AND PRACTICES

The information provided by respondents was important in determining the households' behaviour and practices that might affect the normal functioning of the sanitation systems. The results are presented in Figures 14 to 19.

4.4.1 How sanitation services can be improved

When asked how sanitation services could be improved, three options were provided. Fifty percent of the respondents mentioned that there was a need for the service provider to improve the way the service was being provided. Figure 14 shows that 24% of the respondents suggested reductions in the service payments, whilst 25% of the respondent raised a need for hygiene education to be conducted in order to improve service delivery.

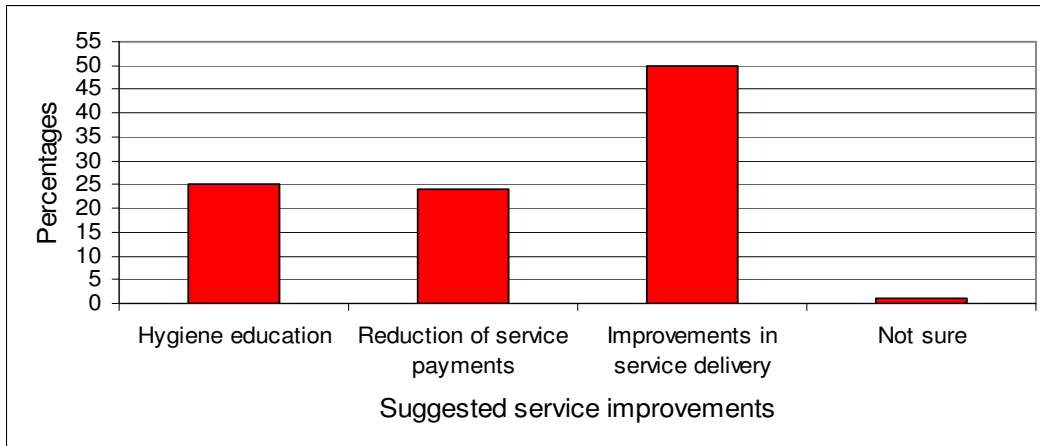


Figure 14: Suggestions given by respondents on how water and sanitation services could be improved.

4.4.2 Type of material used for anal cleaning

The results to questions 20 - 27 are presented in Figure 15 to Figure 18. The results revealed that 60% of the sample population used toilet paper for anal cleaning while only 40% used newspaper. However, about half of the respondents who used toilet paper indicated that they sometimes used newspaper when they did not have money to buy toilet paper.

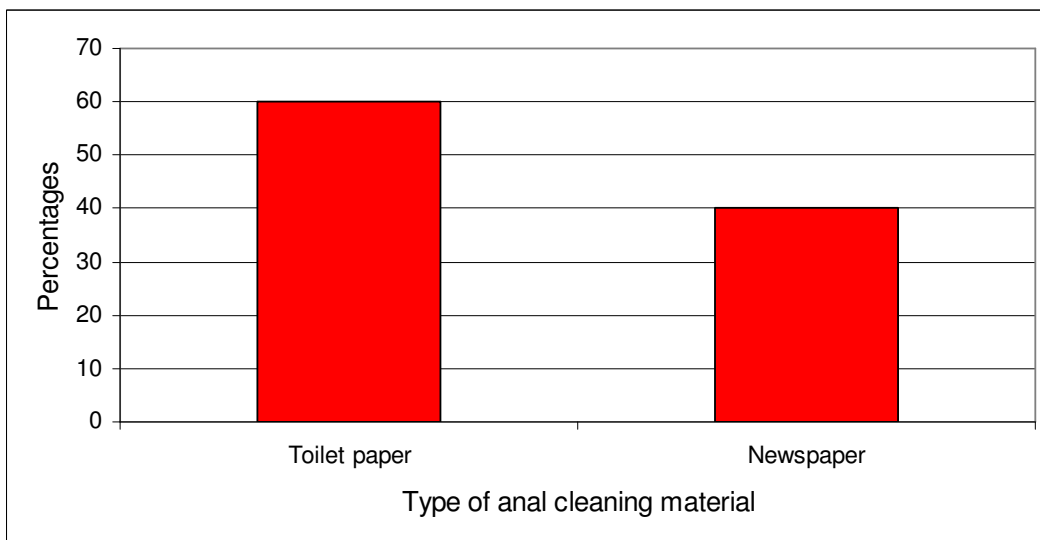


Figure 15: The type of anal cleaning material used by households.

4.4.3 Knowledge on why the type of cleaning material is used

When the respondents were asked the reasons for using the type of anal cleaning materials they chose, the results in Figure 16 indicate that 38% of the respondents did not

have sufficient funds to buy proper toilet paper, 47% said they were used to the material chosen and 14% said they had been taught to use the material they chose.

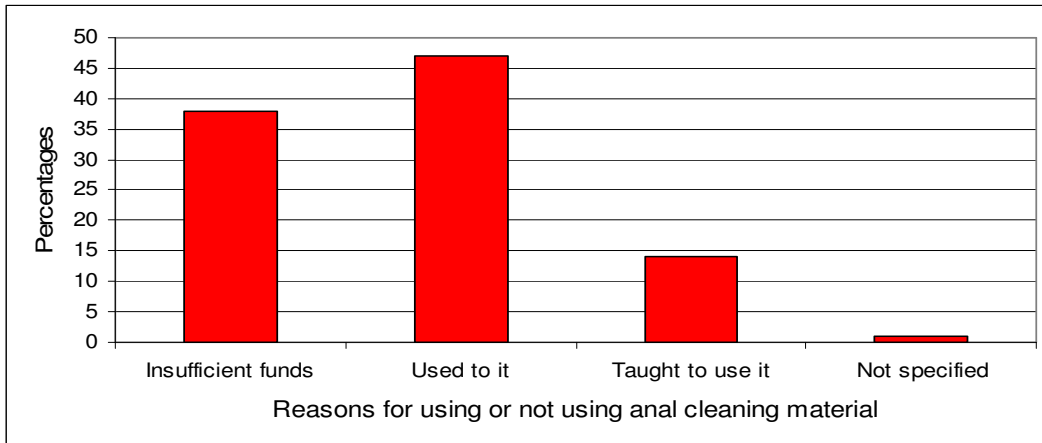


Figure 16: Reasons why respondents use the type of anal cleaning material they chose.

4.4.4 Experience on the use of anal cleaning material

A total of 61% of the respondents was comfortable with the use of the anal cleaning material they chose with 25% indicating that they were not comfortable with their choice. However, 14% did not indicate or specify their feelings regarding the use of the type paper they chose.

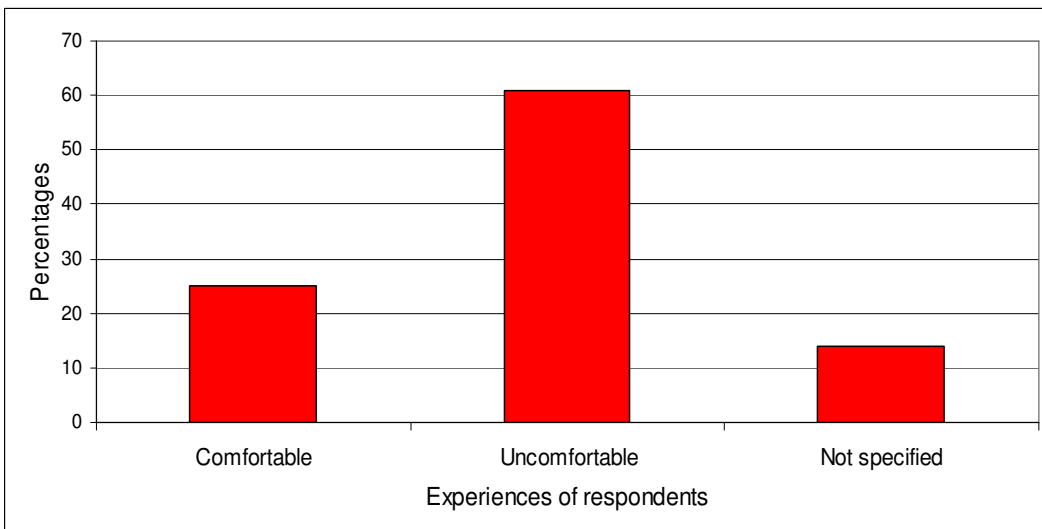


Figure 17: Experiences of households in using the anal cleaning material.

4.4.5 Solid material disposed into drains or toilets

The findings as reported in Figure 18 indicate that 97% of the respondents did not admit to depositing any foreign material in the dirty water they disposed of. The observations made during the interviews, however, showed that the majority of the respondents disposed of their grey water in the drains provided next to their toilet.

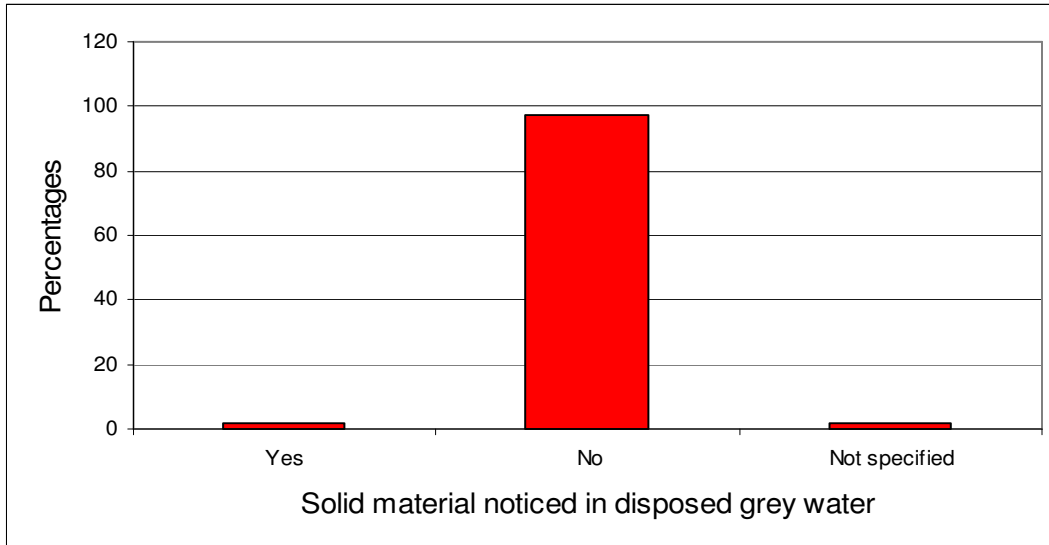


Figure 18: Solid material noticed when the households disposed of grey water.

4.5 SANITATION AND WATER SERVICES PAYMENTS

The results recorded for questions 30 to 33 provided the information on whether the households experienced water cut-offs and how frequently these cut-offs were occurring. The sites from which the respondents would fetch water if water was cut off are also reported. The results are presented in Figures 19 and 21.

4.5.1 Payment of water and sanitation service and water supply cut-off

Figure 19 indicates that 72% of the community paid for their services whilst 28% were not paying for their water and sanitation services. The results also indicate that 56% of the households did not experience water cut-offs whilst 44% experienced water cut-offs.

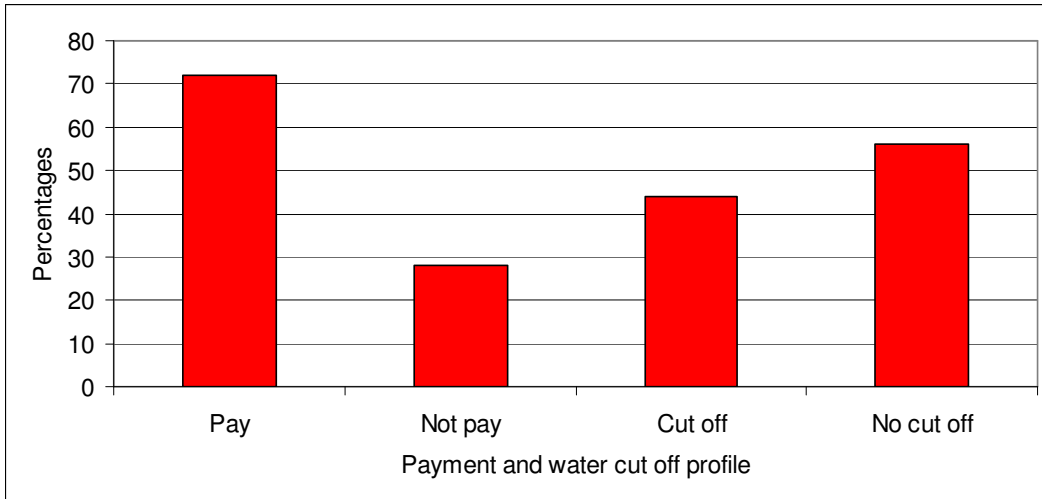


Figure 19: Payment and water cut-off profile in Poding Tse Rolo

4.5.2 Options explored by respondents when water is cut off

According to Figure 20, of those households experiencing water cut-offs, 10% would pay their water bills to have water supply restored again and 14 percent would fetch water from their neighbours. Sixteen percent of the respondents would put their buckets underneath the dripping taps until the bucket was filled, whilst 3% would store enough water to provide them with water for the period that the water is cut off. Only 1% would wait for water to be restored.

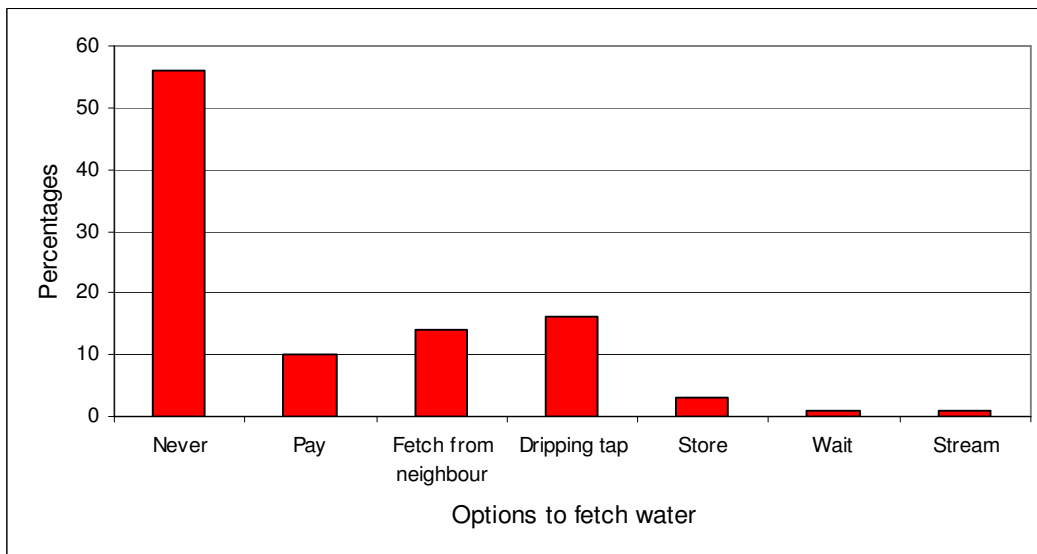


Figure 20: Options explored by respondents when water is cut off

4.5.3 Amount paid for water and sanitation services

The results indicate that 49% of the respondents paid between R10 and R50 for water and sanitation services, 23% paid between R51 and R100 per month, and 4% of the respondents paid between R101 to R200 for these services per month. The majority of respondents paid less than R50 a month. It was found that this could be linked to the high rate of unemployment as indicated in Figure 8.

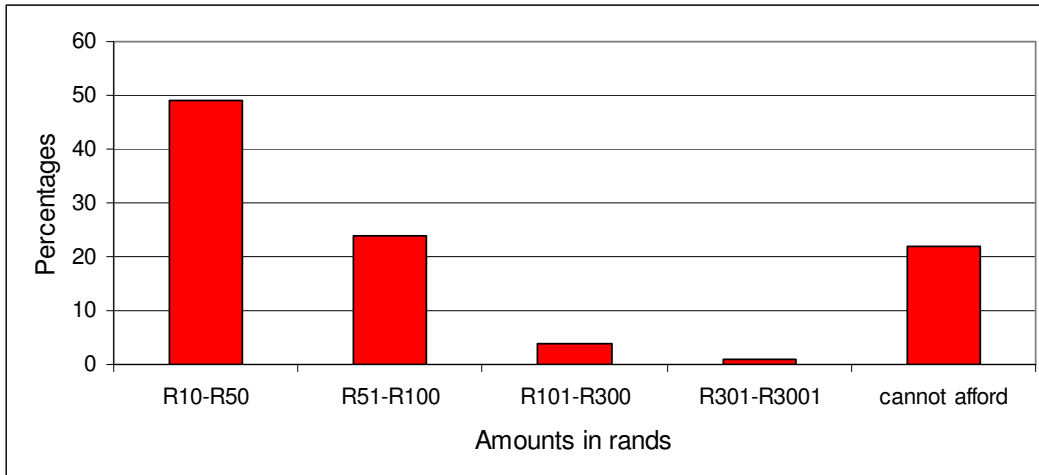


Figure 21: Amount of money paid by respondents for water and sanitation services per month.

4.6 AWARENESS OF COMMUNITY INVOLVEMENT IN HEALTH EDUCATION PROJECTS

The information explored the knowledge of the community regarding the ward meetings, frequency of ward meetings, sanitation projects taking place, and specific days when the domestic waste was collected by the service provider. The results based on questions 37 to 46 are presented in Figures 22 to 25.

4.6.1 Community ward meetings

The level of awareness of ward meetings was also evaluated. The results in Figure 22 show that 63% of the respondents indicated that community meetings were held as compared to 36% who said that no meetings were taking place in Poding Tse Rolo. The results indicate that only 1% of the respondents was not sure whether meetings were taking place or not.

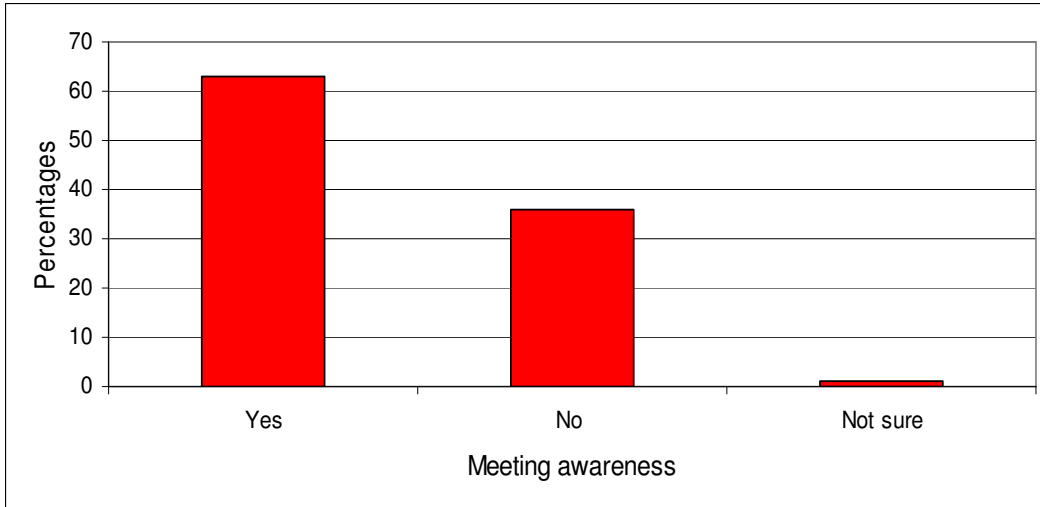


Figure 22: Awareness of people regarding the ward meetings in Poding Tse Rolo

4.6.2 Frequency of meetings held by local authority with the community

When responding to the question on the frequency of the meetings held, 35% reported that the meetings were held once in a quarter, 18% indicated that the meetings were convened once every month and 6% indicated that they were held once in every six months. The varied answers given by respondents as presented in Figure 23 suggest that the community was either not attending the meetings, or that residents were not adequately informed about the meetings.

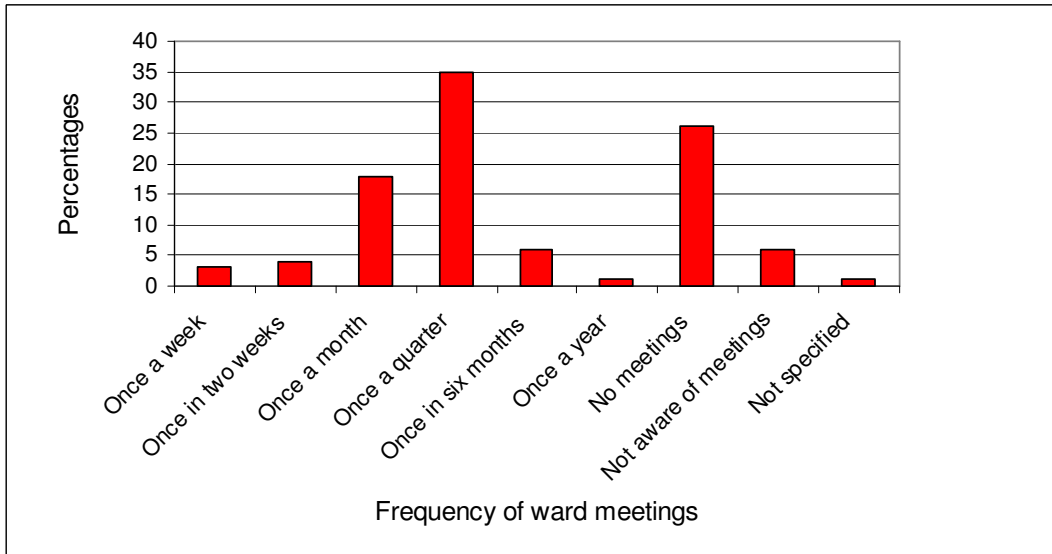


Figure 23: Frequency of meetings held in Poding Tse Rolo

4.6.3 Sanitation projects taking place in the community

Figure 24 indicates that only 14% of the respondents were not aware of any sanitation projects. The results further indicate 86% of the respondents claimed to be aware of sanitation projects.

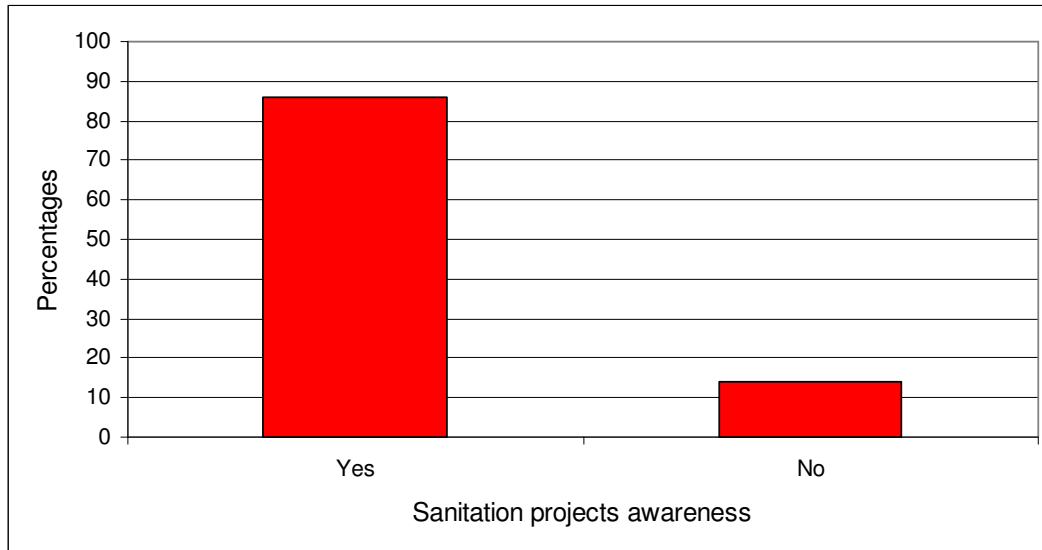


Figure 24: Responses of respondents on whether they are aware of sanitation projects in Poding Tse Rolo

4.6.4 Awareness of diseases caused by polluted water

When asked whether they were aware of any diseases caused by polluted water, Figure 25 shows that 72% of the respondents were not aware of any diseases caused by polluted water whereas 28% of the respondents were aware of such diseases. When asked to mention the type of diseases caused by polluted water, 51% of those who were aware of diseases mentioned cholera and diarrhoea. Tuberculosis was also mentioned as being caused by polluted water by about 12% of the respondents.

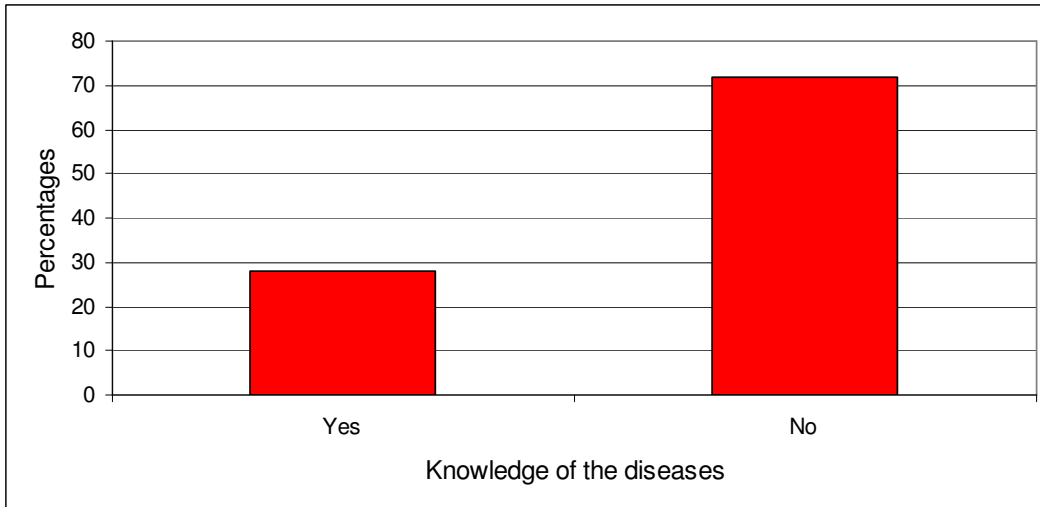


Figure 25: Knowledge of diseases caused by polluted or contaminated water.

4.6.5 Age of infants starting to use a toilet

The reported ages at which infants in the area started using the toilets are presented in Figure 26. This aspect was explored to get an indication of the age at which potential surface faecal pollution by infants was no longer under the control of their mothers or caretakers. This could help to focus future educational programmes on domestic surface cleanliness.

The results in Figure 26 indicate that 24% of the respondents said that their children started using the toilet between one and three years of age, 8% said between the ages of four and five, and 4% said from six years and above. The majority of the respondents (43%) indicated that they could not remember when their children started using the toilet since they had had their children a long time ago and that there were no children at their homes at the time of the interviews. The other 21% of those interviewed was not sure at what age their infants started using the toilet.

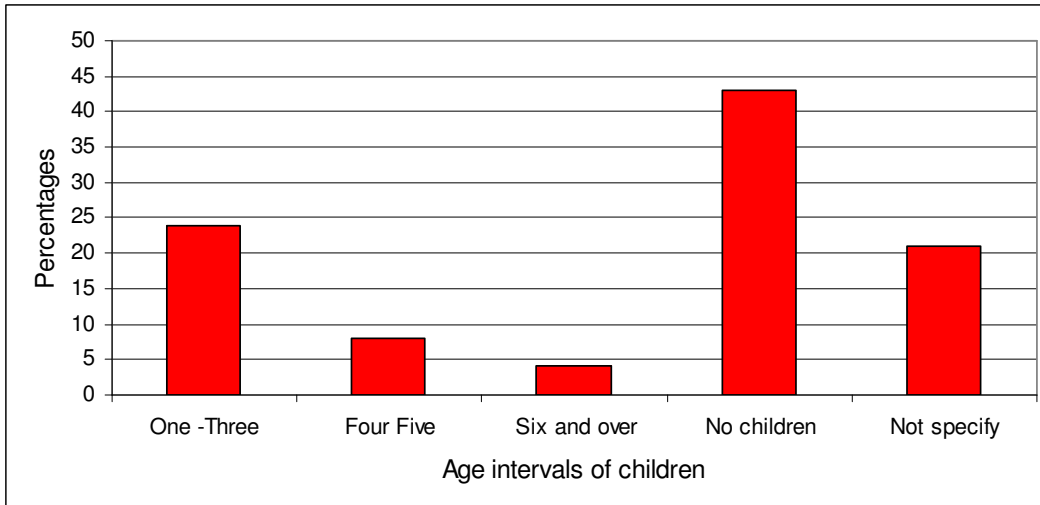


Figure 26: Responses of respondents on the age at which infants start using the toilets.

4.6.6 Knowledge of specific days on which waste is collected from Poding Tse Rolo

The results in Figure 27 indicate that more than 50% of the respondents said the waste was collected on Mondays, 22% said that waste was collected on Tuesdays, and 15% said that it was collected on Wednesdays. It has been an observation during the pilot study that when waste is not collected properly it is spread over the environment and enters the open manholes. The results suggest that the service could be provided over a number of days in specific areas, hence the different responses from the respondents.

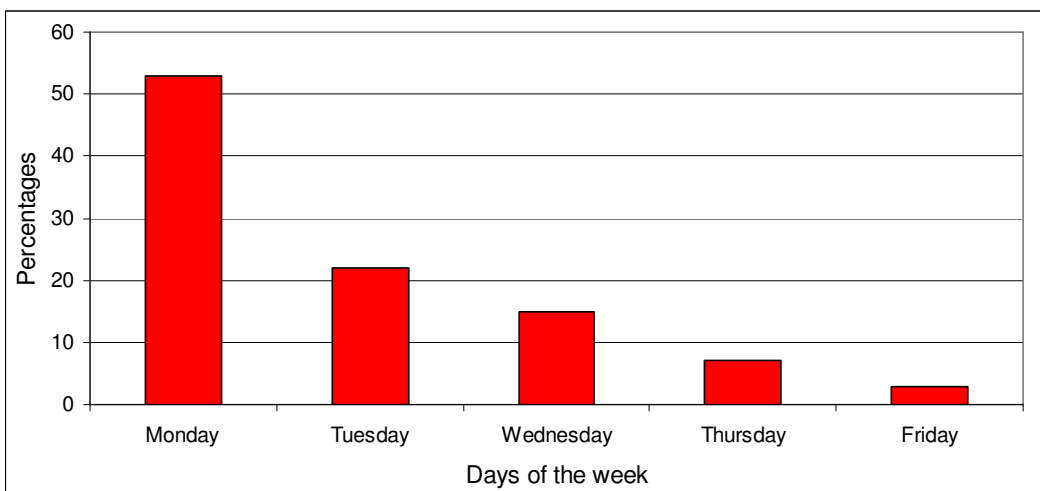


Figure 27: Knowledge of specific days when waste is collected in Poding Tse Rolo

4.7 PARTICIPATION IN SANITATION INITIATIVES

The literature reports on the important role women play in establishing health education programmes within communities throughout the world. It was important to establish the role of women in Poding Tse Rolo in this regard. The results based on questions 32 to 36 are presented in Figure 28 to 30.

4.7.1 Women's participation in sanitation projects

The results in Figure 28 indicate that 78% of the respondents was not aware of the role of women in sanitation projects whilst 22% admitted that women were represented in sanitation project committees.

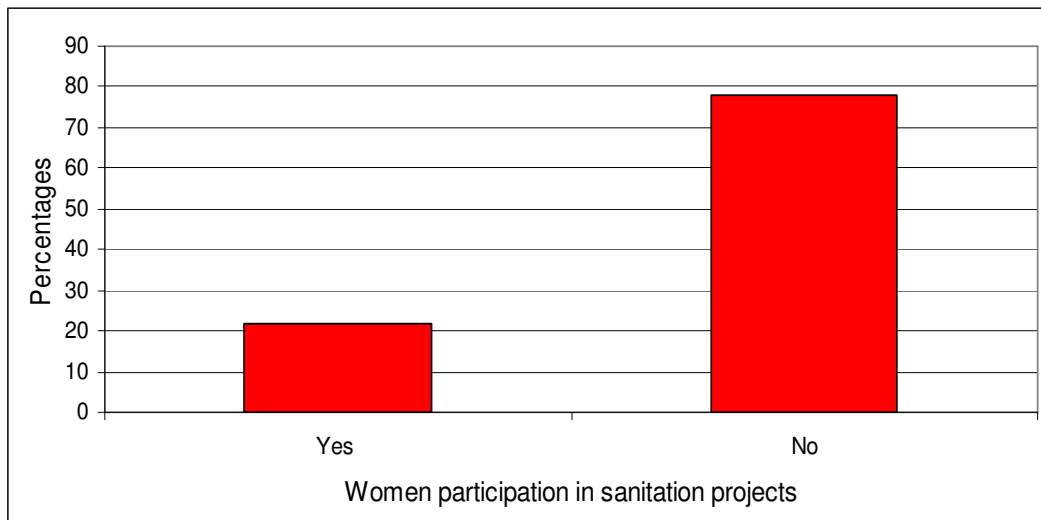


Figure 28: Response of respondents on the participation of women in sanitation projects

4.7.2 Sanitation-related issues at ward meetings

Figure 29 shows that 82% of the respondents did not raise sanitation issues during community meetings and as a result sanitation issues were not placed on the agenda. Of those who did not discuss sanitation issues at ward meetings themselves, 11% admitted that sanitation issues were discussed, whereas 7% were not sure whether such discussions ever took place.

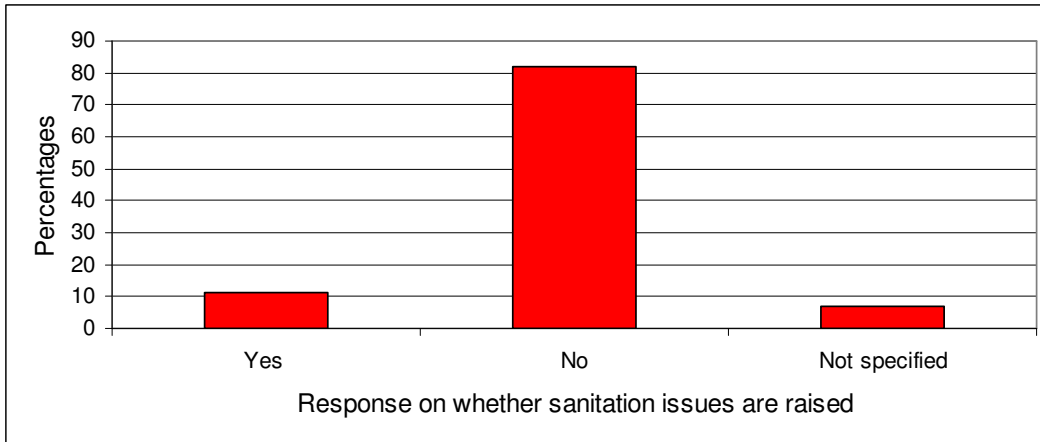


Figure 29: Responses of respondents on whether they raise sanitation issues in the ward meeting.

4.7.3 Reason for not raising sanitation-related issues at meetings

When asked why they were not raising sanitation issues at the meetings, 44% of the respondents mentioned that the local authority was not fulfilling its promises and that it would therefore serve no purpose to raise these issues. Thirty three percent of the respondents said they were afraid of being sidelined by the authorities and 10% said they did not feel free to raise issues in the presence of their partners. Similar results were found in a study conducted by Mathabatha and Naidoo (2004:16-17).

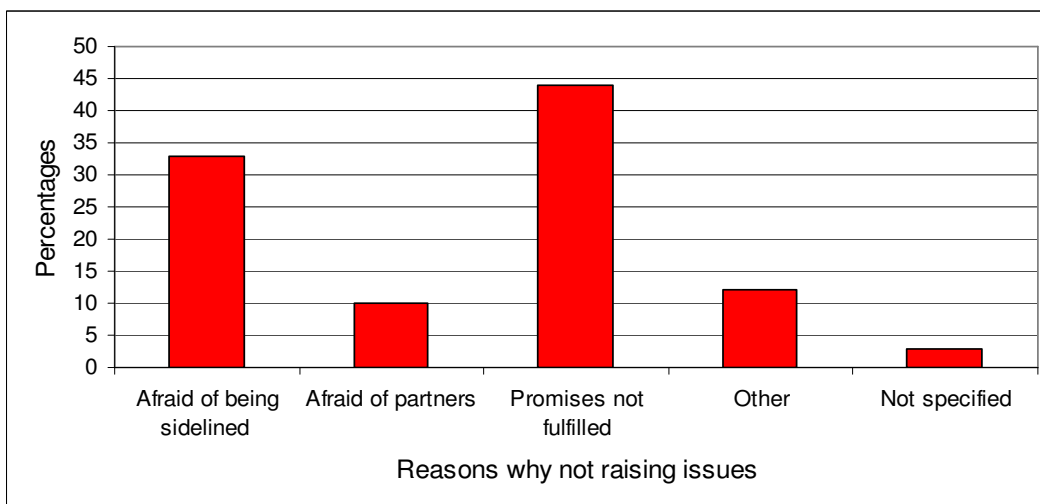


Figure 30: Reasons why the respondents are not raising sanitation issues in the meetings

4.8 OBSERVATIONS

The following were observed at each household after the interviews had been conducted and the responses recorded:

Type of toilet facility:

1. condition inside toilet;
2. operational status of toilets;
3. general cleanliness of the yard; and
4. manhole covering in place.

Table 7: Observed operational status of the households toilet

Condition of toilet	Percentages
Toilets not properly flushing	38
Toilets properly flushing	62
Toilet paper inside the toilet	20
Newspaper inside toilet	58
Toilets without anal cleaning material	22

The results from the observation indicate that all the toilets used were waterborne systems. Sixty two percent of these toilets were clean and were flushing properly. All of the manholes in the areas where interviewers travelled were covered, except that some of them were showing signs of overflowing. Observations made after the interviews showed that 58% of the toilets had a piece of newspaper beside the toilet, even in the households where respondents mentioned that they used toilet paper. It was also found that the number of toilets where newspaper instead of toilet paper was used was higher.

4.9 SUMMARY OF CHAPTER FOUR

This chapter shows the results of the interviews and the observations made during the administration of questionnaires. The knowledge, attitude, behavioural and practices of the community was investigated and findings presented and discussed. The findings suggested

that the community's behavioural practice has the influence on the sustainability of the sanitation systems. The social economic status, lack of awareness and involvement of women in sanitation issues seemed to be the major contributor to manhole blockages in Poding Tse Rolo.

CHAPTER FIVE

DISCUSSION AND RECOMMENDATIONS

5.1 INTRODUCTION

The study was conducted in the community of Poding Tse Rolo, near Philippolis in the Free State province of South Africa under the jurisdiction of Kopanong Local Municipality. The study aimed to determine how the sanitation, water provision practices and the behaviour of the Poding Tse Rolo community contributed to the sustainability of provision of sanitation services in the area. Moreover, a number of hypotheses was tested to investigate the blockages in the systems. The exploratory nature of the study, possible response bias and problems inherent to interviews in late afternoons all limited the generalisation of the results.

The results obtained from the evaluation of the responses to the questionnaire suggest that the causes of the blockages could be ascribed to a combination of socio-economic and administrative factors and that the opportunity cost to make sustainable adjustments to the process had not been determined. The results generally provide support for the hypotheses that the behavioural and cultural practices of the community of Poding Tse Rolo negatively influenced the sustainability of the sanitation systems.

Although the majority of people in the township are using waterborne sewage systems, Poding Tse Rolo experienced problems with the effective and efficient provision of sanitary services to the township. Wastewater, sewer and manhole blockages in 2004 resulted in sewerage overflow in the streets and in the yards of the community. This investigation showed that households in the community as well as the local authority contributed to the status of the blockages and neglect of the sanitary system.

5.1.1 The role of the households in managing the sanitary system

When the Free State Department of Treasury (2008:5) conducted the socio-economic review for the period 1996 to 2006, it was found that the province faced high levels of migration. The review reports that only 26.4% of the population was between the ages of 20 - 34 years, whereas 40.5% was between 0 to 19 years. It was argued that there was a decline in the younger generation in the area due to pressures of resources, and a lack of institutions of higher learning and job opportunities. Theron (2000:38), in a survey

conducted in Botshabelo near Bloemfontein in Free State, found that 79.6% of the respondents was between 21 and 59 years, with 10% of the respondents younger than 21 years old.

Figure 8 in Chapter four shows that 83% of the households in Poding Tse Rolo was unemployed and that 42% of those who were employed were working as domestic workers. It was also found that 13% of the working people earned less than R1 500 per month (Figure 10, Chapter 4). This suggests that when an average of four people per household relies on one income, it can have a negative impact on poorer families. It is clear that an average household in Poding Tse Rolo, comprising of 3 people (Figure 6) and with an average income of R1 000 (Figure 10) will find it difficult to set aside the funds to purchase proper toilet paper. If they did, it would be at the expense of buying food to survive. Similar observations were made by Duncker (2000a:43), who report that poor families cannot afford to buy disinfecting material and soap to improve their personal hygiene. They would rather spend every cent they have on food. These observations would explain why alternative anal cleaning options, for example newspapers (Figure 15), were used in households in Poding Tse Rolo.

The results also indicate that not all households were paying for the sanitary and water services provided (Figure 19), the resultant effect being the cut-off of water to the residences. No water supply to the residence implies no available water to flush the toilet, and this renders the water borne sewerage system ineffective. Apart from the potential health hazards in the household itself, the combination of incorrect anal cleaning material and no water is a sure recipe for blockages in the sewage system. Therefore, the real cause of blockages from a household perspective may be the inability of households to afford toilet paper and services, more so than the use of alternative anal cleaning materials that are available in the immediate environment. However, while considerable sympathy lies with the people who cannot afford to pay for any of the services, those who can pay and do so with great sacrifices are also penalised when overflows in the street take place and they have to accommodate the unhealthy situation. A concealed situation may therefore exist in the community which in the long term can result in apathy towards any community and local government involvement.

Some households were depending on pensions and social grants for maintaining their families. The study found that there were no major factories and businesses to employ people except an abattoir, four schools, two clinics, a municipal office and few shops. It may therefore be argued that employment opportunities are limited and that any strategy to improve services for which residents have to make additional payments will not be

successful. The reason for such a conclusion is that this investigation found that 72% of the community paid for their water and sanitation services (Figure 19); however, 49% paid less than R50 per month. This low level of service payments indicates that the community cannot even pay for the present services they receive. As a consequence, the hypothesis that the survival options of individuals in Poding Tse Rolo negatively influence the sustainability of the sanitation system is therefore accepted. The conclusion is reached that the situation in the short term will not change and that alternative, non-monetary solutions are needed.

5.1.2 The role of the community in managing sanitary systems

According to a National Household Survey conducted in South Africa, it was found that in most African communities, females are responsible for the health of households (UNICEF, 2005). The survey indicates that mothers are usually the people with the best knowledge of health matters in the household. They also possess the best knowledge about the activities in and around the house of the other household members.

In theory active participation, especially of women in the community meetings, can lead to change in behavioural practices and ultimately open channels of communication between households, and also between households and service providers. When neighbours are able to discuss sanitation issues that affect their well being on a day-to-day basis, they will also educate one another in the process. Unfortunately, this ideal is not applicable to the community of Poding Tse Rolo. The results of the study according to Figure 29 indicate that although blockages in the sewage systems do occur, 82% of the respondents did not raise the sanitation issue at the ward meetings when they had the opportunity to do so. Women's involvement and their participation either in sanitation projects or committees are low (Figure 28). This could have a negative effect in the normal functioning and sustainability of the sanitation system servicing the area.

The fact that sanitation issues were not on the agenda of the authority that convened the meetings therefore leads to the assumption that this issue was not a priority for the service provider. It appears that they found no reason to consider sanitation as a major problem in the community. As a consequence, a major opportunity to rectify the problem was lost.

The study revealed that there were reasons why the community was not enthusiastic to become involved in community-type solutions to problems. Some reasons were based on personal experiences. When asked the question why sanitation issues were not raised during meetings, the response was that the municipality was not fulfilling their promises

(Figure 30), hence the apathy. Thirty three percent of the respondents indicated that they were afraid of being sidelined or victimised by the authorities (Figure 30) if they should raise this issue. A small percentage of the respondents suggested that the prevalence of tradition and cultural constraints prevented freedom of speech in the community. In this regard, 10% of the respondents were afraid to raise issues in meetings in the presence of their partners.

In conclusion, the study assumed that a combination of past experiences of no follow-up on the part of the authorities, victimization, negative peer group responses and to a lesser extent, tradition and cultural orientation, contributed to poor communication and networking within the community. The basis to establish co-operative relationships between the project implementers and the community as the beneficiaries of service delivery does not exist. Such relationships are essential for successful rural water supply and sanitation programmes.

The study indicated that 63% of the respondents were aware that ward meetings were held (Figure 24). This implies that promotion for the attendance of ward meetings should have taken place. However, much confusion about the nature of the meetings and the dates and time when they took place existed. Thirty six percent of the respondents was not even aware of such meetings (Figure 23). The findings indicated that 35% of the respondents reported that the meetings were held once in a quarter, 18% said that meetings were convened once every month and 6% indicated that they were convened once in every six months. The varied answers given by respondents (Figure 23) suggest four matters of concern in the Poding Tse Rolo community namely:

- people were not adequately informed about ward meetings by the authorities;
- the community missed opportunities to attend meetings and to use them as a forum to raise legitimate concerns;
- people lost interest in attending meetings; or
- the meetings were not taking place as reported by 26 percent of the respondents.

Blockages of sewage systems are not a new occurrence. The study found that the community of Poding Tse Rolo was aware that they had to contact the responsible authority when they experienced blockages in the streets (Figure 12). According to the Water Services Act, act 108 of 1997, it is the responsibility of the Local Authority to provide water and sanitation services. It also appears that they were informed as to whom to

contact when blockages occurred inside or outside their yards. These actions could only take place if people experienced similar blockages in the past. It was noted that there were different views regarding the time taken by the municipality to unblock the blockages. The results as presented in Figure 13 show that 36% of the respondents rated the municipality response time to blockages as effective. Although this percentage is higher than individual percentages as shown in Figure 13, the overall results indicate that the blockage response time was ineffective. When the unit manager of Philippolis was asked about the minimum time taken to unblock the blockages, he indicated that they normally took one to two days to unblock the blockages. He further mentioned that the additional staff appointed by the municipality had led to the improvement in response time. This response implies that Mr Vorster, the Unit Manager of Philippolis, was not aware that 64% of the unblocking took longer than two days. Nor was the community aware that unblocking should take less than three days. The lack of involvement in community initiatives by the community itself and the slow response of the local authority to emergency blockages both support the hypothesis that community involvement in local governmental communication systems has a direct relationship with the standard of health and sanitary service delivery of the Philippolis ward.

5.1.3 The role of the Authorities in managing sanitary systems

From the Government's perspective, the eradication of the sanitation backlog would have numerous far-reaching socio-economic and environmental benefits to be enjoyed by each household in the Republic. It was reported that basic water services from 1994 to 2004 had been provided to 10 million people in the rural areas. In 2005, 2 522 54 buckets were still being used whereas WISA (2008:28-29) announced that the bucket system was close to being eradicated. The change over from a bucket to a water articulated sewage system also implied that water to service the sewage system was readily available and that the rural communities could afford the running water needed to sustain the integrity of the system. However, the availability of water also had the potential to introduce new diseases to households and it was assumed that appropriate health education programmes would be an integral part of the sanitation programme.

The results of the study showed that although a culture of service payment seemed to exist in Poding Tse Rolo, the majority of people were paying less than R100 a month (Figure 21). This is quite an achievement given the low level of employment. However, 28% of residents still did not pay for services (Figure 19), the result being that 44% of the community was experiencing water cut-offs (Figure 19). These observations are not

unique to Poding Tse Rolo. A study conducted by Theron (2000:58-62) revealed that approximately 60% of the sample population's water supply in Botshabelo in the Free State would be cut off. It would only be after a period of time that the water supply would be restored again.

A major potential problem arises when water to a community is cut off. The findings as presented in Figure 20 show that 16% of those who experienced water cut-offs would fetch water from their neighbours. This implies that no water would be available for flushing toilets and relieving oneself would most probably take place in the immediate environment outside the building, which in turn could initiate a vicious negative health cycle. Cutting the water supply, which is an administrative response to non-payment, can result in major-health related issues with far reaching consequences. The WHO (2004:1-2) emphasises that unsafe water supply and inadequate sanitation is normally associated with high morbidity and mortality from water-related diseases. The NCWSTI (2000: 4) emphasises that providing water to a community is part of the total development and upliftment process of the community. The literature review has indicated that a basic service is a human right and if services are not affordable, the community cannot be expected to provide the system required to ensure human health. It is essential that the health of communities is not put at risk through inadequate or inappropriate services provision.

The non-availability of water is problematic especially when the community is using waterborne sanitation as is the case of Philipolis. When water supply is cut off, the community is unable to flush the toilets and would rather use the environment to relieve themselves. However, the study by the Community Water and Sanitation Agency (CWSA) (2004:40-50) reinforces the fact that the availability of water is not related to good hygiene behaviour. The CWSA found that those who had water available did not have better hygiene practices than those who did not have water available. This means that the provision of sanitation and water services should always be combined with hygiene promotion.

The results as presented in Table 1 indicate that 100% of the Poding Tse Rolo ward used the waterborne sanitation system. According to EnviroTeach (2004:9), 29% of the water used in households is flushed through the toilet. This means that when one household has an average of three members (Figure 6), more water would be used depending also on the number of toilet visits made by the individual household members. The risk of debt burden on households therefore increases because they cannot afford paying for services due to their low economic status (Figure 8). In this regard, the inability of the community to pay

for services resulted in 44% of the community's water supply being suspended by the local municipality (Figure 20).

The DWAF, (South Africa, 2002c) emphasises that sanitation systems must be sustainable and affordable to the service provider and payment by the user is essential to ensure the sustainability of the systems.

Depriving people of sanitation and water supply will lead to the deprivation of human dignity. Therefore, when the community of Poding Tse Rolo lacks access to water and sanitation, whether due to non-payment of services or otherwise, they will be deprived of their dignity.

5.1.4 Operation and maintenance of waterborne sanitation systems

A review of the literature has indicated that in sanitation projects goals tend to focus on the number of toilets constructed or the number of people given access to sanitation and not to the people's cultural and social behaviour towards proper handling of toilet facilities. In addition to this, the system failure in areas where the institutional infrastructure cannot provide reliable operations and maintenance support, is from a public health point of view not appreciated by most of the local municipalities of South Africa (Wood *et al.* 2001).

The long-term costs and the ability to sustain subsidised services in an environment where the affordability and capacity of users are low, are enormous, and the risk of debt becomes a burden to the municipality if services payment levels do not improve significantly. The results according to Table 7 indicate that 100% of the households used a waterborne sanitation system and that 97% of the respondents were satisfied with this type of sanitation system (Table 7). According to WIN-SA (Issue Two: 1-4) waterborne systems are characterized by frequent sewer and manhole blockages and skilled labourers are required to do regular repairs. However, Figure 9 shows that 42% of the community worked as domestic workers and that a limited number of residents were skilled labourers. The high rate of unemployment (Figure 8) further suggests that the community would spend their money on food rather than on buying or repairing broken taps or toilet cisterns.

In most of the municipalities in South Africa, sanitation facilities rapidly fall into disrepair and were disused shortly after installation. The failure of these systems was as a result of the residents' inability to meet the cost of servicing them which was not taken into account when the new system was introduced. It is accepted therefore that the financial costs and skills capabilities of the community in terms of maintaining and servicing the systems were

limited (Figures 9 and 10). This limitation had a direct impact on the sustainability of the water borne systems in Poding Tse Rolo.

The findings as presented in Figure 11 indicate that 71% of the households were not experiencing any blockages. Despite the findings presented in Figure 11, the attendees at the feedback session held on the 15 July 2006 did not agree with these results. People were concerned that blockages were still occurring in Poding Tse Rolo. Although the frequency of blockages had decreased as compared to those recorded at the beginning of the study (Table 2), it is believed that there was an indirect awareness creation among the community during the operationalisation of the study, particularly during the interviewing process.

5.1.5 Awareness and knowledge of the community

During the operationalisation of the study materials such as rags, sheep skins, plastics and newspapers were observed next to the manholes leading to the oxidation dams. This finding does not correlate with the responses as presented in Figure 18 which indicate that people were removing all foreign materials from grey water before disposing of it into the drains. Old clothes, rags or plastics were found in blocked manholes. The uncertainty of the households regarding the specific day of waste collection (Figure 27) might have led to waste being disposed of in the open sewers and manholes. During the operationalisation of the study, a notice was observed at the municipal office notice board indicating that waste is collected on Thursday. However according to Mr Voster the vehicles used to collect waste sometimes breaks down and waste is therefore not collected on every Thursday's but on any other day when the vehicle is been repaired (Voster, 2008: personal communication).

The level of hygiene awareness is a worrying factor as this lack of knowledge may cripple the sustainability of sanitation systems in Poding Tse Rolo. The results recorded in the study reveal that 24% of the community lacked hygiene education and that 50% demanded an improvement in the manner in which the service was being provided (Figure 14). If hygiene education and awareness are inadequate and people are not happy with the sanitation services provided (Figure 14), high incidences of blockages such as those reported in Table 1 would be the result.

As reported in Figure 26, the study found that 24% of the children started using the toilet between the ages of one and three years. However, the majority of respondents (43%) indicated that they could not remember when their children started using the toilet. The major reasons why they could not remember were attributed to the fact that households

had children a long time ago and that there were no children at their homes at the time of the interviews.

The last phase of the study which was conducted was the community feedback session. The purpose of the feedback session was to present the findings of the study to them and to present the general perspectives of the community based on the results. The session was convened on 16 July 2006 in the Poding Tse Rolo community hall. The major concerns raised at this feedback session were those of unemployment, the unaffordability of water and sanitation services, the lack of participation of women in the sanitation projects and the lack of awareness regarding the impact of poor sanitation on community members' lives.

Based on the findings of the study, the question may be asked whether the National Government had taken into account the relationship between the affordability of toilet paper by the poorest people and the optimal functioning of the sewage articulation system when the flush-toilet strategy for all citizens in the Republic of South Africa was developed.

The WRC (2002) emphasise that expecting people in ultra-low income settlements to pay for improved levels of service without any equivalent increase in their household incomes simply makes their poverty greater, rather than raising their standard of living. Solo, Perez and Joyce, cited in Phaswana-Mafuya (2006:20), emphasise that the key financial and economic challenge includes the high cost of sanitation to low-income families.

5.2 CONCLUSION

According to Jagals (2001:37), an understanding of whether a specific sanitation system could be considered sustainable, requires a comparison of a cluster of factors which might influence the sustainability. A conclusion on the outcome of the study is therefore reached using these factors.

The following is a summary of the factors that would affect the sustainability of the sanitation system in Poding Tse Rolo:

- The use of a waterborne sanitation system;
- Positive acceptance by the community of the sanitation system;
- A significant number of manhole and sewer blockages had been experienced before the study. The frequencies of these blockages changed during and after the study, which perpetuated minor elements of pollution to the environment;

- Community participation in sanitation issues occurred only peripherally at ward meetings, without much impact on the service delivery strategies of the local authority;
- No sanitation awareness programmes had been undertaken with members of the Poding Tse Rolo community;
- Women's participation in sanitation-related issues was extremely limited;
- The service provider was effective in reacting to problems. Although there were mixed responses to this question, the majority of the participants commented that the service provider attended to blockages and that their efforts were relatively effective, albeit sometimes late.
- Community members applied their finances optimally for service delivery. It was found that 50% of the study population paid monthly for services, even though the payment was negligible.

According to the above factors it is concluded that the sustainability of the waterborne system is on the borderline. The reasons supporting this conclusion are:

- the low socio economic status of the people and the lack of employment opportunities in Poding Tse Rolo;
- the insufficient participation of the community at ward meetings; and
- the lack of or no discussions regarding sanitation issues in community ward meetings.

Although the installed system was not working properly and services were not paid for adequately (Figure19), it is postulated that the system might not be maintained in a sustainable manner. The knowledge of good hygienic behaviour appeared to exist in Poding Tse Rolo, but this was shadowed by the low economic status of the community.

Based on the results presented in Figure 26, it may be concluded that:

- there was less disposal of excreta in the environment than had been hypothesised since there were no little children in the households of the majority of the respondents; and
- faecal transmitted diseases would be minimal because there were few children defecating in the environment.

5.3 RECOMMENDATIONS

It is recommended that:

1. The study indicated that most of the community households depended on pensions and social grants as a means of financial income. Moreover, the study revealed that there was an average of three dependants per household. Based on these factors, it is recommended that the local authority should look at the economic status of households when setting water and sanitation tariffs;
2. The lack of community awareness of sanitation-related issues was identified as a shortcoming in Poding Tse Rolo. The awareness initiatives should be conducted in collaboration with community-based organisations, non-governmental organisations and concerned groups in order for them to be successful. It is recommended that such organisations be established in order to give the community, particularly women, a forum from which to voice their concerns and initiatives. Campaigns such as Water Week, Sanitation Week and World Water Monitoring days should be used to create community awareness;
4. Because metal manhole covers are stolen and sold as scrap metal, it is recommended that new covers be made of a polimer mixture comprising mainly of concrete, and that these be used as manhole covers instead of metal ones. This should also limit vandalism.
5. There is a need for improved communication between the municipality and the community. It is suggested that the local municipality should put notices in public places indicating on which days the waste is collected:
6. Community participation and ownership of sanitary systems should be increased in Poding Tse Rolo. The enhancement of job creation opportunities and skills development can contribute to the long-term sustainability of the sanitation facility and
7. The consideration of an alternative sanitation system that will meet community's needs in terms of their socio economic status, skill level and water availability.

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