CHALMERS

Sanitation in an informal settlement

A user-oriented study on sanitation solutions and factors influencing decisions for implementation in Cochabamba, Bolivia

Master of Science Thesis in the Master's Programmes Design and Construction Project Management and Environmental Measurements and Assessments

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Department of Civil and Environmental Engineering
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CHALMERS UNIVERSITY OF TECHNOLOGY
Gothenburg, Sweden 2013
Master's Thesis 2014:08

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Improved, offset pit in the Study Area, see section 6.2. Photo: Private

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ABSTRACT

Causing the deaths of 760,000 children every year, diarrhoeal disease is the second leading cause of death among children under five (World Health Organization, 2013). Adequate sanitation, safe drinking water and hygiene can prevent many of those deaths. In addition to the health benefits, adequate sanitation implies decreased environmental impact (Water Supply & Sanitation Collaborative Council, 2010) and can impose direct and indirect economical benefits for both the users and the society (Minh & Hung, 2011). The United Nations have established eight goals in order to fight global poverty and one of the targets is to halve the proportion of people living without access to safe drinking water and improved sanitation, by the year 2015 (United Nations, 2013). In 2011, Bolivia was one of 45 countries in the world having a sanitation coverage of less than 50% (World Health Organization & UNICEF, 2013). The aim of this study is to map the sanitation practices in an informal settlement in the outskirt of Cochabamba, Bolivia. Moreover, the purpose is to identify factors influencing the decisions related to implementation of improved sanitation solutions among the inhabitants in the Study Area. The data was collected through a user-oriented interview study. Three types of sanitation practices were identified; open defecation, unimproved pit latrines and pour-flush toilets connected to improved pits or septic tanks. Most of the interviewees have access to a sanitation solution in their household, whereas few practise open defecation. Some drivers for implementation of improved sanitation were identified, e.g. safety, social pressure and cleanliness and hygiene. Moreover, barriers for implementation were e.g. lack of funding and difficult ground conditions. Furthermore, tipping points having a direct impact on the final decision to implement improved sanitation were identified. The factors influencing the choice of sanitation solutions were habit, economy and space. The existing improved sanitation solutions have commonly been implemented little by little, over a longer period of time with help from, primarily, family members.

Key words: sanitation, drivers, barriers, informal settlement, user-oriented, Bolivia

Contents

Preface

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Martina Nilsson and Laila Olsson

Abbreviations

EcoSan	Ecological sanitation
EU	European Union
INE	Instituto Nacional de Estadística [the National Institute of Statistics]
IP	Improved pit
MDG	Millennium Development Goals
NGO	Non-governmental organisation
OD	Open defecation
OTB	Organizaciones Territoriales de Base [Grass Root Organisation]
PF	Pour-flush toilet
ST	Septic tank
UN	United Nations
UNICEF	United Nations Children's Fund
UPL	Unimproved pit latrine
WHO	World Health Organization
WSSCC	Water Supply & Sanitation Collaborative Council

1 Introduction

Causing the deaths of 760,000 children every year, diarrhoeal disease is the second leading cause of death among children under five (World Health Organization, 2013). Diarrhoea is often a symptom of an infection caused by bacteria, virus or parasites which spread through contaminated drinking water and food, and due to insufficient hygiene. Thus, adequate sanitation, safe drinking water and hygiene can prevent many of those deaths. In addition to the health benefits, adequate sanitation implies decreased environmental impact such as eutrophication (Water Supply & Sanitation Collaborative Council, 2010). Moreover, access to sufficient sanitation can impose direct and indirect economical benefits for both the users and the society. For example, loss of possibility for income due to illness can imply severe consequences for someone with low or very low income (Minh & Hung, 2011). This can lead to a vicious cycle where the person cannot recover satisfactory due to lack of nutrition and medicines (Banerjee & Duflo, 2011).

In order to fight global poverty, the United Nations established the Millennium Development Goals (MDGs) of which one target is to decrease the population without access to basic sanitation. The concept of basic sanitation implicates sanitation solutions which hygienically separate human excreta from human contact and is also referred to as *improved sanitation* (United Nations, 2013). While the work with most of the goals and targets are proceeding as planned, the target concerning sanitation does not (World Health Organization & UNICEF, 2013).

The coverage of improved sanitation around the world is 80 percent in urban areas and 47 percent in rural. There are 45 countries in the world where less than half of the population have access to improved sanitation. One of those countries is Bolivia, where the data collection for this Master's Thesis was conducted. The coverage of improved sanitation in Bolivia is 57 percent in urban areas and 24 percent in rural. Half of the rural population in Bolivia practises open defecation (World Health Organization & UNICEF, 2013). The Study Area, where the interviews were conducted, is an informal settlement, situated in a low-income district in the the southern, peri-urban part of the city Cochabamba. Almost half of the people living in the district are migrants. More than 75 percent of the households in the district do not fulfil the minimum living standard criteria[1] due to overcrowding and lack of access to basic services, such as water and sanitation (PROCASHA, 2013).

In order to increase the spread of improved sanitation, the reasons for the slow progress need to be examined. To do so, understanding about how sanitation solutions are chosen and diffused is needed. Sanitation seems to be as much a social issue as a technical one (van Vliet, et al., 2011) and the cultural views of the everyday habits connected to sanitation affects what sanitation solutions are, and are not, suitable for a certain context (Jenkins & Curtis, 2005). External stakeholders aiming to implement long-term sustainable, improved sanitation often fail when the possible adapters do not share their perception of what is the best solution (Banerjee & Duflo, 2011). Hence, this Master's Thesis is user-oriented as the authors strongly believe that there must be a demand for sanitation among users before an implementation can succeed. Thereby, in order to increase the spread of improved sanitation, the factors affecting the implementation of sanitation among possible adopters must be examined and understood.

[1] The Universal Declaration of Human Rights: Article 25 (UN, 2013)

1.1 Purpose and aim

This Master's Thesis attempts at contributing to the body of knowledge concerning the implementation of improved sanitation in an informal housing area in Cochabamba, Bolivia. One part of the study aims at mapping the sanitation practices existing in the Study Area. A further aim is to identify drivers and barriers affecting the decision-making preceding implementation of improved sanitation solutions. This Master's Thesis is being a part of a PhD project with attempt to describe how and why water and sanitation systems spread in low-income contexts, focusing on the city of Cochabamba in Bolivia.

1.2 Research questions

What sanitation practices exist in the Study Area? How have the existing sanitation solutions been implemented? Why have the users chosen these specific solutions? What drivers and barriers have been preceding the decisions concerning sanitation practice?

1.3 Delimitations

This study is based on the assumption that various factors, e.g. available infrastructure and technological options, are limiting the possibility to choose a certain sanitation solution. There are many possible stakeholders, e.g. the municipality, companies providing sanitation services and non-governmental organisations (NGOs). However, this study focuses on the users due to the authors' belief that the users are the ones being most affected of what sanitation solution being implemented. Moreover, in the specific context for this study, the users are the ones making the final decision on whether or not to implement sanitation.

The study was carried out in a specific settlement, throughout the report referred to as the Study Area. The Study Area is located in the city of Cochabamba and was selected with help from the Bolivian NGO PROCASHA, which carries out projects to improve the living conditions in low-income areas in Bolivia. As there is no available infrastructure in terms of sewage systems in the Study Area, the focus is to examine how the users manage the lack of municipal sanitation. The results from this study represent the interviewees and hence, might not be applicable elsewhere.

Sanitation is often defined as the collection, storage, treatment and disposal or re-use of human excreta, the management or recycling of solid waste, drainage and disposal of grey water[2], and collection and management of industrial and hazardous waste (WHO, et al., 2008). However, this idea of what is to be included in sanitation is not feasible in all contexts. For example, in areas with low access to improved sanitation, sanitation is the management of human faeces and urine at household or community level. In the Study Area where this study was conducted, sanitation only exists on a small-scale household level, i.e. sanitation in the context of this study is defined as the collection and storage of human excreta.

Throughout this report, the concepts of improved and unimproved sanitation are used in accordance with the definitions by the World Health Organization (WHO) and UNICEF. Improved sanitation is defined as "*a sanitation facility that hygienically separates human excreta from human contact*" (World Health Organization & UNICEF, 2013). Unimproved sanitation simply does not.

[2] Grey water: disposal of household wastewater (WHO, et al., 2008)

1.4 Methodology

A part of the work with this thesis was carried out through a two month's stay in Cochabamba, Bolivia, where the data was collected. The data collection consisted of a qualitative interview study, observations, conversations in the Study Area as well as documents provided by PROCASHA, an NGO with which we collaborated. Moreover, a literature study was carried out. The methodology is further elaborated in Chapter 3.

2 The Plurinational State of Bolivia

Bolivia is a land-locked country situated in the mid-west of Latin America, see Figure 2.1. The western parts of the country are located in the Andes on high altitude while rainforest dominates the northern part. Hence, many climatic zones are represented in Bolivia and the Bolivians divide the country into three geographical zones; the Highlands, the Valleys and the Lowlands (Landaeta, 2004). Not only the climate, but also the cultural life is diverse as many indigenous groups are represented in Bolivia (Wutich, 2006; Werner, 2009). In total, at least 37 ethnicities are represented in the country, hence "*the Plurinational State of Bolivia*". The lion's share of the indigenous population is constituted by Quechua and Aymara. However, more than 50 percent of the population do not consider themeselves belonging to any specific ethnic group (Instituto Nacional de Estadística, 2013).

Figure 2.1 Map of Latin America and the Caribbean, Bolivia marked with darker grey (Weltkarte, 2012)

Bolivia is one of the poorest countries in Latin America (The World Bank, 2013). Half of the population lives in moderate poverty, which the World Bank defines as an income that is barely enough for a family to afford food, shelter, health care, and clothes. The income range for moderate poverty is more than $1,25 but less than $2 to $5 per day, depending on possibility to self-supply. 80 percent of the population, both urban and rural, work within the informal sector and hence, Bolivia has the largest informal sector in Latin America (The World Bank, 2008). The population is about 10 million, the average life expectancy is 67 years (UNESCO, 2013) and the literacy is approximately 95 percent (Instituto Nacional de Estadística, 2013).

The bigger cities in Bolivia, e.g. El Alto, Santa Cruz and Cochabamba, see Figure 2.2 (El Alto is not marked on the map but is located in the conurbation of La Paz), have high growth rates due to urbanisation. Hence, the demand for land and housing is high in and around those cities. The landscapes have thereby changed radically when rural areas in the outskirts have become urban. As land and housing costs are high in the cities, informal settlements are the most common housing solution for low-income

families. The houses in such areas are often constructed without formal building standards and knowledge, and the neighbourhoods have evolved without urban planning. Moreover, due to their informal status, these areas often lack access to basic and municipal services (Landaeta, 2004).

Figure 2.2 Map of Bolivia (Weltkarte, 2012)

In June 2012, a new law was instituted in Bolivia (Ministerio de Planificación del Desarrollo, 2013; Revollo, 2012; Caero, 2013). This law, *La Ley 247*, makes it easier for informal settlements to be legalised (Ministerio de Planificación del Desarrollo, 2013). This applies to houses that are immobile and permanently inhabited since at least five years before the institution of the law. The implications of the law do not apply for houses in areas considered to impose a risk for the people living there. Such risks might be unstable ground conditions or pollution due to hazardous waste or similar. In addition, houses in ecologically fragile areas will, generally, not be legalised and neither will settlements in municipality owned green areas (Revollo, 2012). The law implicates that the cities, surrounded by informal settlements, can grow considerably when some of the settlements in the peri-urban areas become legalised. Hence, public organisations stress the difficulties and high costs related to the planning and providing of municipal services in areas with existing, unplanned infrastructure (Caero, 2013).

2.1 History

Throughout the past centuries, different civilisations have dominated the part of Latin America where Bolivia is now located. The most famous to our time are the Incas even though they ruled the Bolivian highland for less than a century while previous civilisations had been dominate for much longer (Wutich, 2006; Werner, 2009). In 1530, the Spaniards conquered and destroyed the Incan empire and gave colonists the right to indigenous land and labour. Bolivian silver became an important income for Spain but when the easy accessible silver veins were tapped, the Spanish dominance declined (Wutich, 2006). As a reaction to the brutal slave-conditions under which the native where forced to work, and emboldened by the weakened strength of their colonialists, rebellion groups emerged (Wutich, 2006; Werner, 2009). Under the command of Simón Bolívar, the Spaniards were defeated in the year 1825 and Bolivia was named after him (Werner, 2009).

Even after the independence, revolts and military coups were frequent until the reinstitution of democratic elections in 1982 (Wutich, 2006). Despite political and economic instability, no coups have erupted since. However, there have been major protests from different political movements with different objectives. Most often, the protests have been indigenous groups claiming their rights to natural resources they get their livelihood from, or better social terms (Werner, 2009). For example, almost all sectors of employment have their own, active union. Minor, peaceful protests in forms of road blockades and strikes are very common throughout the country, see Figure 2.3.

Figure 2.3 The drivers of the micros (the buses) in Cochabamba are protesting against their low salaries by blocking every crossing around the city centre with their vehicles (Photo: private)

2.2 Politics and mobilisation

Native people have historically, since the Spaniard conquest, been and are still being marginalised in Bolivia (Werner, 2009). Evo Morales is a former coca-farmer and the first indigenous president in Latin America. Since his accession to the post, in the year 2005, the government is re-nationalising services and the rights to natural resources which earlier were privatised and owned by foreign companies. The aim is to empower the indigenous people. However, whether re-nationalising is the best way to achieve indigenous empowerment is not agreed upon by everyone. There are powerful interests fighting to preserve the neoliberal reforms (Wutich, 2006). In 2003, a conflict between social and indigenous organisations and the military broke out. The conflict was due to the former president's, Gonzalo Sánchez de Lozada, plan to export Bolivia's vast natural gas resources to the United States. Over 60 people died and 400 were injured before the conflict ended by the collapse of the government and the resignation of the president who fled to the United States where he was granted political asylum (López, 2013). In 2006, Evo Morales re-nationalised the natural gas resources (Alpert, 2012).

The Bolivian government has since the accession of Morales initiated different reforms and campaigns in order to empower the indigenous population. One school reform, and a law since 2010, implies that all schoolchildren must learn an indigenous language as well as Spanish and a foreign tongue (Alpert, 2012). Moreover, the high amount of illiteracy in the country at the time for the election in 2005 made the government initiate a literacy campaign with the aim to eradicate illiteracy. The

campaign is called *Yo sí puedo*, which means ”Yes, I can” and many adults have completed the course since the campaign started (Danbolt Drange, 2007).

As mentioned earlier, social participation such as labour unions are common in Bolivia. Moreover, other social organisations are common and respected within the society. Even though the country has a rather recent history of coups, these organisations are rather than being considered as threats, acknowledged by the government as reliable partners in social programs and development projects (Landaeta, 2004).

Organizaciones Territoriales de Base (OTBs) are common in Bolivia and function, by law, as formal representations of the inhabitants in a certain area during parleys with local governments. The concept of OTBs comprehends both the people and the area in which the people live. OTBs have the legal right to, e.g. propose and supervise the implementation of public services and work in line with the needs of the community, change decisions which do not map the needs and interests of the community and promote and participate in actions for sustainable development and preservation of the environment (Landaeta, 2004).

2.3 The City of Cochabamba

Cochabamba is the fourth biggest city in Bolivia and capital of the Cochabamba Department which is one of nine departments in the country. The city is located in the centre of the country, see Figure 2.2, in a valley on the eastern slope of the Andes at 2,500 meters above sea level. The climate is semi-arid and due to the year-around pleasant temperature, Cochabamba is called *the City of Eternal Spring* (Werner, 2009). There is wet season from November to March and dry season from May until October.

The unregulated and unplanned expansions of Cochabamba are low-income settlements and have emerged due to the high costs for urbanised land. About two thirds of the migrants in Cochabamba have come from other urban areas in the Highlands, such as La Paz, Oruro and Potosí (Landaeta, 2004). Due to the evolving of informal areas and the, by tradition, systematic marginalisation of indigenous groups (Werner, 2009), Cochabamba is a segregated city with a clear distinction between high- and low-income areas and the difference in services provided (Wutich, 2006).

Figure 2.4 Satellite view of the Cochabamba valley (MapQuest, 2013)

The city is located in a valley, see Figure 2.4, and the area contains several potential water resources, e.g. the rivers Río Rocha and Río Tamborada, the lake Laguna Alay, a spring zone, confined aquifers and a number of alluvial fans. Despite this, water is scarce in the city due to industrial and domestic pollution of surface water and over-abstraction and pollution of the aquifers. Hence, 40 percent of the households in Cochabamba get their water from surface water sources outside the valley (Wutich, 2006). The northern zone of the Cochabamba valley, by the foot of the mountain slopes, contains many wells and is vegetated all year whereas the southern zone has less accessible water and thereby less vegetation, see Figure 2.5. In the city centre and the northern, wealthier areas, most households have access to basic services, i.e. water and sanitation, provided by the municipal company SEMAPA. In the southern parts of the city, where most low-income areas are found, and in peri-urban areas, the coverage of municipal water and sewage systems is much lower (Wutich, 2006).

Figure 2.5 The central and northern part of the city to the left and the southern part of the city to the right (Photos: private)

Although municipal water is accessible in the central parts, it is for most households only accessible for a few hours per day. Most households have storage tanks which they fill up when they can and hence, they have access to water in their houses around the clock (Wutich, 2006). In 2000, the municipal water in Cochabamba was privatised and water prices dramatically increased, which led to a series of protests and battles between protestors and the police leading to the death of one person. The protests are commonly referred to as the Cochabamba Water War and after months of conflicts, the control of the water system returned to the municipal company (Wutich, 2006).

The city of Cochabamba has one wastewater treatment plant, Alba Rancho, and its capacity is constantly exceeded (Revollo, 2011). The inflow of wastewater is sometimes, especially during rainy season, two times the dimensioned inflow. Consequently, the wastewater is not sufficiently treated and hence, contaminated water continually is being discharged into the river Río Rocha (Revollo, 2011; Romero, et al., 1998). The water leaving the treatment plant contains both organic matter and heavy metals from the industries in the city. Furthermore, the water from Río Rocha, downstream the Alba Rancho outflow, is used for irrigation on corn fields and fields with fodder crops (Revollo, 2011). Moreover, people living in the areas close to Alba Rancho and downstream Río Rocha have discovered contamination in their wells (Romero, et al., 1998).

3 Methodology

The focus for this Master's Thesis is multidisciplinary, combining engineering research and social science, with emphasis on human influence on technical change. The goal of the study is to examine the factors influencing the decision-making concerning implementation of sanitation solutions. This is a subject previously not examined in the Study Area. Thus, the research approach here is more qualitatively oriented than quantitatively. The study is user-oriented and an interview study was carried out with people living in the Study Area during a two month field study in Cochabamba. In addition to the interview study, data was also collected through observations, informal conversations and meetings with PROCASHA as well as the Settlement Community Organisation. Moreover, documents about the Study Area were provided by PROCASHA.

3.1 Scientific approach

Traditionally, there has been a division of the scientific approaches within social sciences, with the positivism in one end of the scale and the hermeneutics in the other end. Influenced by natural sciences, the positivist researcher is to be absolutely objective and neutral, meaning that the researcher at any time in the research project could be replaced by another researcher (Watt Boolsen, 2007). The methods for formulating theories are quantitative and statistical hard data methods. The ideal science in the positivist perspective is physics (Patel & Davidson, 2011). The positivist research has been criticised for being too narrow, lacking theory and being inappropriate to deal with processes with social or human characteristics (Watt Boolsen, 2007).

The hermeneutic approach was originally a method for interpretation of biblical, juridical and literary texts (Kvale & Brinkmann, 2009). The core of the hermeneutic approach is the interpretation of the meaning. The role of the researcher is engaged and subjective, and through the pre-understanding of the researcher the interpretation is influenced. This is looked upon as an asset rather than a weakness (Patel & Davidson, 2011). The understanding is built upon prejudices (Kvale & Brinkmann, 2009).

Between these endpoints, there are other research approaches, e.g. phenomenography, ethnomethodology, and Grounded Theory (Patel & Davidson, 2011). The research approach assumed to be most suitable for this thesis is Grounded Theory. Grounded Theory started out as a reaction towards what was called ”grand theories”, which were large and complete theoretical constructions. A perceived risk was that all research would verify these structures, especially in hypothetic-deductive research within positivist research tradition. Instead, Grounded Theory attempt to formulate local theories based on empiricism for the unique case. The researcher starts working impartially with collection of empirical evidence rather than initially reviewing existing theory. The research question is open and might be reformulated during the study (Patel & Davidson, 2011). The key concepts of Grounded Theory is *constant comparison* and *theoretical sampling*, which imply that collection of data and generation of a theory take place simultaneously and that various methods for data collection are possible (Suddaby, 2006). The empiricism is coded into differentiated categories, which develop through the iterative process of collecting, transcribing and repeatedly read the text material, e.g. transcripts from interviews. Throughout the process, more empiricism might be collected if needed. This process continues until

the codes maintain unchanged and theoretical saturation has been reached (Patel & Davidson, 2011). However, the point where theoretical saturation occurs is often determined by the timeframe for the study (Kvale & Brinkmann, 2009). The key idea of Grounded Theory is not to develop an unambiguous universal truth (Suddaby, 2006). Several parallel local theories might co-exist. A grounded theory is a set of codes which are closely connected to empiricism (Patel & Davidson, 2011).

3.2 Choice of research method

Qualitative interview research is suitable when the focus of the research is to describe the world from the interviewees' point of view (Kvale & Brinkmann, 2009). According to Watt Boolsen (2007), traditionally the quantitative approach has been perceived to be super ordinate the qualitative. However, a shift has occurred in the attitude towards these different research approaches and now, more and more they complement each other in order to create a more holistic picture of causes and connections (Watt Boolsen, 2007). The different approaches have different applications depending on what stage in the research process the researcher is in (Flick, 2009). Qualitative research is an iterative process. Initially, a theory is developed, referred to as *inductive research*, and further the theory is tested and verified, which is called *deductive research* (Kvale & Brinkmann, 2009). In Grounded Theory, the researcher shift between inductive and deductive approaches constantly, through the constant comparison practice (Suddaby, 2006).

According to Kvale and Brinkmann (2009), the interview study as a scientific method is easily misunderstood to be simple to carry out, due to the similarities between the interview and the everyday conversation. However, they claim, this perception is deceptive, because of the lack of standardised rules or methodological conventions. For instance, the number of interviews needed to get an adequate result is not general. Too few imply difficulties to make generalised conclusions, however too many imply too much data to analyse. Thus, the optimal amount of interviews is not straight forward and has to be evaluated for each study. Moreover, time is often the most limiting factor.

The structure of the interviews varies depending on the type of study being carried out. This study is based on semi-structured interviews, meaning that the same questions are asked to all interviewees, but the questions are open for interpretation and not limited to by the researchers pre-determined answering alternatives. This enables the interviewee to more freely tell their opinion and ideas about the topic of interest (Patel & Davidson, 2011).

Interview research is permeated by ethical questions. The researcher wants to create an environment for the interviewee to feel comfortable to talk about private matters that later will be made public. In-depth interviews with individual persons are suitable when the subjects for the interviews are sensitive. In this study, all interviews are in-depth interviews as being performed with one interviewee at the time. However, the concept *in-depth* in this study is used when referring to the interviews which more deeply examine the topic of specific interest. Due to the asymmetric division of power, the interviewee might react by withholding information or questioning the researcher. When interpreting the interviews, it is necessary to listen to the descriptions spoken by the interviewee as well as the opinions between the lines, referred to as *manifest* and *latent* answers, respectively (Kvale & Brinkmann, 2009; Esaiasson, et al., 2012).

3.3 Data collection

The Study Area was chosen in collaboration with PROCASHA, which carries out projects in the Study Area. The researchers were introduced to another settlement as well, but chose to focus on the Study Area. The difference between the two areas is that the Study Area is a settlement which has existed for 11 years while the other settlement is under construction and so is the sanitation system. Both the houses and sanitation system are planned and constructed in collaboration with PROCASHA. The Study Area, where it is up to each household to choose which sanitation option to use, seemed to be more interesting in terms of examining factors that affects users' decisions about implementation of sanitation. One interesting feature about the Study Area is that it is not planned in beforehand, but rather has developed little by little as people have settled there. Thus, there has not been any planning considering the infrastructure, neither roads nor water and sewage systems. From a community planning perspective, it is interesting to study how the people there manage these issues. PROCASHA has initiated a women's working cooperative in some settlements in the region, whereof the Study Area is one. The research group attended several meetings with the cooperative as well as the Settlement Community Organisation. This, in order to present the research group and the project, and to investigate the inhabitants' interest to participate. A further objective was to establish relations with potential interviewees in order to make them feel comfortable talking about their private life and everyday habits. Due to the already established contact, the cooperative was the starting point for the selection of interviewees. However, it turned out that not all of the women in the cooperative wanted or had possibility to participate, why the selection of interviewees became more depending on what people we met in the area and who wanted and were able to talk to us.

The semi-structured interviews (Kvale & Brinkmann, 2009) took place during daytime, where possible, e.g. outside people's homes, by the side of the road etcetera, and were carried out together with interpreters, who were native Bolivians. The research group took notes, not only from what was actually said, but moreover what was observed and general reflections and thoughts. After the interview the research group reflected on and discussed the outcome. Some of the interviews were completed with follow-up questions and more in-depth interviews at other occasions. The selection of in-depth interviewees was based on their willingness to elaborate their thoughts and experiences. Continuously during the interview study, the research group developed ideas about how to proceed with the interviews, both in terms of what to ask and how to ask, as well generally as individually.

Representatives from 14 households were interviewed for mapping the sanitation solutions in the Study Area. Six of these households were chosen for more in-depth interviews for identifying drivers and barriers for implementation of sanitation. Average time of the interviews was approximately one hour, and the interviews were recorded in order to later become transcribed. The transcriptions were carried out by a native Bolivian.

During the interviews, there was one interviewee whilst the group of interviewers and interpreter amounted to three or four. The roles in the group of interviewer were divided into one main interviewer, one taking notes and one listening, ready to ask follow-up questions. Due to the outdoor location, the interviews could occasionally be overheard by people passing. At one occasion, the intention was to interview a certain person; however two other were present why it became more of a group interview.

However, the topics considering the everyday sanitation habits, was shown to be sensitive to talk about in the presence of others. Thus, during following interviews the research group ensured that the interview was carried out with one person at the time.

Themes covered during interviews were:

- basic information about the interviewee
- description of water solution
- how the implementation of water solution was carried out
- description of sanitation solution
- how the implementation of sanitation solution was carried out
- other technical services - electricity and telephony

The themes for the in-depth interviews with focus on sanitation were:

- previous solution
- other considered options
- decision-making
- construction: who performed, materials, time, cost, financing
- satisfaction

Table 3.1 Data collection procedures related to the research questions

Research question	Interviews	Conversations	Observations	Documents[3]
What sanitation practices exist in the Study Area?	x	x	x	
How have improved sanitation solutions been implemented?	x	x	x	
Why have the users chosen these specific solutions?	x	x		
What drivers and barriers have been preceding the decisions concerning sanitation practice?	x	x	x	x

In addition to the interviews, conversations, observations and studied documents constituted the data collection, see Table 3.1. Conversations with different people during visits in the Study Area provided general understanding about the area and also enabled possibilities to more informally ask general questions when these emerged. Observations were carried out during the specific interviews as well as more generally during the visits in the Study Area. During interviews, observations concerning the

[3] The documents have mostly been used for analysis of the drivers and barriers in order to categorise them.

housing type and size, construction materials and use and supply of water were paid attention, as well as indicators for habits such as hand-washing and use of soap. In some cases, the interviewees showed their sanitation solutions. Documents with available information about the settlement were studied in order to provide a basic understanding of the context.

3.4 Analysis of data

As mentioned earlier, the qualitative interview research generally has few standard rules (Patel & Davidson, 2011; Kvale & Brinkmann, 2009), which also corresponds to the analysis of the data. The analysis process in this case consisted of compiling the material for each interviewee, in order to categorise the answers and label these with the appearing codes for drivers and barriers. Not all material from the interview study has been analysed since not everything was relevant for this study. The data concerning water use and supply, implementation of the water solution and the use of other technical solutions has not been analysed further. Nor has the specific interviewees' gender and age been related to their sanitation practice. As the first round of interviews were semi-structured and the second more in-depth, the information has been more extensive than needed in order to answer the research questions. Hence, relevant data was selected for the analysis. Further, the interviewees' pronouncements were compared in order to search for trends, similarities and differences. Also, a comparison between drivers and barriers found in literature was carried out.

In accordance with one of the key features in Grounded Theory, the analysis has been an iterative process throughout the study (Patel & Davidson, 2011; Kvale & Brinkmann, 2009; Suddaby, 2006). As more material was gathered and further on, transcribed and translated, the analysis has emerged. Finally, the total amount of the selected material was analysed both quantitatively and qualitatively and thereafter compared to literature. The quantitative analysis consisted of examining the distribution of different sanitation solution in the Study Area and the most frequently mentioned drivers and barriers. The qualitative analysis consisted of examining the dictums of each interviewee in order to read between the lines and find latent answers.

While analysing the results, a not previously presumed factor, affecting the users' decision to implement improved sanitation, was identified. In contrast to drivers and barriers, which seem to be rather constant over time, this other factor has more of a sudden character. The researchers chose to denote it *tipping point* and define it as *a certain event or situation which enables the potential adapter to overcome the barriers* or *"the straw that broke the camel's back"*.

4 Sanitation

1.2 billion people in the world live in extreme poverty (United Nations, 2013). Hence, the United Nations (UN) has initiated the Millennium Development Goals (MDG). The goals were set in year 2000 and aim to halve the population living in poverty by the year 2015 (United Nations, 2005). The MDGs consists of eight goals and 18 targets, attempting to address the variety of implications of poverty. One of these goals is to *"ensure environmental sustainability"*, which is divided into three targets, whereas one is formulated *"Halve, by 2015 the proportion of people without sustainable access to safe drinking water and basic sanitation"* (United Nations, 2013). While the part of the target concerning safe drinking water is reached, the spread of basic sanitation, also called *improved sanitation*, is moving too slow (World Health Organization & UNICEF, 2013). Moreover, the UN designated the year 2008, *The International Year of Sanitation* (Nelson & Murray, 2008).

There are various sanitation options, both improved and unimproved. *Improved sanitation* implies adequate separation of human faeces from human contact whereas *unimproved sanitation* does not. Different sanitation solutions are further presented in the sections 4.3 and 4.4. UNICEF has developed the sanitation ladder, a tool which can be used for monitoring the progress towards the sanitation target within the MDGs. It shows four different levels of sanitation, from open defecation to a sewage system, see Figure 4.1. The term *improved pit* is in the original sanitation ladder referred to as *pit latrine*. However, *improved pit* is the term used throughout this report in order to clarify that the construction of the pit ensures separation of human excreta from human contact.

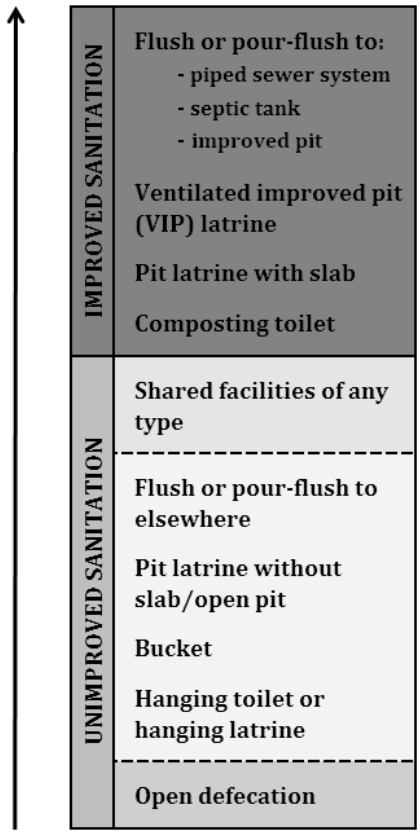

Figure 4.1 The sanitation ladder, modified (World Health Organization & UNICEF, 2013)

4.1 The importance of sanitation

The United Nation in 2010 declared access to improved sanitation to be a human right (United Nations General Assembly, 2010). The reason for the declaration was the acknowledging that access to safe drinking water and sanitation are related to all human rights. Moreover, lack of sanitation is related to various health implications throughout the world. The World Health Organization estimates that 760,000 children die every year due to diarrhoeal disease, whereof most in developing countries. Hence, diarrhoeal diseases are the second leading cause of death among children under five (WHO, et al., 2008). Everyone, particularly children, elderly, disabled, and women are affected by poor sanitation. Diarrhoeal diseases due to faecal-oral transmission of germs spread because of insufficient disposal and/or treatment of human excreta and lacking hygiene, see Figure 4.2.

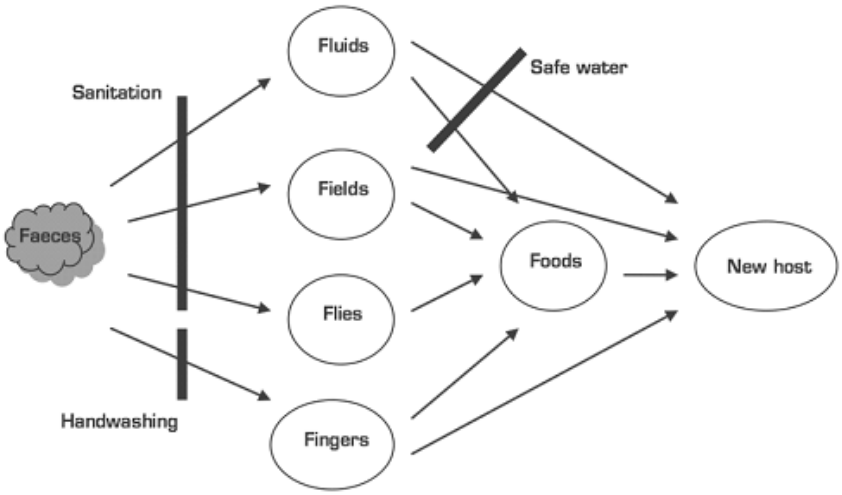

Figure 4.2 Pathways for faecal-oral transmission of germs (Water Supply & Sanitation Collaborative Council, 2010)

In addition, flies which breed and feed from human excreta spread various diseases. Hence, making sure that the excreta is disposed out of reach for flies or in a way that the flies cannot get out even though they could get in, those diseases can be prevented (WHO, et al., 2008). Moreover, heavy metals and toxic substances, both organic and inorganic, are a threat to human health and the environment. Insufficient treatment of wastewater or direct disposal of human excreta to water bodies can imply eutrophication and hence, seriously damage ecosystems (Water Supply & Sanitation Collaborative Council, 2010).

There are economic benefits to gain from improved sanitation, both direct and indirect. Improved sanitation results in fewer illnesses among users which imply lower healthcare expenses and thus direct economic benefits. Moreover, the days the user needs to stay at home from work due to illness decreases and that is an indirect economic benefit (Minh & Hung, 2011). In addition, illness which implies limited or no possibility to income may impose severe consequences for a person with low or very low income. The small or non-existing economical margins can lead to a vicious cycle where the person cannot recover satisfactory due to lack of nutrition and medicines and hence, not being able to work and thereby worsening the economic situation and moreover, the health (Banerjee & Duflo, 2011). There is, for example, a correlation between open defecation, disease and sustaining poverty (United Nations, 2013).

4.2 Sanitation coverage in Bolivia and Cochabamba

Bolivia was in 2011 one of 45 countries in the world, where less than 50 percent of the population had access to improved sanitation (World Health Organization & UNICEF, 2013), see Figure 4.3. Most of those countries are located in Africa whereas Bolivia is the only country in Latin America and the Carribean. However, the data from Paraguay and Venezuela is not sufficient enough for a reliable result. Hence, Bolivia might not, in reality, be the only country on the continent with such low coverage of improved sanitation (World Health Organization & UNICEF, 2013).

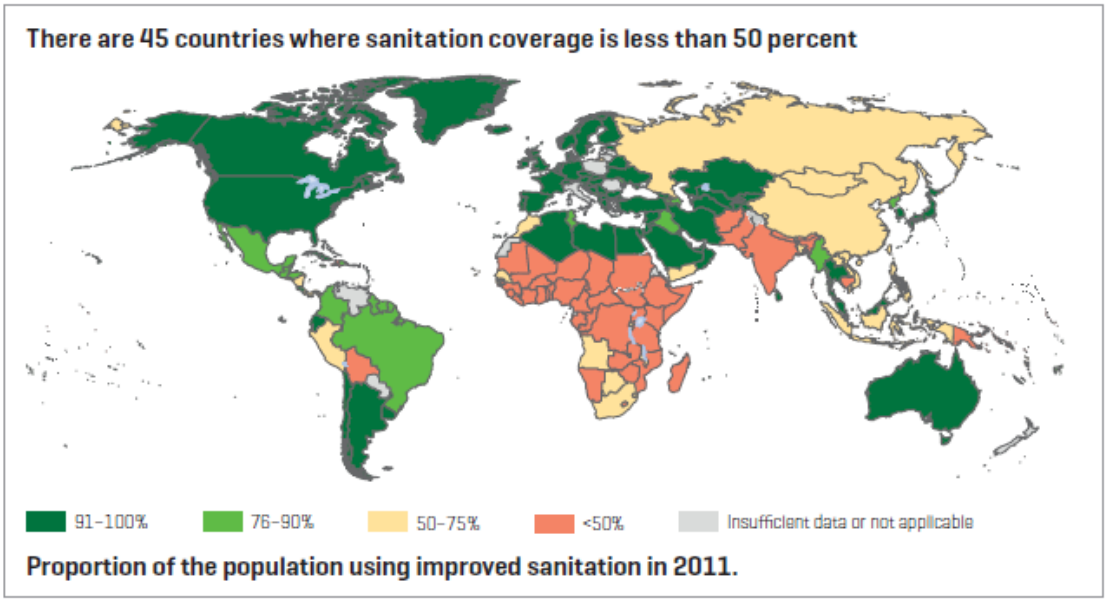

Figure 4.3 The sanitation coverage in 2011 (World Health Organization & UNICEF, 2013)

The World Health Organization (WHO) and UNICEF have estimated the use of the four different sanitation facility categories, represented in the sanitation ladder, see Table 4.1. Figures for Bolivia are presented in relation to other countries.

Table 4.1 Use of sanitation facilities in 2011 (percentage of population). Figures from the World Health Organization and UNICEF (2013)

	Urban				Rural				National			
		Unimproved				Unimproved				Unimproved		
	Improved	Shared	Unimproved	OD	Improved	Shared	Unimproved	OD	Improved	Shared	Unimproved	OD
Bolivia	57	28	10	5	24	5	22	49	46	20	15	19
Latin America and the Caribbean	87	7	5	1	63	6	17	14	82	6	8	4
Least developed countries	48	26	20	6	31	12	25	32	36	16	23	25
Developing countries	74	17	5	4	43	9	17	31	57	13	12	18
Developed countries	97	2	1	0	92	3	5	0	96	2	2	0
The World	80	13	4	3	47	9	16	28	64	11	10	15
Sweden	100	0	0	0	100	0	0	0	100	0	0	0

Considering improved sanitation, there is a big difference between urban and rural areas in developing countries. Moreover, open defecation is practised to a much larger extent in rural areas than in urban. For example, 49 percent of the population in Bolivia's rural areas practises open defecation compared to 5 percent in urban areas (World Health Organization & UNICEF, 2013).

The Bolivian Institute of Statistics, *Instituto Nacional de Estadística* (INE), have also estimated the sanitation coverage and use in the country and moreover, in the different departments. They have estimated the amount of people having access to some kind of sanitation and the amount of people practising open defecation. Besides that, INE makes no distinction between improved and unimproved sanitation. However, among the ones having access to sanitation, the percentages of private and shared use have been estimated. Moreover, different outlets have been identified and their incidence estimated. Different outlets identified in the INE report are sewage systems, septic tanks, pits and surface[4] (Instituto Nacional de Estadística, 2013), see Figure 4.4.

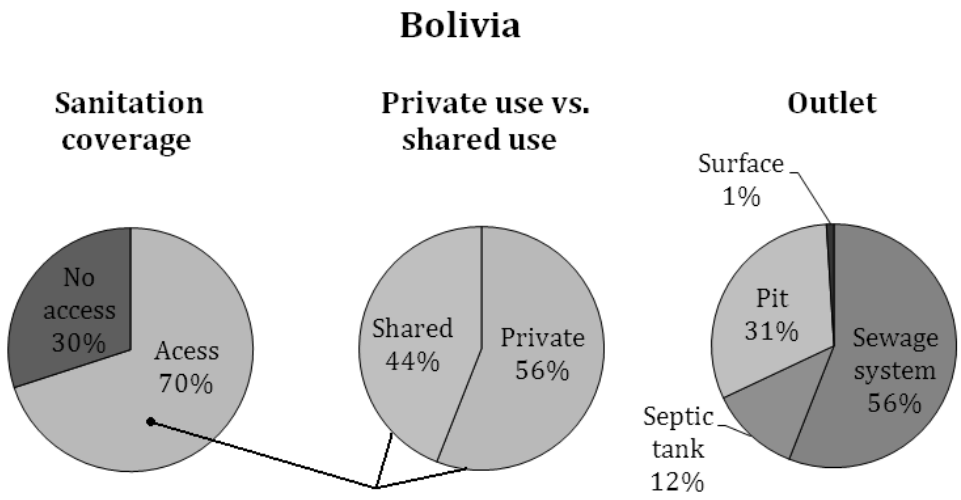

Figure 4.4 The sanitation coverage and types of use and outlets in Bolivia (Instituto Nacional de Estadística, 2013)

According to WHO and UNICEF (2013), 19 percent of the population in Bolivia practises open defecation, see Table 4.1, whereas it is 30 percent according to INE (2013), see Figure 4.4. However, WHO and UNICEF (2013) have stressed the possibility that their estimations may differ from the ones made by national governments due to the use of different estimation methods.

As the Cochabamba Department constitutes of both urban and rural areas, the figures in Figure 4.5 does not represent the sanitation coverage in the city Cochabamba. However, the estimated sanitation coverage for the department is representative for the rest of the country as the figures does not differ much from Figure 4.4. The biggest difference between Bolivia and the Cochabamba Department is the use of private and shared sanitation facilities where the department have a higher share of users of private facilities.

The municipal water and sewage systems in the city Cochabamba, provides barely 50 percent of the inhabitants with sewage system (SEMAPA, 2013) and most of them lives in the wealthier areas (Wutich, 2006). The other half of the population uses small-scale sanitation on a household or community level. The second most common

[4] E.g. a street, a stream or a river

outlet, after sewage system, in the Cochabamba Department and the rest of the country, is pit, see Figure 4.4 and Figure 4.5.

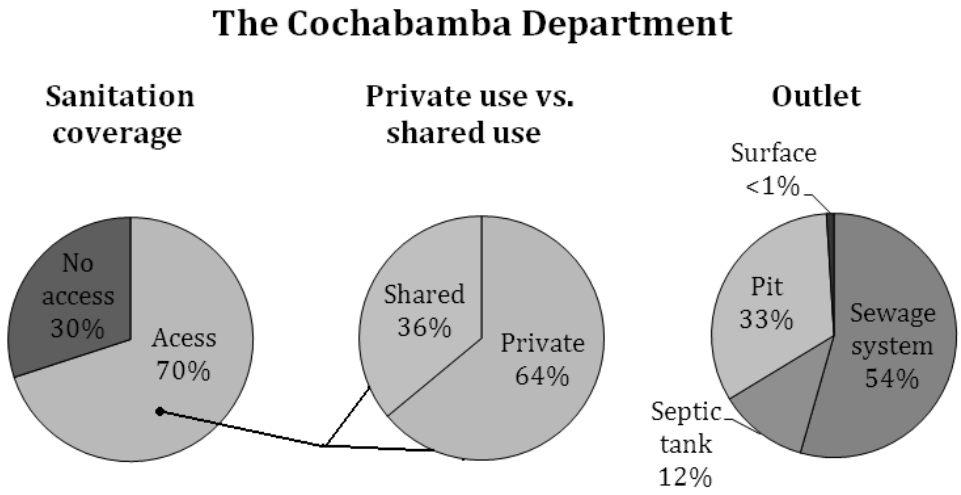

Figure 4.5 The sanitation coverage and types of use and outlets in the Cochabamba Department (Instituto Nacional de Estadística, 2013)

4.3 Improved sanitation options

Sanitation solutions denoted as improved are pit latrines with slab, ventilated improved pit latrines, composting toilets and cistern-flush or pour-flush toilets where the wastewater is discharged into a piped sewer system, a septic tank or an improved pit (World Health Organization & UNICEF, 2013). These options are described below.

4.3.1 Pit latrine with slab

The simplest type of improved sanitation is a pit latrine with slab, consisting of a pit of ideally 4-5 meters depth, fully covered with a slab or platform with a squatting hole or a seat, see Figure 4.6. The slab can be made from any material, provided that it is easy to clean and solid. Moreover, the slab must totally cover the pit in order to separate the excreta from human contact (World Health Organization & UNICEF, 2013). In order to provide privacy and shelter from weather, there should be a superstructure above the pit. Pit latrines are suitable sanitation options when water consumption is low, approximately less than 25 litres per person per day as it does not require any water for flushing (The World Bank, 2013).

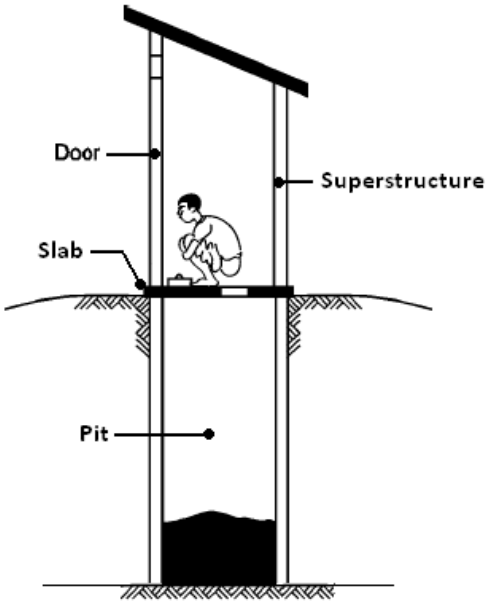

Figure 4.6 Improved pit latrine (Cotton, et al., 1995)

The pit latrine can be emptied via a slab or hole outside the superstructure, or sealed when full. The latter alternative requires another pit latrine to use while the first one is left for natural processes to decompose the organisms causing diseases. This is referred to as a twin pit system. After approximately one year, the content of the first pit latrine is possible to discharge without risk, and the content is able to compost (The World Bank, 2013).

The main advantages with pit latrines are that they are cheap and rather easy to construct. However, if a twin pit system is used, a new pit must be dug and the superstructure needs to be moved. It also requires more land to use the twin pit option. Moreover, pit latrines may cause smell and presence of flies which can cause transmission of faecal germs (The World Bank, 2013).

The pit can have a floor slab but if not, it is called soak pit or leach pit which refers to the characteristic that liquids soak or drain into the ground while solid faecal material remains in the pit. This solution is only suitable where the ground material and groundwater level ensures that groundwater contamination will not occur, or in areas of small risk for flooding. Moreover, in densely populated areas, the concentrations of nitrates and bacteria in the ground might be too high and hence, affect the environment and the groundwater (The World Bank, 2013).

4.3.2 Ventilated improved pit latrines

A more advanced type of pit latrine is the ventilated improved pit (VIP) latrine. A ventilation pipe covered with a fly proof mesh allows air to circulate, into the pit via the squat hole and flow out through the ventilation pipe. This decreases the faecal odour and prevents flies attracted to the odour from exiting the pit. Moreover, the flies are attracted to light. Hence, it has to be dark inside the superstructure in order to prevent flies in the pit from exiting through the squat hole. The only source of light in the pit is the light from the ventilation pipe. Thus, the flies inside the pit try to exit through the end of the ventilation pipe but as hindered by the mesh, they eventually die and fall back into the pit (World Health Organization, 2005), see Figure 4.7.

The VIP latrine is a better alternative to prevent flies from spreading faecal-oral diseases, than ordinary improved pit latrines; however the dark interior of the superstructure may be perceived as unpleasant by the users. If the superstructure is changed in order to provide more light, or if the fly-proof mesh is not functioning as intended, the fly-related benefits with the VIP latrine is lost (The World Bank, 2013).

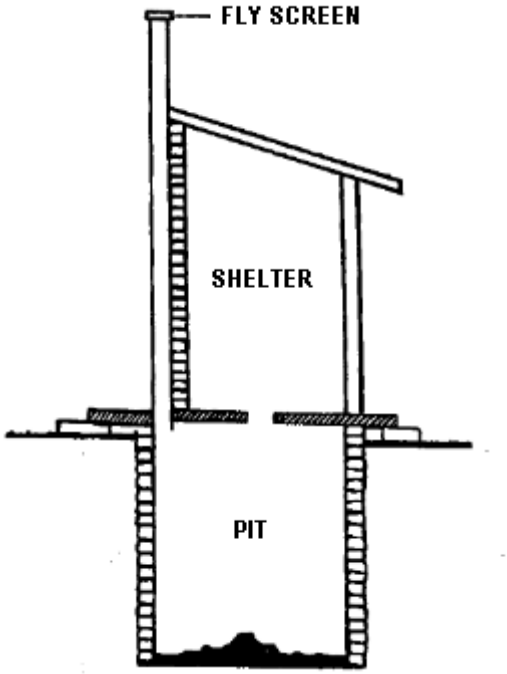

Figure 4.7 Ventilated improved pit (VIP) latrine (World Health Organization, 2005)

4.3.3 Cistern-flush or pour-flush toilet

The main characteristics of a cistern-flush or pour-flush toilet are the use of water to dispose the excreta. Between the toilet and the following container for the discharge, there is a water seal, see Figure 4.8 and Figure 4.9, which prevents odour, flies and contact with faeces. The difference between a cistern-flush and a pour-flush toilet is that the first stores water in a built-in cistern and is flushed by pulling or pushing a button or similar. A pour-flush toilet, on the other hand, is flushed by manually pouring water directly into the bowl (World Health Organization & UNICEF, 2013). A flush toilet should not be used unless the use of water is more than 25 litres per day and person. A cistern-flush is not recommended if the minimum use is less than 60 litres per day and person. For example, toilets connected to a sewage system require reliable water supply of at least 60 litres per person and day (The World Bank, 2013).

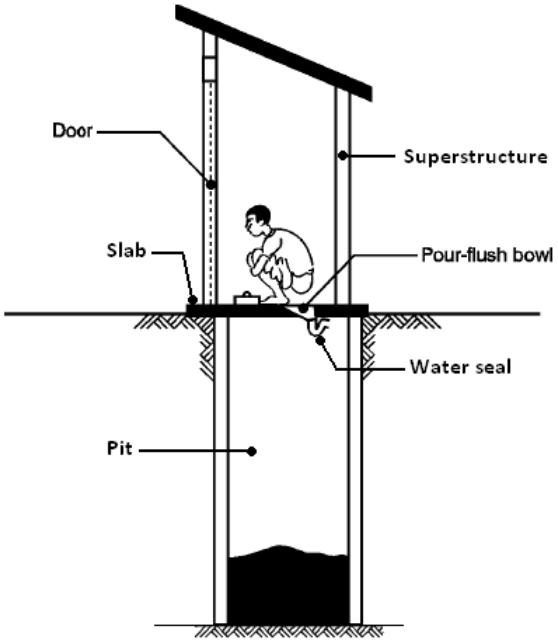

Figure 4.8 Pour-flush toilet above pit (Cotton, et al., 1995)

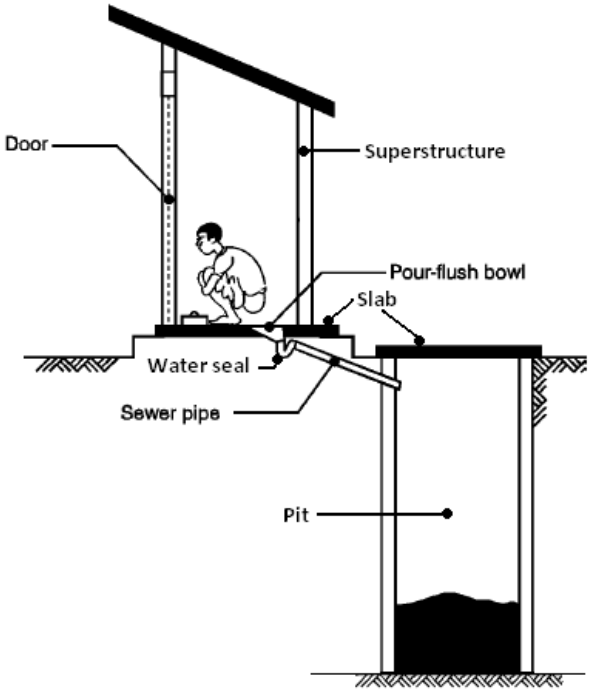

Figure 4.9 Pour-flush toilet with offset pit (Cotton, et al., 1995)

Flush toilets remove the excreta from the households and are easy to use and keep clean. However, the large amounts of wastewater produced need to be treated in order to avoid environmental risks due to infiltration into the groundwater table or health risks related to irrigation with insufficiently treated wastewater (The World Bank, 2013). In order for the pour-flush facility to be improved, the excreta must be discharged into one of following alternatives:

Piped sewer system: A system of sewer pipes, collecting and transporting human excreta and wastewater from households to treatment plants and further disposal (World Health Organization & UNICEF, 2013).

Septic tank: The septic tank is a water-tight cistern in which the faeces are allowed to settle whereas the urine and wastewater is discharged into the ground through a drain-field, or into a sewage system (The World Bank, 2013).

Improved pit: The pit must have a solid slab in order to prevent human contact with the excreta. Otherwise, the solution is not improved (World Health Organization & UNICEF, 2013) . See 4.3.1, for further information.

4.3.4 Composting toilet

A composting toilet is a dry toilet in which excreta is stored and composted. Carbon-rich materials such as grass, ash, sawdust, straw and/or optionally food wastes are added in order to maintain the composting process. Alternatives, both with or without urine separation exist. One type of urine separating composting toilet is the ecological sanitation, EcoSan, aiming at keeping the nutrient cycles closed, by using the urine and faeces for agricultural purposes. When the urine is separated, it can be used as fertiliser without treatment, as few of the diseases derived from excreta is transmitted through the urine[5]. Moreover, the faecal matter is easier to manage when dry. The EcoSan option is beneficial for people who want to use the excreta as fertilisers; in areas with high groundwater table or very rocky soil, as they can be built above ground level; and also where water consumption is low. However, this sanitation option requires more maintenance and knowledge about construction and operation, in comparison to pit latrines. Moreover, the EcoSan alternative is notably more expensive (The World Bank, 2013).

4.4 Unimproved sanitation

All kinds of sanitation solutions not explained above are referred to as unimproved sanitation. In the event of an improved sanitation facility being shared by two households or more, this is also considered being unimproved sanitation (United Nations, 2013).

4.4.1 Flush- or pour-flush to elsewhere

To “elsewhere” refers to excreta being discharged into any other place than the improved alternatives described above, i.e. not into an improved pit, a septic tank or a sewer. For example, pour-flush toilets sometimes have outlets into streets, streams, rivers or other surfaces (World Health Organization & UNICEF, 2013).

4.4.2 Pit latrine without slab, or open pit

A pit latrine without a slab or simply a hole in the ground does not ensure that the excreta is separated from human contact, hence, these alternatives are unimproved (World Health Organization & UNICEF, 2013).

4.4.3 Bucket

This option refers to using a bucket or other similar container to collect faeces and urine for further disposal or use (World Health Organization & UNICEF, 2013). The

[5] The exceptions are typhoid and schistosomiasis

content of the buckets is often discharged into streets or water-bodies (SanitationDrive, 2011).

4.4.4 Hanging toilet or hanging latrine

A hanging toilet or latrine is placed above a watercourse of any kind, into which the excreta is discharged (World Health Organization & UNICEF, 2013).

4.4.5 No facilities

According to the Water Supply & Sanitation Collaborative Council (WSSCC) (2010), the definition of open defecation is *"defecating in the open and leaving the faeces openly exposed to the air"* (Water Supply & Sanitation Collaborative Council, 2010). 15 percent of the global population practises open defecation. However, according to the MDGs, this practice must be totally eliminated by 2025. Practicing open defecation imposes risks for human health, considering the transmission of diseases as well as potential risk of being exposed to violence, mostly for women and children. Moreover, not only is open defecation an indication of poverty, there is also a correlation between open defecation, disease and sustaining poverty (United Nations, 2013).

Practicing defecation on the ground, covering the faeces with a layer of earth is denoted the *cat method*. Other options of defecation practices is wrapping the excreta and discharging it into the garbage (World Health Organization & UNICEF, 2013) or disposal of the faeces in a plastic bag which is thrown away. The latter is referred to as *flying toilet*, used by approximately 1 billion slum dwellers globally (SanitationDrive, 2011).

5 Theoretical framework

This chapter presents theory about the diffusion of technologies in general and more specifically about sanitation. Finally, in other studies identified, individual drivers and barriers for the implementation of sanitation are presented.

5.1 Socio-technical systems

Various scholars agree upon that technology not only consists of the technical devices, but of the knowledge and know-how to use, operate, maintain and manufacture the artefacts (Rogers, 2003; Grübler, 1998; Unruh, 2000; Wilkins, 2002). This is commonly referred to as hardware and software, where hardware is the device and software the know-how (Rogers, 2003; Grübler, 1998). These are interrelated and cannot be separated. As much as we need to understand the role of technology in society, the societal role in development and use of technology needs to be taken into account (Bijker, 2001; Grübler, 1998).

There has been, and still is among some scholars, a perception that "*good technology*" will sell itself, and that superior technical devices will *"win*" over inferior ones. However, this is not always the case (Unruh, 2000; Rogers, 2003). In fact, there are other explanations for the success or failure of a certain innovation. Technological systems consist of infrastructure of physical, social and informational characteristics which are intertwined and co-evolve. Hence, networks of many dimensions and components are created, and this in turn might benefit some certain technology which fits in the existing technological system. In that way, a state of *"lock-in*" appears (Unruh, 2000). *"Lock-in*" refers here not only to physical but also to institutional and mental inertia. What is considered a suitable technological device varies with cultural values, beliefs, experiences and expectations (Rogers, 2003), as well as with economic possibilities for implementation (Banerjee & Duflo, 2011). Thus, Grübler (1998) states that *"technology cannot be separated from the economic and social context out of which it evolves"*. This implies that implementing a certain technology requires understanding about the importance of the local context in which the technology is to be implemented (Altaf, 2011).

The problem with e.g. failed aid projects concerning sanitation is seldom due to lack of technological devices, but rather failed implementation of the technology. Wilkins (2002) argue that historically, the transfer of technology from North to South, i.e. from developed to developing, more or less meant to put foreign technology into a developing context, without considering knowledge transfer or domestic capacity building for operation and maintenance. The contextual conditions have not been taken into account. Moreover, the transfer of technology should aim at improving existing technology in order to fit the local conditions (Wilkins, 2002). It is common within aid business that donors and aid workers have an idea about what poor people need. However, as the potential adapters do not always agree, aid projects often fail (Banerjee & Duflo, 2011). The poor are seldom seen as sources of knowledge and are rarely consulted in these projects. Instead, the poor are often perceived as different from people in high-income parts of the world, and whose behaviour makes them stay poor (Banerjee & Duflo, 2011). Despite the knowledge of failed aid projects, the same models are continuously being used. However, in order to improve aid programs, the complexities of the context need to be understood (Altaf, 2011). Rogers (2003) points out that in order for a technology to be adapted, it needs to be compatible with the

social system. In line with this, van Vliet et al. (2011) suggest that the technical perspective needs to be supplemented by a social perspective.

5.2 Explanations to the slow progress towards the sanitation target

As stated earlier, the progress towards meeting the sanitation millennium target is too slow (World Health Organization & UNICEF, 2013). Various reasons for this have been identified; however, lack of technological solutions is not one, nor is lack of attention (Nelson & Murray, 2008).

The failure of implementation of sanitation systems in a developing context can be derived from many reasons. According to Rogers (2003), most innovations spread unsatisfyingly slow, at least from the point of view of inventors and promoters of the technology. Moreover, the view of what technology is suitable in a certain context might differ depending on the perspective. Promoters of improved sanitation might have a completely different picture compared to the, in this case, poor people being the potential adopters. Banerjee & Duflo (2011) state that "*the poor often resist the wonderful plans we think up for them because they do not share our faith that those plans work, or work as well as we claim*".

In order to increase the spread of improved sanitation, the reasons for the slow progress need to be examined. To do so, understanding about how sanitation solutions are chosen and diffused is needed.

A common perception is that implementation failure is a result of the individual's shortcomings of using "good" technology. This view originates in lacking understanding of the importance of a technology being compatible with values, beliefs and experiences of the users (Rogers, 2003). Explaining the failure of implementation based on the technical features only has shown not to provide the full picture. Hence, sanitation seems to be as much a social as a technical issue (van Vliet, et al., 2011). A crucial aspect to consider is which sanitation system being appropriate in the certain context (Mara, 2008). The cultural views of the everyday habits connected to sanitation are known but seldom explored by sanitation managers (Jenkins & Curtis, 2005).

Low demand for sanitation among the world's poor (Nelson & Murray, 2008) and inadequate understanding of the importance of improved sanitation among policy makers and the society at large (Minh & Hung, 2011) are two explanations for failed implementation. Why the demand for sanitation in poor communities is low is not unequivocal. One suggestion is that the sanitation options are not desirable and affordable (Nelson & Murray, 2008). Considering the aspect of desirability concerning demand for sanitation, this is also connected to the local and cultural context (van Vliet, et al., 2011). However, the demand for sanitation appears to be driven more by private desires, such as status, comfort and convenience, than of societal benefits, e.g. decreased risks for disease and environmental damage (Nelson & Murray, 2008).

As the desired spread of improved sanitation concerns poor and very poor people, Mara (2008) states that cost is the key criterion when choosing sanitation solution. Moreover, Nelson & Murray (2008) point out unwillingness to invest in services for poor as one key reason for the hitherto slow spread of sanitation services. The world cannot and will not subsidise all implementation of sanitation needed in order to reach the sanitation target (Mara, 2008). Moreover, poor households seldom get financial

support from lending institutions such as banks or cooperatives. Furthermore, the possibilities to save money are limited when income is low and irregular. More common is "*saving brick by brick*", i.e. saving by progressively investing in construction materials (Banerjee & Duflo, 2011).

There are different views about whether aid is a useful tool for fighting poverty. On one hand, Sachs (2005) is very positive, whereas Easterly (2007) and Moyo (2009) are sceptic. Moreover, Ovaska (2003) claims that despite the latest 50 years of continuous development aid, the results have not become what was expected, and Altaf (2011) states that aid projects seldom succeed (Altaf, 2011; Ovaska, 2003).

Due to the dominant sanitation solution in the developed world, consisting of water-flush toilets connected to piped sewage systems or septic tanks, a perception of this option being the "*ultimate stage in a process of modernisation*" has become locked-in (van Vliet, et al., 2011). However, this resource-demanding sanitation solution is highly dependent on constant water supply and thus, not suitable in areas of water scarcity (The World Bank, 2013), nor has it been affordable. Moreover, water-flush toilets produce large amounts of wastewater which require treatment in proper facilities. In addition, in areas with low water consumption, the wastewater may be more concentrated, which even more stress the need for proper treatment (van Vliet, et al., 2011). In areas where the infrastructural systems required for this sanitation solution are non-existing, there is a window of opportunity for late-comers to leap-frog to other solutions (Grübler, 1998). In reality, however, the choice are often depending on the level of water supply (Mara, 2008) and/or limited due to lack of funding, political will and, as the perception of water-flush toilets and sewage systems has become locked-in, lacking imagination (van Vliet, et al., 2011).

In order to influence the spread of improved sanitation systems, Jenkins and Curtis (2005) argue that an understanding of the generation of demand and motivation for this is of high importance. Moreover, they claim that there is lacking attention of consumer behaviour and demand in existing literature (Jenkins & Curtis, 2005).

5.3 Drivers and barriers for implementation of sanitation

A driver is a desire for change and a factor that enhance the desired change (Jenkins & Curtis, 2005; Wilkins, 2002). A barrier, on the other hand, is a factor that hinders a desired change. Barriers tend to be interlinked and thus, it is not sufficient to overcome one single barrier to realise the change (Wilkins, 2002).

5.3.1 Drivers

Jenkins and Curtis (2005) carried out a study in seven rural, low-income villages in Benin. The villages had poor access to social services and lacked access to sanitation. Jenkins and Curtis (2005) studied the "natural" forces that were underlying the demand for household latrines in the villages. By interviewing the villagers and study the diffusion of household latrines in the absent of external interference, Jenkins and Curtis identified three categories of drivers: prestige related, drivers related to well-being, and situational drivers (Jenkins & Curtis, 2005).

The *prestige* related drivers included experiences of improved sanitation and hence, dissatisfaction with open defecation due to latrine habit and/or a desire to identify with the "urban elite" and avoiding the embarrassment of directing visitors to the bush. Moreover, increased social status from owning a latrine and cultural-religious drivers, such as post-mortem intergenerational status, were identified. Meanwhile, the

drivers related to *well-being* constituted safety from the dangers associated with defecating in the open, such as dangerous animals and insects, robbers, rapists, and illness due to infectious diseases. Moreover, convenience, comfort, cleanliness, and privacy were other well-being drivers mentioned by the respondents. In addition, potential supernatural dangers in association with open defecation were other recognised drivers. Furthermore, one *situational* driver for implementing sanitation was to ease restricted mobility, such as difficulties to walk and squat due to old age, illness, or disability. Another driver, situational related, was to increase rental income.

Jenkins and Curtis conclude that convenience, comfort, and privacy were the most common drivers for women whereas the most common driver among the men was prestige. Prestige was superior to health among the respondents. Moreover, migration, travel and education played an important role for influencing the demand for sanitation (Jenkins & Curtis, 2005).

O'Loughlin et al. (2006) performed a follow-up study on some households in Ethiopia which had earlier implemented improved latrines through community mobilisation. The study aim was to verify latrine presence and use as well as to interview both adopters and non-adopters about latrine related costs, knowledge, attitudes and practice. The main reasons for satisfaction among the adopters and drivers among non-adopters were cleanliness, health benefits, habit, social pressure and prestige, as well as knowledge about sanitation. Some of these drivers can, according to O'Loughlin et al. (2006), be strengthened by observations. For example, sanitation spread faster in areas closer to towns and especially along roads. Therefore, one can conclude that habit, social pressure, and prestige are important drivers. Furthermore, knowledge might be a driver even though not clearly stated by the respondents (O'Loughlin, et al., 2006). When knowledge spread within and between societies, it does not only enable more households to adopt a latrine but moreover, the social pressure might increase and hence, prestige becomes a stronger driver.

Rodgers et al. (2007) carried out a study whereof one objective was to investigate perceptions of improved latrine ownership among households in Ghana that had or had not participated in latrine-promotion programs. The most frequently reported advantages with, and drivers for implementation of latrines were convenience, cleanliness, and health benefits. In contrast to the results from the study of Jenkins and Curtis (2005), health benefits were perceived to be a driver for latrine adoption and use (Rodgers, et al., 2007). However, some respondents in the study of Rodgers et al. (2007) had been participating in latrine promotion programs and health volunteers were working in the districts during the time of the study. The respondents in the study of Jenkins and Curtis (2005) had not.

5.3.2 Barriers

WaterAid (2009) have documented the results of various studies on open defecation and the socio-cultural barriers and possible triggers for sanitation in four different West African countries. The identified barriers were: lack of resources, smell, maintenance, safety issues concerning the construction, geophysical conditions such as too hard or unstable ground, and simply no interest in using latrines (WaterAid, 2009). Similarly, Jenkins and Curtis (2005) identified 13 barriers to adoption of improved latrines, of which the most important ones were: high costs (actual or believed), lack of credit, unavailable or complex technical devices, unsuitable ground conditions, and poor performance and operation of latrines – generating smell and poor safety. Without focusing the study on identifying barriers, O'Loughlin et al.

(2006) came across some reasons among non-adopters for not constructing a latrine. The three main reasons were; lack of manpower, lack of time, and lack of awareness. Among the respondents in the study of Rodgers et al. (2007), both adopters and non-adopters, pointed out a number of perceived disadvantages with latrines whereof smell from the latrine, need for maintenance and need for cleaning were the three most frequently mentioned.

6 Results

The results are based on interviews, more informal conversations and observations, as well as documents provided by PROCASHA. One part of the interviewees is denoted with figures from 1 to 8. These were only possible to interview once. The other part of the interviewees is denoted by letters from A to F. These people were interviewed more than once, which enabled follow-up questions and more in-depth interviews.

6.1 Description of the Study Area

The Study Area is an informal settlement, situated in the peri-urban District 8 in the southern part of Cochabamba. Almost half of the people living in District 8, are migrants. More than 75 percent of the households in the district do not fulfil the minimum living standard criteria[6] due to overcrowding and lack of access to basic services, such as water and sanitation. The health conditions are poor; the child mortality is 94 deaths per 1000 live births (PROCASHA, 2013). This number can be compared to 6 deaths per 1000 live births in developed regions and 19 per 1000 in Latin America and the Caribbean in general (United Nations Inter-agency Group for Child Mortality Estimation, 2013). Among the people in District 8, possibility to education has been stated as one of the reasons for migration (PROCASHA, 2013).

The Study Area is one of the poorest settlements in District 8 and is formally considered being a green area or pastureland. The settlement has existed for just over 10 years and is located on a 24˚ hillside of mainly porous material which erodes during rainy season, causing damages to roads and constructions, see Figure 6.1. For example, one person died last year when a wall collapsed during construction. The wall was constructed in order to prevent slides and thereby to function as protection, both to people and other constructions (PROCASHA, 2013). Moreover, the ground varies between different plots in terms of porosity and solidness. On some plots, it is rather easy to dig by hand while the ground is very solid on others and hence, excavators are needed for digging on those plots.

Figure 6.1 A construction which has been damaged due to the unstable ground (Photo: private)

[6] The Universal Declaration of Human Rights: Article 25 (UN, 2013)

6.1.1 The inhabitants

The Study Area is populated by 1600 people in 339 households, divided into 15 small neighbourhoods, called *manzanos*. The settlement is unplanned and thus, there is limited space for infrastructure. The inhabitants are socially, politically, and economically vulnerable. Human rights to health care, education, housing, and proper living conditions are far from fulfilled. There is no district health care centre nearby and generally, the people lack health insurance (PROCASHA, 2013).

Most of the inhabitants are of different native origins, mainly Quechua and Aymara. Hence, most adults speak Quechua or Aymara as well as Spanish. Some of them have learnt Spanish when they were young, while others have learnt Spanish as adults. Some people do not speak Spanish at all, whereas few people speak all three languages. Moreover, the people have migrated from different parts of the country. The Spanish being spoken is influenced by the native languages and local dialects, and thus, contains as well native as dialectal words and expressions.

People have migrated to Cochabamba for various reasons, e.g. the pleasant climate[7]. Being a single woman or widowed in rural areas is not socially accepted, which is said to be another reason for moving to the city[8,9]. However, the primary reason for moving to the Study Area was that land was available there. Hence, families could construct their own houses and not being dependent on rental housing. The norm in the Study Area is that the families consist of a mother, a father and their children. Generally, children live with their parents until they get married.

6.1.2 Economic situation

The inhabitants in the Study Area, generally work within the informal sector and have irregular and low or very low income. The informal sector commonly includes work within the transport, trade and construction sectors. It is common with odd jobs which generate immediate income. Employments with monthly salaries are not very common among the people in the Study Area. For example, fruit vendors buy fruit in the morning and sell it during the day. The income is the difference between expenses for buying the fruit and the gross profit[10]. A driver's income is based on the payments from customers, minus the cost for fuel and possible rental of the car[11]. For some people, leasing their car to drivers is a source of income[12]. PROCASHA has estimated the average monthly household income in the Study Area to be ~2000 Bs (approximately 2000 SEK). The margins between income and expenses are small; hence, saving money is difficult. Food, loans, transportation and education are the main expenses (PROCASHA, 2012). The societal structures imply that women are often at home, taking care of the children and the household. Men, on the other hand, spend most of their time out of home due to work. Generally, women are less educated than men. Women are often economically dependent on their husbands (PROCASHA, 2013) and women living without husbands are dependent on support from their children[13,14].

[7] Interviewee 3, interview 2013-04-15
[8] Interviewee 8, interview 2013-04-17
[9] Interviewee B, interview 2013-04-15
[10] Interviewee 3, interview 2013-04-15
[11] Interviewees D, interview 2013-04-16
[12] Interviewee 7, interview 2013-04-16
[13] Interviewee B, interview 2013-04-15

6.1.3 Housing situation and available services

Due to the informal status of the settlement, the people do not have property rights. This, in combination with lack of funding and sometimes due to lacking material supply, implies that many houses are under construction for several years. The constructions are rarely performed with proper knowledge and skills (PROCASHA, 2013). The houses often consist of 1 to 2 rooms, constructed by bricks or adobe[15].

All households in the Study Area have access to electricity, provided by a private company. However, due to the informal status of the area, the households lack municipal services such as piped water and sewage system. Private vendors provide water from tanker trucks. Most families store the water in second-hand oil drums[16,17], see Figure 6.2, or containers from the chemical industry[18] whereas some families have bought new plastic barrels[19]. One barrel (~200 litres) of water from the truck costs 5 Bs (approximately 5 SEK) and the water is used for almost all of the water consumption purposes in the household. However, some families buy bottled water in PET jars à 20 litres for 12 Bs, mainly for drinking[20,21].

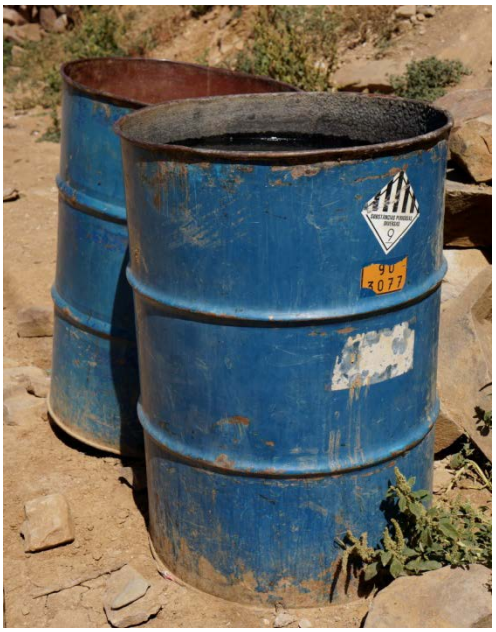

Figure 6.2 The most common type of barrel for water storage in the Study Area (Photo: private)

All households collect rain water during the rainy season. The rain water is mainly used for laundry. Moreover, during the rainy season, the water trucks can have difficulties getting to the area due to damaged roads. When so, the people might have to use the rain water for other purposes as well even though most of the interviewees state that they do not consume the rain water. According to observations, some of the women in the Study Area are laundering daily and among the interviewed households, the clothes worn by the family members were perfectly clean despite the dusty

[14] Interviewee A, interview 2013-04-29
[15] Adobe is a low-cost construction material made of clay and straw
[16] Interviewees D, interview 2013-04-16
[17] Interviewee F, interview 2013-04-28
[18] Interviewee E, interview 2013-04-23
[19] Interviewee B, interview 2013-04-15
[20] Interviewee B, interview 2013-04-15
[21] Interviewee 6, interview 2013-04-16

environment. The common practice is to reuse water from laundry for flushing the toilet[22,23], if having a pour-flush, and irrigation of the garden[24,25]. Few people have showers. For daily personal hygiene, basins and buckets are being used. Even though hand-washing after using the toilet was not observed in the Study Area, and neither was hand-washing facilities and soap in connection to the toilets, most of the interviewees washed themselves thoroughly once a day.

6.1.4 The Settlement Community Organisation

The board of the settlement community consists of 14-15 persons, whereof most of them are presidents in their respective *manzano*. The board is elected every other year[26]. Board meetings and general meetings for all members take place monthly. The village community is financed both by monthly fees of 2 Bs per household as well as penalty fees if the household is not represented at meetings, marches or parades. The village community does not provide receipts for the payments[27]. Sporadically, audits are carried out. The results from the audit are presented at the general meeting, where all neighbourhoods are supposed to be represented[28].

The Study Area was previously part of a larger area, which was divided into two parts after disagreements about what themes to focus on for the future development. Moreover, there were rumours about corruption in the Settlement Community Organisation Board which further implied the division. Currently, the focus is to receive certificates for the right to own their own land. The division of the group was due to different ideas about how to carry out this process[29]. As previously mentioned, the Study Area is divided into smaller manzanos, which consist of about 20 households each, see section 6.1.1. This group size is considered being convenient for collaboration; the groups should not be larger[30]. Each manzano has got a president. How the president is chosen varies between different manzanos. In one manzano, the president role rotates and it is compulsory to be president for six months[31]. Being president of the manzano means a lot of work and few people want to be in this position, since the work is time consuming and unpaid. The president of the Settlement Community Organisation Board is being elected among the presidents of the manzanos. If the people are not satisfied with the president, they can set him or her aside[32,33].

The Settlement Community Organisation does not have the legal status of an OTB, see section 2.2. Hence, they do not have the right to propose projects for the development of the Study Area or represent the Study Area and its inhabitants in parleys with the local government.

[22] Ibid.
[23] Interviewee 7, interview 2013-04-16
[24] Interviewee E, interview 2013-04-23
[25] Interviewee 8, interview 2013-04-17
[26] The president of the Settlement Community Organisation board, interview 2013-08-14
[27] Interviewee B, interview 2013-08-20
[28] The president of the Settlement Community Organisation board, interview 2013-08-14
[29] Interviewee B, interview 2013-08-20
[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] The president of the Settlement Community Organisation board, interview 2013-08-14

6.1.5 Safety

It is not safe, especially for girls and women, to walk in the Study Area after dark and the inhabitants avoid doing so if possible[34]. However, if lacking access to sanitation in the household, some might need to go outside to practise open defecation. Girls and women which have been walking in the area after dark have been sexually violated and killed. Men, on the other hand, are at risk of being suspected to be thieves or rapists and hence, they risk to be assaulted. Trust for the police is non-existing. In order to protect the area from intruders and violators, the neighbours take turn patrolling the area during the night. If the night patrol spots someone they do not recognise, it might imply severe consequences[35]. Lynching has occurred in order to signal to potential thieves that they should stay away. Moreover, each household keeps watchdogs and many have fences or walls around their homes. Some walls have shards of glass and barbed wire on top. However, these safety issues are not unique for the Study Area. The authors of this report were strongly advised not to walk, but to go by taxis from authorised companies when transporting in Cochabamba in general. Shards of glass and barbed wire on top of walls were very common in the central parts as well, see Figure 6.3.

Figure 6.3 A wall with shards of glass and barbed wire in the central part of Cochabamba (Photo: private)

6.1.6 Involvement of non-governmental organisations

Four NGOs are or have been active in the Study Area. In addition to previously mentioned PROCASHA, the NGOs represented are Water for people, Habitat for humanity and Alerta Verde. Themes that these NGOs work with are access to water and sanitation, improved housing and gardening[36].

One NGO donated sink, toilet and basin, to families who constructed the platform and superstructure for a bathroom themselves. This benefitted 3 to 5 families. One opinion about external support considering sanitation is that instead of being provided an amount of money, covering only a part of the total cost, it would be preferable if the

[34] Interviewee B, interview 2013-04-15
[35] Ibid.
[36] The president of the Settlement Community Organisation, interview 2013-08-14

concerned households could receive help to construct the entire bathroom, both pit and superstructure. The households could thereafter pay off the loan to the bank. The risk otherwise is that the bathrooms will not be finished due to inability to pay the total cost. Many households urgently need this kind of support, in order to improve the hygiene and health, which would benefit the children, especially[37]. Moreover, the president of the Settlement Community Organisation suggests that help from some organisation with technical knowledge about which sanitation solution is to prefer in different places in the area, would be preferable. This, due to that e.g. a pit latrine is not suitable in a slope whereas the liquid from the pit would diffuse in the ground and spread to the neighbours. There are still many families in the area which lack bathrooms.

6.2 Sanitation practices

Five years ago, the Settlement Community Organisation decided that everyone in the Study Area should have some kind of sanitation solution on their own plot[38,39]. However, most households do not[40,41], due to various reasons. Contradictory, among the 14 households interviewed in this study, only one lacked some kind of sanitation[42]. The most common perception about the reason for other households lacking sanitation, is lack of financial resources[43,44,45]. Another, less common belief, is that people from some areas are less careful about their hygiene and hence do not want sanitation[46]. Three different sanitation solutions were identified during the study:

1) open defecation in the slope
2) unimproved pit latrine, see Figure 6.5
3) pour-flush toilet connected to
    (a) an improved pit right under the pour-flush toilet, see Figure 6.6
    (b) an improved, offset pit, connected to the pour-flush toilet with a pipe, see Figure 6.7
    (c) a septic tank

Further in this report, the concepts improved and unimproved sanitation are used. Moreover, the identified drivers and barriers, see section 6.3, are related to the implementation of improved sanitation, as the stated desire among the interviewees is to have a bathroom with a pour-flush toilet. All interviewees except one[47], expressed the desire for municipal sewage system. However, in the absence of such a system, a pour-flush toilet and an improved pit was, according to the interviewees, the second best solution.

[37] Ibid.
[38] Ibid.
[39] Interviewee F, interview 2013-04-28
[40] Ibid.
[41] Interviewees D, interview 2103-04-23
[42] Interviewee C, interview 2013-04-16
[43] Interviewee C, interview 2013-04-23
[44] Interviewees D, interview 2013-04-16
[45] Interviewee B, interview 2013-04-23
[46] Interviewee F, interview 2013-04-28
[47] Interviewee 5, interview 2013-04-18

One household lacks sanitation on their plot[48] and thus, performs open defecation whilst four households have unimproved pit latrines[49,50,51,52]. However, some people

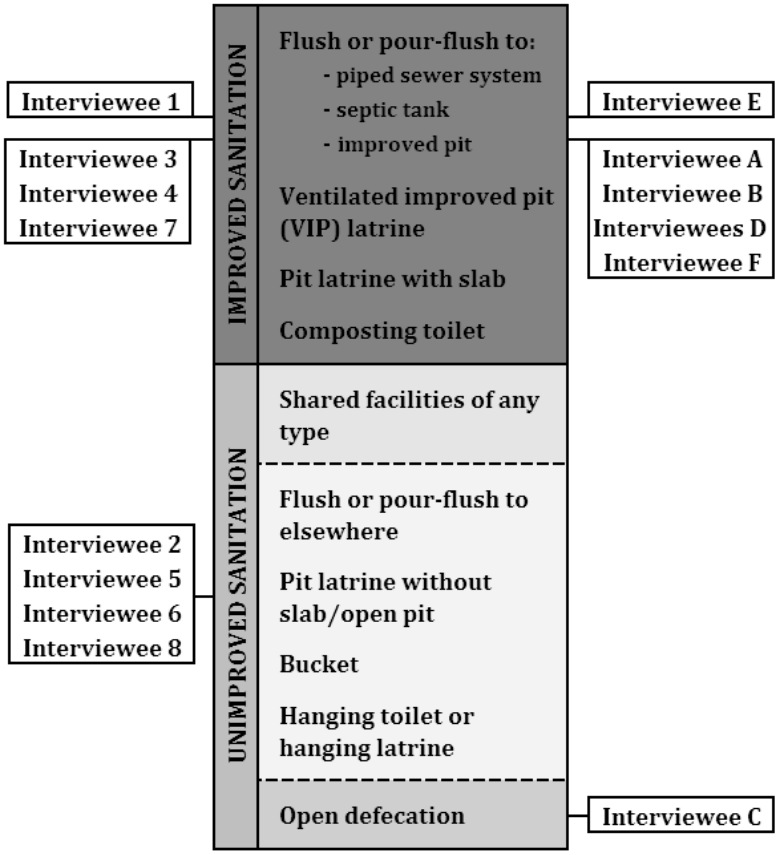

Figure 6.4 The position of the interviewees on the sanitation ladder.

having an unimproved pit latrine, sometimes practise open defecation anyhow[53,54,55]. The remaining nine households have pour-flush toilets, connected to an improved pit[56,57,58,59,60,61,62], either directly under the toilet or offset, or a septic tank[63,64], see Figure 6.4 and Table 6.1. As previously mentioned, see section 6.1.3, water from laundry is being used for flushing the toilets. As the toilets are only flushed after

[48] Interviewee C, interview 2013-04-16
[49] Interviewee 2, interview 2013-04-23
[50] Interviewee 5, interview 2013-04-18
[51] Interviewee 6, interview 2013-04-16
[52] Interviewee 8, interview 2013-04-17
[53] Interviewee B, interview 2013-04-23
[54] Interviewee 6, interview 2013-04-16
[55] Interviewee 8, interview 2013-04-17
[56] Interviewee 3, interview 2013-04-15
[57] Interviewee 4, interview 2013-04-17
[58] Interviewee 7, interview 2013-04-16
[59] Interviewee A, interview 2013-04-29
[60] Interviewee B, interview 2013-04-16
[61] Interviewees D, interview 2103-04-16
[62] Interviewee F, interview 2013-04-23
[63] Interviewee 1, interview 2013-04-17
[64] Interviewee E, interview 2013-04-23

defecation, approximately 1 to 3 litres of water is used per person and day for this purpose. When the improved pits and septic tanks get full, the owners have a private company emptying the pits and tanks. The cost varies between 350 Bs[65] and 400 Bs[66].

Figure 6.5 Two different unimproved pit latrines in the Study Area (Photos: private)

Figure 6.6 This is how a pour-flush toilet right above an improved pit can look from outside (Photo: private)

Figure 6.7 An offset, improved pit (Photo: private)

[65] Interviewees D, interview 2013-04-16
[66] Interviewee 3, interview 2013-04-15

As mentioned earlier, all interviewees except one, wanted a sewage system and in the absence of the same, most of them wanted a pour-flush toilet connected to an improved pit or septic tank. The main reason among the interviewees with children living at home, was the perception that the unimproved pit latrines are not convenient for children and various dangers associated with open defecation in the slope[67,68,69,70,71,72,73].

Table 6.1 Information about the interviewees (where information is lacking, the cell is marked with grey): *PF=pour-flush, ST=septic tank, IP=improved pit, UPL=unimproved pit latrine, OD=open defecation*

	Members in the household	Household income/month (Bs)	Sanitation	Sanitation at previous location
Interviewee 1	3	~3000	PF to ST	PF to IP
Interviewee 2	4	~1800	UPL	PF to IP
Interviewee 3	6	2650	PF to IP	
Interviewee 4	4		PF to IP	IPL
Interviewee 5	3		UPL	Sewage system
Interviewee 6	3	1600	UPL	
Interviewee 7	5	2200	PF to IP	PF to IP
Interviewee 8	4	~1800	UPL	Sewage system
Interviewee A	5	2100	PF to IP	IPL
Interviewee B	1	~1000	PF to IP	
Interviewee C	4	2250	OD	
Interviewees D	6	~1200	PF to IP	PF to IP
Interviewee E	3		PF to ST	PF to IP
Interviewee F	3		PF to IP	PF to IP

[67] Interviewee 2, interview 2013-04-23
[68] Interviewee 6, interview 2013-04-16
[69] Interviewee 7, interview 2013-04-16
[70] Interviewee 8, interview 2013-04-17
[71] Interviewee A, interview 2013-04-29
[72] Interviewee C, interview 2013-04-23
[73] Interviewees D, interview 2103-04-16

6.3 Results from in-depth interviews

Six of the households were interviewed more than once, where the follow-up interviews focused on implementation of sanitation. This included drivers and barriers for construction. Following section provides a detailed presentation of the characteristics of the six households. An overview is presented in Table 6.2.

Table 6.2 Sanitation characteristics of the six households (where information is lacking, the cell is marked with grey): *PF=pour-flush, ST=septic tank, IP=improved pit, UPL=unimproved pit latrine, OD=open defecation*

	Interviewee A	Interviewee B	Interviewee C	Interviewees D	Interviewee E	Interviewee F
Years in Study Area	9	9	10	10	8-10	5
Monthly household income	2100 Bs	~1000 Bs	2250 Bs	~1200 Bs		
Current sanitation	PF to IP	PF to IP	OD. PF to IP under construction	PF to IP	PF to ST	PF to IP
Years with current solution	1	2	10	9,5	5	5
Previous sanitation while living in the Study Area	OD	UPL and OD	OD	UPL	UPL	OD[74]
Sanitation at previous location	IPL			PF to IP	PF to IP	PF to IP

6.3.1 Interviewee A

Interviewee A has recently constructed a tiled bathroom with help from PROCASHA. They offered possibility to loan money and provided expertise for the construction. The bathroom contains a WC and a basin. The family also has a shower. A pipe connects the toilet to an improved pit, made of brick walls and an earth floor. The construction started and was completed during the year 2012. Interviewee A has got a water tank under the ground level and it is located right next to the pit, separated by a brick wall and some cement. However, PROCASHA intended the tank Interviewee A uses as water tank, to be a septic tank. Yet, Interviewee A got the impression that the municipal sewage system would arrive within a near future and hence, decided to construct a smaller improved pit. There had been people walking around in the area, taking measurements and a rumour spread among the neighbours that those people represented the municipality, preparing for a sewage system.

Before constructing the bathroom, Interviewee A and the children defecated in the slope below their house. While doing so, the children were mocked and had stones thrown at them by other children in the area. Furthermore, Interviewee A says that it was embarrassing when having guests and they had to show the guests to the slope when they needed to use the toilet. Some guests did not manage to walk in the slope by themselves and Interviewee A or the children had to keep them company and support them.

[74] Interviewee F did not permanently live in the Study Area during that time

Interviewee A had wanted to have a bathroom before PROCASHA offered their support, but could not afford it and lacked knowledge about such a construction. Moreover, Interviewee A says that the ground is very difficult to dig in and not even the neighbour could help with that, see Figure 6.8. The child that has left home did so due to the dissatisfaction with the standard the family's house held, as being used to the higher standard at their previous house, where they had improved sanitation.

Drivers: the children were mocked, embarrassment showing guests to the slope, difficulties for some guests to go to the slope, one of the children left home due to the low standard compared to earlier housing situation

Barriers: lack of funding, lack of knowledge, difficulties to dig

Tipping point: PROCASHA offered assistance to construct a bathroom

Figure 6.8 A close-up on the ground close to the house were Interviewee A lives (Photo: private)

6.3.2 Interviewee B

With help from one of the adult sons, Interviewee B constructed a bathroom with tiles on the walls and a concrete floor. The bathroom consists of a shower, a basin and a WC, which is connected by a pipe to an offset improved pit. The pit has brick walls, a concrete slab and earth floor. When it gets full, Interviewee B will have someone emptying it. Interviewee B estimates the time it will take for the pit to get full to 10 years. The bathroom and pit was constructed two years ago. Before that, Interviewee B had an unimproved pit latrine, covered with planks, close to the house. However, Interviewee B sometimes went to the slope to defecate anyhow due to the unpleasant smell from the unimproved pit latrine and desired a cleaner and more hygienic sanitation solution.

A close encounter with a large viper in the slope, made Interviewee B make the final decision to construct a bathroom. The son helped with both the design and the construction and they used some kind of excavator for digging the pit. Interviewee B had the economic possibility to begin the construction rather immediate when the decision was made. The reason for why the construction of the bathroom had not been performed before was the uncertain housing situation. Interviewee B is rather satisfied with the present sanitation solution.

Drivers: fear of snakes, dislike of the smell from the unimproved pit latrine, the desire for a cleaner and more hygienic sanitation solution

Barriers: uncertainties whether being allowed to keep the house and plot or not, due to the informal status

Tipping point: close encounter with snake

6.3.3 Interviewee C

Interviewee C and the family practise open defecation in the slope but they are constructing a bathroom which they complete little by little when they can afford material and there is material supply. The bathroom will have a squat toilet, as such a toilet requires less water for flushing than a WC. A pipe will connect the toilet to an improved pit which will be constructed with brick walls, earth floor and a concrete slab. Interviewee C will have someone to empty it when it gets full. Moreover, the pit will have an earth floor to avoid it to flood during the rainy season. Earlier, the family had an unimproved pit but did not have enough space for a new pit when the first one got full.

Interviewee C does not think that it is safe for the children to go to the slope and as there is no sewage system available in the area, Interviewee C decided to construct the bathroom. Moreover, Interviewee C finds the smell in the slope unpleasant and has for long desired a more clean and hygienic sanitation solution for the family. However, there was no space for a bathroom on their plot and the ground conditions below their house made it difficult to dig by hand. The family had plans to reconstruct their house, which required more space and hence excavation of the part of their plot which was too steep for construction. Thus, an excavator was hired and in addition to the excavation of the steep slope, Interviewee C took the opportunity to get help digging the pit.

Interviewee C was the one to make the decision to construct the bathroom as being the one with construction knowledge in the family. Before making the decisions to construct a pour-flush toilet to an improved pit, Interviewee C wanted to have ecological sanitation. However, due to the extra work load compared to an improved pit, and risk of misuse by guests, Interviewee C decided not to. Another reason for not choosing ecological sanitation was the perceived higher cost. Moreover, the NGO offering support for implementation of the ecological sanitation solution, required adoption by at least five households in the Study Area and there seemed to be little interest.

Drivers: dangers associated with defecation in the slope, dislike of the smell in the slope, desire for a cleaner and more hygienic sanitation solution

Barriers: difficulties to dig by hand, lack of space, lack of funding. (Specifically for EcoSan: the prerequisite that at least five households would implement EcoSan, Interviewee C was afraid of misuse and increased maintenance work)

Tipping point: they hired the excavator to excavate the slope

6.3.4 Interviewees D

The Interviewees D live together with their four children. They have lived in the Study Area for 10 years. Before moving there, they lived in the northern zone of Cochabamba, where they were connected to the municipal water and sewage networks. However, during the first six months in the Study Area, they had an

unimproved pit latrine before they constructed their present solution, even though their initial plan was to construct another solution as soon as possible. Hence, when the house construction enabled a bathroom and the unimproved pit was filled up, the bathroom and the improved pit was constructed.

They have a bathroom with a WC, which is connected to an improved pit with approximate volume of 10 m^3 with walls made of bricks and cement, earth floor and a concrete slab. Interviewee D constructed the pit with help from the father who is a builder. The pit was used for nine years before it was emptied for the first time. Interviewees D decided to have this specific sanitation solution because it was cleaner, more hygienic and better suited for their children, who were scared of using the unimproved pit latrine. They think that the previous solution was less hygienic due to the absorbance of fluids into the ground; it contained worms and flooded during rainy season. Moreover, they say that it was ugly. They did not consider other sanitation options before construction the current one. Sometimes, with the wind, they can feel the smell from other families' unimproved pit latrines and find that unpleasant.

Interviewees D wish to add a shower and a basin to the bathroom. They want to improve everything; however the economic situation does not allow that yet. Interviewees D say that families with more money are able to construct the bathrooms as they wish. Moreover, they dream about having municipal water and they are organised with other households in the settlement, fighting to get water and sewage systems.

Drivers: inconvenience for their children, desire for a cleaner and more hygienic sanitation solution, they thought it was ugly, the unimproved pit flooded during rainy season

Barriers: lack of funding

Tipping point: the unimproved pit got full

6.3.5 Interviewee E

Interviewee E lives with mother and a sibling in a house. They have lived in the Study Area for 8 to 10 years. One part of the house is a shop where Interviewee E works. Interviewee E is an architect and has previously worked with sanitation projects for the municipality. The house, in which Interviewee E and the family live, has got two bathrooms, of which one is in use. The bathroom contains WC, basin and a shower. Both bathrooms are connected to a septic tank constructed with reinforced concrete in order for the construction to last for approximately 20 years. The tank is well sealed and Interviewee E estimates that the tank will have to be emptied every 1,5 to 2 years. Interviewee E hired external workforce to construct the bathrooms and the tank. The construction of the bathrooms started five years ago and before that, Interviewee E and the family used unimproved pit latrines even though the intention was to construct bathrooms in the future. The construction has proceeded little by little until finished.

Before Interviewee E moved to the area, the house the family lived in had a pour-flush toilet, as the house they live in now. Interviewee E was the one who made the decision to implement the present system, which is constructed to be easily connected to the municipal sewage system when that arrives. Interviewee E has implemented the present sanitation system because it is the most economic solution for the family under current conditions. Furthermore, Interviewee E says that it is more comfortable, clean, practical and more long-term than having unimproved pit latrines. Moreover,

the current solution is also long-term due to the aspect that it only needs minor modifications when the municipal sewage system arrives. Interviewee E says that there are other types of septic tanks with alternative design available at the market; however, the more advanced options are more expensive.

Interviewee E mentions the topography as one aspect of difficulty for the implementation of a sewage system. Due to that the area is situated in a slope, the people must have their uphill living neighbours' sewage pipes on their plots. Otherwise pumps will be needed and that would imply higher costs and a more vulnerable system. Interviewee E is not yet satisfied with the current sanitation system and is still waiting for the arrival of municipal water and sewage networks. Moreover, Interviewee E addresses the importance of knowledge when implementing sanitation, comparing two neighbours on the other side of the street. One of the families do not have much money and could only afford an unimproved pit latrine. The other neighbour has more money and lives in a maisonette, but still uses an unimproved pit latrine. Hence, Interviewee E says, money is not enough for the construction of bathrooms. If the possible adapter lacks knowledge about different sanitation options, construction of sanitation or the benefits with sanitation, that person will not construct a bathroom.

Interviewee E tells about a project where the municipality constructed toilets in schools in Cochabamba. The toilets had WCs but the children were used to squat toilets. Hence, the WCs were destroyed and removed by the pupils in order to enable squatting. Not until the WCs were gone and the hole at a height suitable for squatting, the pupils started using the bathrooms.

Drivers: a desire for a cleaner, more hygienic, comfortable, practical and long-term sanitation solution; a will to prepare for the arrival of the municipal sewage system

Barriers: lack of funding

Tipping point: no identified tipping point

6.3.6 Interviewee F

Interviewee F lives together with the interviewee's elderly parents. Five years ago Interviewee F settled permanently in the Study Area and at around the same time, the Settlement Community Organisation made a decision that all families must have some kind of sanitation solution on their plot. The house was in the family's possession for a few years before Interviewee F settled permanently and during that time, Interviewee F practised open defection when visiting.

Interviewee F is of the opinion that a sewage system is a basic service and that a bathroom is a fundamental facility in a household. Thus, Interviewee F has constructed a bathroom with WC and shower. The toilet is connected to an improved pit, which Interviewee F has constructed with bricks. Every month Interviewee F disposes lime in order for the content of the pit to settle. Interviewee F estimates that the pit will get full after approximately six years of use. Then, Interviewee F will cover the current one as the walls are too weak and will probably collapse if the pit is being emptied. Thereafter, Interviewee F will construct a new pit, which will be able to be emptied. Interviewee F is content with the current sanitation solution. However, Interviewee F says that the politicians do not understand that the people need piped water and sewage systems, but focus on their own interests instead. Interviewee F could consider to get organised in order to get piped water and sewage systems to the

settlement. However, Interviewee F is not interested to get organised if it would imply giving politicians an opportunity to stuff more money into their private pockets.

Interviewee F finds open defecation to be uncomfortable due to presence of snakes and scorpions, and moreover, states that it is unhygienic. Interviewee F has been to military school for two years and was taught how to build pit latrines. Interviewee F is of the opinion that a minimum time of education is needed, in order to know how to interact with the environment and how to avoid contamination. Moreover, Interviewee F says that peoples' habits concerning sanitation are connected to where they come from. Interviewee F is the only interviewee who clearly states that open defecation contaminates the environment.

Drivers: considers basic sanitation to be fundamental for a household, dangers such as snakes and scorpions, the Settlement Community Organisation's decision, a desire for something more comfortable

Barriers: no identified barriers

Tipping point: settled permanently in the Study Area

7 Analysis and discussion

The results from the previous chapter and the studied literature are analysed throughout different sections, focusing on the research questions. An overview of the factors related to the implementation of improved sanitation among the six interviewees with which in-depth interviews were conducted, are presented in Table 7.1.

Table 7.1 Factors related to the interviewees' (A to F) implementation of improved sanitation (where information is lacking, the cell is marked with grey)

		Interviewee A	Interviewee B	Interviewee C	Interviewees D	Interviewee E	Interviewee F
External support		PROCASHA and sons	Adult son	None	Interviewee D's father	Hired work force	None
Financing		PROCASHA provided some material and opportunity to loan money. A son gave Interviewee A some cement	Savings	Saved some money from the household income	Salary	Mother's salary	
Drivers	***Manifest***	Safety, comfort, social pressure	Smell, cleanliness and hygiene	Need, safety, smell, comfort	Aesthetics, comfort, cleanliness and hygiene, functionality	Comfort, cleanliness and hygiene, functionality, durability	Comfort, regulation, safety, need
	Latent	Habit, children		Children	Habit, children, smell, durability	Habit, knowledge	Knowledge
	General		Safety				Education, regulation
Barriers	***Manifest***	Economy, lack of knowledge, ground conditions	Housing situation	Ground conditions, economy	Economy	Economy	
	General				Economy	Lack of knowledge	Lack of knowledge
Tipping point		External support	Close encounter with snake	Changed ground conditions	Previous unimproved pit was filled up		Settled permanently in the Study Area

In Table 7.1, drivers and barriers have been divided into *manifest*, *latent* (only drivers) and *general*. A *manifest* driver or barrier is individual and has been clearly stated by the interviewee during an interview or conversation. A *latent* driver is also individual but in contrast to a manifest driver, a latent driver is not clearly stated by the interviewee. Hence, identifying latent drivers has been a process of reading between the lines while analysing the interviews. No latent barriers were identified during the study. Furthermore, some interviewees have mentioned drivers and barriers they think are more or less *general* in the Study Area but do not necessarily affect the interviewee who mentioned it.

The interviewees did not talk in terms of improved and unimproved sanitation. However, when talking to them about their current and desired sanitation solutions, we have been able to categorise these according to the definitions by the World Health Organization and UNICEF (2013).

When asking the interviewees with unimproved sanitation how and why they had implemented their current sanitation solution, they talked more about why they had *not* constructed a bathroom and some kind of *improved* sanitation. Moreover, the interviewees using unimproved pit latrines or practising open defecation, considered those solutions being temporary and undesired. Some interviewees, for example, was waiting for the municipal sewage system while most of the interviewees with unimproved sanitation wanted another kind of solution while waiting but did not have the possibility to construct one. Pour-flush toilets connected to an improved pit or septic tank was generally considered being the second best solution, compared to a sewage system. In addition, the MDG target concerning sanitation is about increasing the coverage of improved sanitation. Hence, the following sections, except 7.1, are focusing on the implementation of, and factors influencing the choices and decisions concerning the implementation of improved sanitation.

7.1 Sanitation practices in the Study Area

Out of the 14 interviewees, nine have improved sanitation, see Figure 7.1. The most common improved solution, used by seven households, is a pour-flush toilet connected to an improved pit while two households have their pour-flush toilets connected to septic tanks. Among the interviewees with unimproved sanitation, unimproved pit latrine is the most common solution. Only one interviewee lacks sanitation on own plot and hence, practises open defecation. However, one interviewee who has an unimproved pit latrine regularly practises open defecation anyhow.

As stated earlier, most of the interviewees have improved sanitation. However, many of the interviewees told us that the majority of the people living in the Study Area have not. When we asked people living in the Study Area for an interview, most of them said no. There can be various reasons for their unwillingness to participate. For example, we were told by our interpreters that sanitation and money are sensitive subjects to talk about. Hence, finding interviewees willing to talk about sanitation might have been difficult due to the sensitive topic of our study. Moreover, why most of the interviewees have improved sanitation may be that the ones who had been able to construct an improved pit connected to a pour-flush toilet, were perhaps proud rather than embarrassed to talk about sanitation. We noted that most of our interviewees lived in houses constructed by bricks whereas most of the people who had houses constructed by adobe declined our request for an interview. As bricks are more expensive than adobe, there is reason to believe that the households with the

lowest income are not represented in the study. This can explain the, according to the interviewees, not fully representative result.

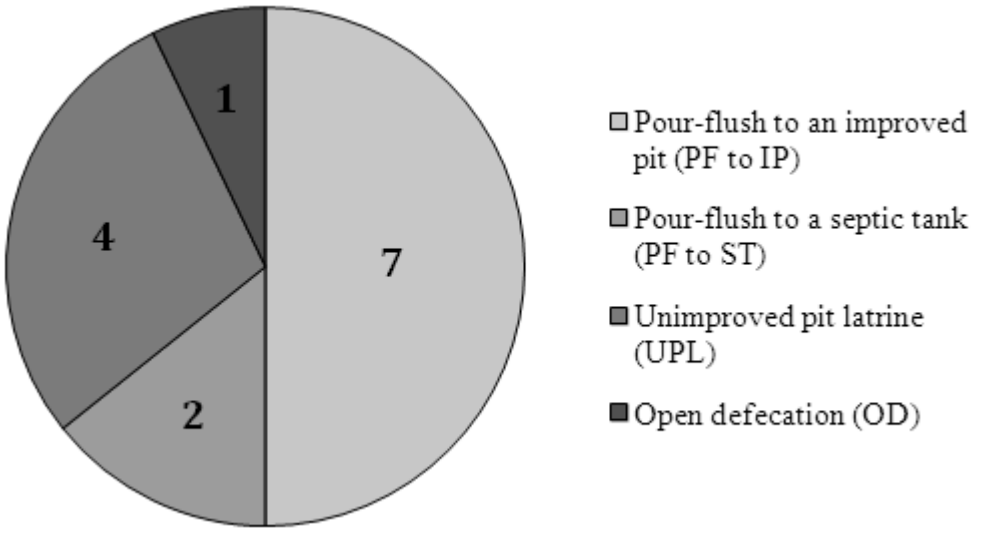

Figure 7.1 The distribution of different sanitation solutions among the 14 interviewees

The interviewees who had unimproved sanitation and agreed to be interviewed might have wanted us, and the readers of this report, to know about their situation. During the interviews, they emphasised the difficulties and inconveniences with unimproved sanitation and explained why they could not implement other solutions. Hence, talking to us and hoping to get help implementing a more convenient and comfortable sanitation solution, or getting the attention of the municipal government which might result in a sewage system, could be an incentive to talk to us. However, in that case, that incentive seems to have been subordinate to the embarrassment letting us know about their sanitation or talking about the topic.

If true as the interviewees state, that most people in the Study Area do not have improved sanitation, what might the reasons be? Firstly, the fact that the settlement is inhabited by low-income families might be one reason. Moreover, it is generally the men who make the decisions about investments. However, the men generally spend most of the day out of home due to work. Hence, it is women and children rather than men who are the most frequent users of the sanitation at home. In other words, the ones making the decisions about sanitation, is not the family member mostly affected by the sanitation situation at home.

Another reason for the stated low coverage of improved sanitation in the Study Area might be insufficient information from the municipality, considering their plans for extension of the sewage system in the city. Rumours spread fast in the Study Area and affect the decisions people make and do not make about sanitation. For example, Interviewee A chose to construct a new, smaller pit after seeing a stranger measuring the topography in the area and heard a neighbour saying that the sewage system will soon reach the Study Area. Now, the interviewee has to empty the pit often which implies that the yearly sanitation cost is much higher than it would have been with a larger pit. Moreover, if the income is low and economical margins small, spending money on constructing an improved pit when believing that the municipal sewage system will reach the Study Area soon, may seem to be a waste of money.

7.2 Factors affecting the decisions to implement improved sanitation in the Study Area

The drivers and barriers identified during the interviews and analysis of the same and the literature, are compared. The reasons why some drivers and barriers are identified in both this study and the literature while others do not, are discussed. Moreover, during the interviews, we identified certain events and situations which made the interviewees make the final decision to implement improved sanitation. We chose to denote those *tipping points* and define them as *a certain event or situation which enables the potential adapter to overcome the barriers* or *"the straw that broke the camel's back"*.

7.2.1 Drivers

The drivers identified during the interviews were mostly of private character in such as they derive from private desires rather than societal benefits. This finding is in line with the study of Nelson and Murray (2008). However, the regulation by the Settlement Community Organisation is a driver related more to societal benefits than personal desires. All, throughout this Master's Thesis, identified drivers are presented in Table 7.2.

The most frequently mentioned drivers for implementation of improved sanitation were cleanliness and hygiene, followed by dangers associated with open defecation, smell and children, see Table 7.1. Other drivers mentioned by more than one interviewee were comfort and convenience. Moreover, factors such as social disapproval for open defection, aesthetics and risk for flooding were mentioned by one interviewee as well as preparation for the future and the perception of sanitation being fundamental for a household.

Table 7.2 Drivers identified in the studied literature as well as during interviews, both individual and general, manifest and latent

Drivers		**Interviewees**	**The studied literature**
Category			
Prestige	Habit	A, D, E	Jenkins and Curtis (2005), O'Loughlin et al. (2006)
	Social pressure[75]	A	Jenkins and Curtis (2005), O'Loughlin et al. (2006)
	Increased social status		Jenkins and Curtis (2005)
	Post-mortem status		Jenkins and Curtis (2005)
Well-being	Safety[76]	A, B, C, F	Jenkins and Curtis (2005)
	Convenience	A, D	Jenkins and Curtis (2005), Rodgers et al. (2007)
	Comfort	E, F	Jenkins and Curtis (2005)
	Cleanliness and hygiene	B, C, D, E	Jenkins and Curtis (2005), O'Loughlin et al. (2006), Rodgers et al. (2007)
	Health benefits		O'Loughlin et al. (2006), Rodgers et al. (2007)
	Smell[77]	B, C	

[75] Social pressure includes avoiding embarrassment
[76] Avoiding dangers associated with practising open defecation
[77] Smell from unimproved sanitation, both unimproved pit latrines and the place for open defecation

	Privacy		Jenkins and Curtis (2005)
	Supernatural dangers		Jenkins and Curtis (2005)
Situational	Ease restricted mobility	A	Jenkins and Curtis (2005)
	Increase rental income		Jenkins and Curtis (2005)
	Risk for flooding of unimproved pit latrine	D	
Other	Migration and travel		Jenkins and Curtis (2005)
	Education and knowledge	E, F	Jenkins and Curtis (2005), O'Loughlin et al. (2006)
	Children	A,C,D	
	Aesthetics	D	
	Durability	D,E	
	Perception that improved sanitation is fundamental for a household	D, F	
	Regulation	F	

7.2.1.1 The most common drivers among the interviewees

Safety is one of the most commonly identified drivers among the six interviewees, A to F, along with *cleanliness and hygiene*, see Table 7.2. As in the study by Jenkins and Curtis (2005) the interviewees talk about the dangers associated with practising open defecation, such as snakes, scorpions, insects and violators. In addition, safety seems to be a general concern in the Study Area as it is considered dangerous walking in the settlement after dark, not only related to open defecation. However, walking alone after dark should be avoided in the more central parts of Cochabamba as well, and might not be specific for the Study Area. However, in the study by Jenkins and Curtis (2005), illness due to infectious diseases was identified as a, by the interviewees perceived, danger associated with open defecation. This is not mentioned by the interviewees in this study. In fact, health in relation to sanitation is not mentioned by any interviewee. See more about health in section 7.2.1.3.

Three out of the six interviewees, Interviewees A, C and D, have young children and all three talk about safety for the children, rather than safety for themselves when describing why they have chosen to implement improved sanitation. Moreover, safety is mentioned by most of the interviewees in this study, but not at all in the studies by O'Loughlin et al. (2006) and Rodgers et al. (2007). However, their studies were focusing more on the advantages and disadvantages of latrine use rather than specifically drivers and barriers for the implementation as in this study and the study of Jenkins and Curtis (2005).

Cleanliness and hygiene generally seems to be important among the interviewees. Laundering and thorough personal hygiene is performed regularly, despite the limited supply of water. Corresponding to these findings, the studies by Jenkins and Curtis (2005), O'Loughlin et al. (2006) and Rodgers et al. (2007), identified cleanliness and hygiene as one of the most common drivers as well. Moreover, among the participants in the study by Jenkins and Curtis (2005), cleanliness and hygiene was considered more important when raising children.

Among all interviewees, 1 to 8 and A to F, *habit* seems to be a driver for implementing improved sanitation even though not clearly stated by the interviewees. However, most of the interviewees who have improved sanitation in the Study Area,

had improved sanitation where they lived before, see Figure 7.2. Moreover, habit does not have to concern previous sanitation solutions in the household at current or previous location. It can also be a matter of other experiences of improved sanitation (Jenkins & Curtis, 2005; O'Loughlin, et al., 2006). For example, if spending much time, due to e.g. work, school or visiting friends, in other parts of the city where there is a sewage system, an individual might get used to improved sanitation. In that case, dissatisfaction with the unimproved sanitation at home might evolve. For example, sanitation has proved to spread faster in areas closer to towns and especially along roads (O'Loughlin, et al., 2006). Hence, *migration and travel* is probably influencing the experiences and thus, the habit.

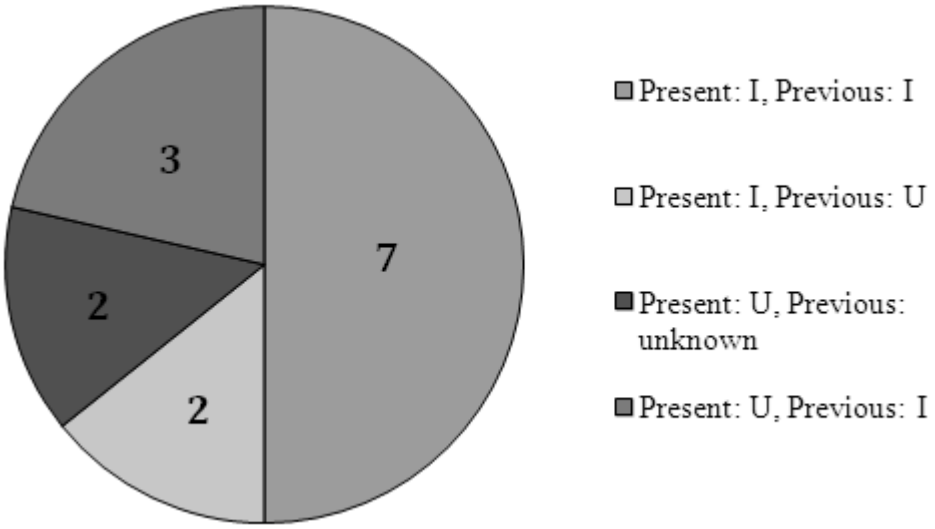

Figure 7.2 Sanitation solutions at previous location, compared to present solution among the 14 interviewees: *I = improved sanitation, U = unimproved sanitation*

More than being a driver for implementation of improved sanitation, *habit* might also be a barrier if it implies unwillingness to implement other improved sanitation options than the one related to the habit. In other words, habit can create lock-in (Unruh, 2000; van Vliet, et al., 2011) in terms of lack of imagination (Mara, 2008). For example, among the six interviewees, A to F, only Interviewee C considered another sanitation option than a pour-flush toilet connected to an improved pit or septic tank. Hence, for Interviewee C, habit can be considered being a driver for the implementation of a pour-flush toilet connected to an improved pit, yet a barrier for implementing EcoSan and other alternatives. Moreover, Interviewee E has been involved in projects where toilets were implemented in schools. According to Interviewee E, the children who were not familiar with using WCs destroyed them until they consisted of a hole, more looking like a squatting toilet.

As mentioned above, safety for *children* was a frequently mentioned reason for the implementation of improved sanitation among all interviewees and furthermore identified as a driver in the study by Jenkins and Curtis (2005). Moreover, another driver mentioned by Interviewee A and Interviewees D, is *convenience* for their children. Hence, implementing improved sanitation for the sake of children seems to have been common among the interviewees even though other drivers were identified as well. In line with this, children as drivers for implementation of improved sanitation have been identified in the study by Jenkins and Curtis (2005). Or, maybe the children are rather enhancers of other drivers in their as well as in our study.

However, without children in the household, the implementation might not have been realised until much later. Hence, among the interviewees with children in the Study Area, *children* could be considered as drivers for implementation.

7.2.1.2 Other drivers identified among the interviewees

Social pressure concerning open defecation seems to exist in the Study Area. This analysis is made due to the stated embarrassment of showing guests to the slope. Other reasons for this conclusion are the mockery of Interviewee A's children and the *regulation* instituted by the Settlement Community Organisation which implies that each household must have some kind of sanitation on the plot. Yet, that regulation does not discriminate between unimproved and improved sanitation. The embarrassment, the mockery and the reason for the regulation are factors related to the social disapproval of open defecation.

According to the studied literature, other drivers can be related to social pressure. For example, *cleanliness and hygiene* in association with sanitation might be influenced by the *social pressure* to be clean and hygienic in general (Jenkins & Curtis, 2005; O'Loughlin, et al., 2006). Moreover, when the number of people with the habit and experience of improved sanitation increases in an area, the requirements of what is adequate sanitation might shift from unimproved to improved (O'Loughlin, et al., 2006). Hence, the acceptance for unimproved sanitation solutions might decrease. This can happen in the Study Area if, for example, the smell from the unimproved pit latrines continues to cause dissatisfaction among the neighbours with improved sanitation. In that case, the social pressure might affect the use of unimproved pit latrines as well, and hence, might increase the number of households with improved pit latrines.

Comfort is a driver mentioned by Interviewee E and Interviewee F who both have bathrooms with WCs. Both of them have elderly parents living with them. Hence, comfort can be related to not having to squat. Furthermore, it can be the comfort of not having to go outside to an unimproved pit latrine as Interviewee E had before, or leaving the plot in order to practise open defecation as Interviewee F had to do before constructing the bathroom. Moreover, comfort can be related to *smell* as in the studied literature (Jenkins & Curtis, 2005; Rodgers, et al., 2007).

Smell has been identified during this study as a driver for implementing improved sanitation. The interviewees deal and have dealt differently with smell. Interviewee B, bothered by the smell from the own unimproved pit latrine, dealt with the problem by sometimes practising open defecation in the slope below the Study Area. On the other hand, Interviewee C who practises open defecation in the slope, finds the smell in the slope to be unpleasant but have not until recently been able to start the construction of an improved pit. Hence, the discomfort from the smell has not, by itself, been a driver strong enough for Interviewee C to overcome the barriers. Moreover, Interviewees D who were bothered by the smell from their neighbours' unimproved pit latrines, cannot do much about it. In general, a pour-flush toilet with a water seal and an offset pit, see Figure 4.9, can decrease the smell (The World Bank, 2013; World Health Organization & UNICEF, 2013). As mentioned above, if dissatisfaction spread among the neighbours due to unpleasant smell from unimproved pit latrines, this might create *social pressure* to implement improved sanitation among the inhabitants in the Study Area.

Even though smell has been a driver among the interviewees in this study and in parts of the studied literature (Jenkins & Curtis, 2005; Rodgers, et al., 2007), it has also

been identified as a disadvantage with improved pit latrines in some studies (Jenkins & Curtis, 2005; Rodgers, et al., 2007; WaterAid, 2009). However, those studies concern improved pit latrines which do not have a water seal, see Figure 4.6, while the improved sanitation solution among the six interviewees, A to F, in this study are pour-flush toilets connected to offset, improved pits or septic tanks.

Interviewees E and F talk about *education* and *knowledge* as important drivers for implementation of improved sanitation. Interviewee F argues that an individual must have a minimum level of education and know about the importance of sanitation in order to implement it. Moreover, Interviewee E states that money is important, but not sufficient for the implementation of improved sanitation. Without knowledge, there will be no demand. In contrast, Interviewee A has chosen to construct a pour-flush toilet connected to an improved pit without mentioning drivers related to knowledge. However, Interviewee A reports lack of knowledge concerning construction of a bathroom as a barrier for implementation and not until PROCASHA offered assistance, the construction could be realised.

Interviewees B, C, D and E have stated *cleanliness and hygiene* as drivers for their implementation, which might derive from knowledge about hygienic benefits with improved sanitation. On the contrary, no interviewees mention health benefits with improved sanitation in comparison to unimproved. Hence, the perception that improved sanitation is more hygienic might rather be a matter of relating cleanliness and hygiene without further knowledge and scientific definitions of what *hygienic* means. Hand-washing in connection with defecation has not been observed in the Study Area. Neither have hand-washing facilities. In other words, Interviewees B, C and D have probably implemented improved sanitation without knowledge about the scientific[78] benefits. Moreover, Interviewee F, who talks about the importance of *education* and *knowledge*, does not mention *cleanliness and hygiene* as benefits with improved sanitation. Instead, Interviewee F emphasises that open defecation contaminates the environment.

The *perception of improved sanitation as something fundamental to a household* is clearly stated by Interviewee F. Hence, as the interviewee addresses the significance of knowledge about the importance of sanitation, these two drivers can be considered to be related. However, Interviewees D clearly considered improved sanitation to be a fundamental part of a household, yet did not mention knowledge nor expressed anything except personal reasons for implementation such as *aesthetics*, *comfort* and *cleanliness and hygiene*.

The reason why *aesthetics* is only mentioned as a driver by Interviewee D, might be that aesthetics is subordinate to economical possibilities. In other words, the inhabitants in the Study Area cannot afford to be selective.

Interviewee E has consciously constructed the bathrooms in order to enable connection to the municipal sewage system without reconstruction. The reason is a desire for a long-term and *durable* sanitation solution. Moreover, the septic tank is made of reinforced concrete and Interviewee E estimates that it will hold for at least 20 years. Interviewees D experienced how their unimproved pit latrine *flooded during the rainy season* and when it got full, they constructed the bathroom and the improved pit. This can be considered being related to the desire of a durable solution. However, Interviewees D gave the impression that their intention from the beginning was to

[78] Such as health and environmental benefits

implement improved sanitation and that the unimproved pit was used while waiting for possibility to construct the other solution. Hence, their choice was probably more influenced by other drivers.

7.2.1.3 Drivers identified in literature but not among the interviewees

Health benefits were identified as drivers for latrine adoption in the study by Rodgers et al. (2007). Moreover, the interviewees in the study by Jenkins and Curtis (2005) considered illness due to infectious diseases being a danger related to open defecation (Jenkins & Curtis, 2005). None of the interviewees in our study, mention health as a driver for implementation of improved sanitation. If this implies that the interviewees do not connect health and sanitation, or if it is because of how the interviews were conducted, is not clear. However, hand-washing in connection with defecation was not observed in the Study Area and neither were hand-washing facilities. The respondents in the study of Rodgers et al. (2007) had been participating in latrine promotion programs and health volunteers were working in the districts during the time of the study, which may have influenced the perception of health as a driver for improved sanitation. The interviewees in this study and the study by Jenkins and Curtis (2005) had not.

Even though *migration and travel* is not mentioned by the interviewees in our study, it is identified in the studied literature (Jenkins & Curtis, 2005; O'Loughlin, et al., 2006). However, it can be considered influencing the experience of possible adopters and hence their *habits*. Moreover, *migration and travel* can impose diffusion of *knowledge* about different sanitation options and *social pressure* (O'Loughlin, et al., 2006).

Some cultural-religious drivers are identified in the study by Jenkins and Curtis (2005). Neither are they identified in the other studies, or in this. However, social pressure can be argued to derive from certain culture-specific perceptions of what is to be socially accepted but the ones found in this study could probably be found in other cultural contexts and other parts of the world as well. In Sweden for example, there are regulations on how to dispose and treat human excreta and it would not be surprising if mockery occurred if someone disregarded those regulations.

7.2.2 Barriers

All, throughout this Master's Thesis, identified barriers are presented in Table 7.3. The most commonly mentioned barriers are lack of funding and lack of knowledge. Other barriers, identified during the interviews, are difficult ground conditions, lack of space and the uncertain housing situation due the informal status of the settlement.

Table 7.3 Barriers identified in the studied literature and during interviews, both individual and general

Barriers	Interviewees	The studied literature
Lack of funding	A, C, D, E	WaterAid (2009), Jenkins and Curtis (2005)
Lack of manpower		O'Loughlin et al. (2006)
Lack of time		O'Loughlin et al. (2006)
Smell from latrines		WaterAid (2009) Jenkins and Curtis (2005) Rodgers et al. (2007)

Maintenance need	C[79]	WaterAid (2009) Rodgers et al. (2007)
Safety issues concerning the construction		WaterAid (2009) Jenkins and Curtis (2005)
Lack of space	C	
Ground conditions[80]	A, C	WaterAid (2009) Jenkins and Curtis (2005)
Unavailable or complex technical devices		Jenkins and Curtis (2005)
Lack of knowledge	A, E, F	O'Loughlin et al. (2006)
Uncertain housing situation	B	
Lack of interest		WaterAid (2009)

7.2.2.1 Barriers among the interviewees

Lack of funding is the most commonly mentioned barrier among the interviewees as well as in the studied literature (Jenkins & Curtis, 2005; WaterAid, 2009). The interviewees have low or very low income and thus, their economical margins are small. Hence, lack of funding being the most frequently mentioned barrier might not be very surprising. Moreover, other literature about diffusion of sanition in developing regions adresses that cost is the key criterion when choosing sanitation solution (Mara, 2008) and that people with low income seldom get financial support from lending institutions such as banks or cooperatives (Mara, 2008; Banerjee & Duflo, 2011). In contrast, Interviewee A got support from PROCASHA and Interviewee C had contact with an NGO willing to donate an EcoSan toilet if the interviewee performed the construction work for the superstructure and pit. However, Interviewee C hesitated and the NGO left the Study Area when they could not find the minimum of five participating households they needed in order to go through with the project.

The statement of Mara (2008), that cost is the key criterion when choosing sanitation solution can be discussed. Many interviewees say that their choice of sanitation solution is based on their economic situation. Interviewees D state that people who have more money have possibility to design their bathrooms as they wish. However, if money would be the strongest factor influencing the choice and implementation of sanitation solutions, it could be assumed that people would not implement any sanitation solution more expensive than the cheapest alternative, i.e. open defecation or unimproved pit latrine. Still, a majority of the interviewees, 1 to 8 and A to F, have or are about to get improved sanitation. Thus, the benefits of investing in sanitation seem to be super-ordinate the cost. In contrast to the statement of Mara (2008), this is not the key criterion in this case.

Among many of the interviewees, lack of funding seems to be more a matter of prioritising. For example, Interviewees D with a monthly household income of approximately 1200 Bs (~1200 SEK) to support six household members, implemented improved sanitation six months after settling in the Study Area, see Table 6.2. Interviewee A, on the other hand, practised open defecation for eight years before constructing the bathroom and the improved pit despite a monthly household income of approximately 2100 Bs to support five household members. Moreover, Interviewee C has a household income of 2250 Bs per month and they are four people living in the house. Yet, the family has used unimproved sanitation for nine years, lately open

[79] When talking about EcoSan
[80] Hard or unstable ground

defecation. However, Interviewees D have better ground conditions which enable digging by hand. Perhaps it is not all about prioritising; some barriers might be more difficult to overcome than others.

O'Loughlin et al. (2006) identified *lack of time* being a barrier for the implementation of improved sanitation. However, *lack of time* can be argued to be related to economy, at least in a low-income context. Staying at home to construct an improved pit, implies lost opportunity for income. Moreover, if the economical margins are small, one day without income can impose more severe consequences than for a person with higher income and better margins (Banerjee & Duflo, 2011). Hence, we argue that constructing an improved sanitation solution imposes direct costs for material as well as indirect costs related to lost opportunity for income. The common practice in the Study Area and other low-income contexts (Banerjee & Duflo, 2011), of constructing little by little might be a result of those indirect costs. In other words, it is more common to construct after work rather than staying at home and construct more effectively during a shorter period of time. Note that people in low-income areas often work six days a week or even more (Banerjee & Duflo, 2011).

Another barrier, identified in the study of O'Loughlin et al. (2006), is *lack of manpower*. However, we argue that this barrier as well, is strongly related to economy. For example, out of the six interviewees, A to F, only Interviewee E spent money on external workforce. Interviewee A got support from PROCASHA and stated that without their help, the bathroom would not have been constructed. If having the economical possibility, external workforce can be hired and the barrier be overcome. In the Study Area on the other hand, Interviewees A, B and D got construction help from family members.

As mentioned earlier, knowledge might be a driver for implementation of sanitation. However, *lack of knowledge* has by three interviewees been stated as a barrier for implementation of improved sanitation. Interviewee A says that lack of construction knowledge was one of the factors hindering the family from constructing a bathroom and an improved pit. In line with that, Interviewee F who possesses that knowledge due to the architectural education and former involvement in municipal projects concerning sanitation agrees. This interviewee states that knowledge is at least as important as funding when it comes to construction of improved sanitation. It does not matter if a person has the money if the knowledge is lacking. O'Loughlin et al. (2006) have drawn similar conclusions. However, we argue that construction skills can be bought for money in terms of external work force. Moreover, it can be argued that if a person possesses the knowledge, yet lack funding, the improved pit will not be constructed anyhow. However, if the knowledge exists, a person might be more motivated to save money in order to realise the construction.

As money is generally scarce in the Study Area, construction knowledge seems to be important. If lacking knowledge, people need to spend money on skilled workforce, money that most of the people do not have. On the other hand, if the knowledge exists, the construction work requires time. Consequently, time spent on constructing implies missed opportunity for income. Hence, constructing costs, regardless of who performs the work. However, doing it by oneself is probably cheaper than hiring external workforce. The cheapest alternative might be exchange of services and/or collaboration.

Due to the informal status of the Study Area, *the housing situation has been uncertain*. Many have mentioned this during both interviews and informal

conversations even though Interviewee B was the only one to clearly state it to be a barrier for construction. In addition, due to the uncertain housing situation, there might be a general resistance among the inhabitants in the Study Area to invest money in a house one might not be able to keep. Especially if the income is low and margins are small. Moreover, economy is related to the housing situation as the Study Area is inhabited by low-income families only. People with higher income do generally not live in these kinds of settlements.

Another barrier stated by some of the interviewees, and further found in the studied literature, was *difficult ground conditions* (Jenkins & Curtis, 2005; WaterAid, 2009) In the Study Area, this signifies hard soil which at some places is almost impossible to dig by hand. For example, Interviewees A and C were not able to dig by hand and Interviewee C hired and excavator which made the hole for the pit. However, the main purpose for hiring the excavator was a reconstruction of the house which required excavation of a steep slope on the plot. While the excavator was there, Interviewee C used it for the pit as well. However, hiring an excavator solely for digging a pit, would imply a very high cost. Such an expense can be considered to be economically justifiable in connection to a more extensive construction, such as a house. However, it might be a far too high cost for a small pit. Interviewee C had for example wanted to implement improved sanitation, yet due to the hard ground and *lack of space* on the plot, the implementation could not be realised until hiring the excavator. By excavating the steep slope, the plot got more space suitable for construction. Hence, both barriers could be overcome at the same time. If there would be more collaboration among the inhabitants in the Study Area, the difficult ground conditions might be possible to overcome by sharing the cost for bringing an excavator and let it dig many pits at once.

Maintenance need for pit latrines were identified as barriers in the studies by Rodgers et al. (2007) and WaterAid (2009). None of the interviewees in this study talked about maintenance of pit latrines as a hinder for implementation of improved sanitation. However, Interviewee C was intimidated by the perceived increased maintenance work with EcoSan compared to a pour-flush toilet connected to an improved pit or septic tank. Hence, need for maintenance might be a factor many potential adopters consider when choosing sanitation solutions. The rather frequent occurrence of pour-flush toilets and improved pits among the interviewees in the Study Area might imply that the maintenance need for such a solution is commonly known among the inhabitants.

7.2.2.2 Barriers identified in literature but not among the interviewees

WaterAid (2009) identified *lack of interest* being a barrier for implementation of improved sanitation. The interviewees, 1 to 8 and A to F, in our study do generally not lack interest. Only one, Interviewee 5, is content with the unimproved pit latrine and the rest of the interviewees desire a sewage system. However, most of the interviewees in this study have improved sanitation. Hence, by implementing improved sanitation, the interviewees have shown that they do *not* lack interest. It might have been different if we had had the opportunity to talk to more people with unimproved sanitation, and especially families practising open defecation.

In contrast to the studies by Jenkins and Curtis (2005), Rodgers et al. (2007) and WaterAid (2009), none of the interviewees in the Study Area mentions *smell* as a barrier for implementation of improved sanitation. Interviewee B did, however, sometimes practise open defecation despite having an unimproved pit latrine on the

plot, due to the unpleasant smell from the pit. The smell from the unimproved pit, became a driver for the construction of improved sanitation. In addition, neither *unavailable or complex technical devices* (Jenkins & Curtis, 2005) or *safety issues concerning the construction* (Jenkins & Curtis, 2005; WaterAid, 2009), could be identified as barriers for implementation of improved sanitation among the interviewees.

7.2.3 Tipping points

We did not look for tipping points from the beginning. Yet, during the interviews, we identified certain events and situations which had a direct impact on the interviewee's final decision to implement improved sanitation. We chose to define tipping point as *a certain event or situation which enables the potential adapter to overcome the barriers* or "*the straw that broke the camel's back*". Among the six interviewees, A to F, Interviewee E is the only one for which we have not been able to identify a tipping point.

The tipping points seem to be very individual. Hence, comparisons are difficult to make. However, in the case of Interviewee A, the tipping point is directly related to the barriers. As economy is the most commonly mentioned barrier identified in the Study Area and related to other barriers, *financial support* can be considered being a tipping point of great importance. Hence, if more households would be given that opportunity, more people might benefit from improved sanitation. However, the other identified tipping points in the Study Area seem to be more of "*the straw that broke the camel's back*".

7.2.4 Correlation between drivers, barriers and tipping points

Interviewee A assigns lack of funding, lack of knowledge and difficult ground conditions as barriers for implementation of sanitation. When the interviewee got support from PROCASHA, considering both knowledge and funding, the construction of the bathroom started. Hence, the tipping point, *external support*, is directly related to the barriers as it meant that the interviewee got help overcoming them. The drivers were not sufficient to overcome the barriers without support. In other words, the barriers were stronger than the drivers. For example, the ground was too hard for Interviewee A to dig a pit by hand. Moreover, the interviewee could not alone finance the construction or the work force. No matter the desire for safety, comfort and avoidance of embarrassment; without support, the barriers were not possible to overcome.

Interviewee B mentioned the uncertain housing situation as the main barrier to implement a more permanent solution. After approximately seven years of using an unimproved pit latrine and sometimes practising open defecation, a close encounter with a large snake made the interviewee decide to construct a bathroom. Hence, the tipping point was *safety* related. The interviewee desired a sanitation solution emitting less smell and being cleaner and more hygienic than the unimproved pit. The tipping point is thus neither directly related to drivers nor barriers. However, this incident had such an impact that it became super-ordinate both the drivers and barriers.

Interviewee C assigns lack of space, as well as difficult ground conditions as barriers for constructing an improved pit. As they *hired an excavator* to adjust their plot, they gained more space and could, due to the excavator, overcome the barriers concerning the ground conditions and lack of space. Further, Interviewee C mentions lack of funding as another barrier. The direct relation between the tipping point and the

barrier seems to consider the ground conditions. However, even though Interviewee C and the family could afford hiring an excavator, there is reason to believe that their low income implies that they only had funding to hire it once. Hence, the digging of the pit had to wait until they had the funding and possibility to begin with their more extensive project on adjusting the slope in order to enable the reconstruction of their house. As previously mentioned, see section 7.2.2.1, the expense of hiring an excavator might be considered being economically justifiable for a house, but not for a pit. Moreover, their plan to excavate the slope might have hindered a prior construction of a pit latrine as it would have had to be moved or destroyed later on. Hence, the economic barrier seems to be super-ordinate the ground condition related barrier and hence, indirectly also the barrier concerning lack of space.

Interviewees D used an unimproved pit latrine for about six months before it flooded and got filled up and they started to construct an improved pit. Hence, the *flooding* and the *pit being filled up* is the tipping point. They have also, similar to other interviewees, assigned lack of funding as their main barrier for implementation. However, despite that and also the fact that Interviewees D have one of the lowest household income, they did implement the improved pit and constructed the bathroom. Hence, the desire for a sanitation solution with higher comfort, cleanliness and hygiene, especially for the sake of their children, were stronger than the barrier. The tipping point is thereby more related to the drivers.

Interviewee E did not directly mention a tipping point or an isolated event that could be interpreted as being crucial for making the decision to implement improved sanitation. However, the interviewee mentions functionality and durability as drivers in addition to comfort, cleanliness and hygiene. Before the construction of the improved sanitation solution began, Interviewee E and the family used unimproved pit latrines and the interviewee said that they wanted a more practical solution. Interviewee E is convinced that the municipality will provide the Study Area with sewage system within a near future. Hence, the sanitation solution is constructed in order to make it possible to connect to the sewage system without further adjustments. Apparently, the lack of funding was subordinate to the strive of having a more long-term solution.

Interviewee F assigned *settling permanently in the Study Area* to be the point at which the final decision to implement an improved sanitation solution was made. Interviewee F has not mentioned any barriers for implementation, but stated that improved sanitation is fundamental for a household. Hence, the improved pit was constructed as soon as settling permanently in the Study Area. Moreover, the interviewee mentioned the decision made by the Settlement Community Organisation which implies that all households must have a sanitation solution on their plot. However, this decision does not seem to have influenced Interviewee F, yet the interviewee thinks that this decision might be a driver for other households. Interviewee F's perception of sanitation being fundamental is super-ordinate other factors.

7.3 Implementation of improved sanitation in the Study Area

Interviewee A practised open defecation for 8 years before constructing the current sanitation solution. The children were mocked and got stones thrown at them while practising open defecation. Having a monthly household income of approximately

2100 Bs to support five household members, Interviewee A could not afford sanitation before the family was provided external support from PROCASHA. In comparison with Interviewees D, which have an household income of approximately 1200 Bs per month for six persons in the household, Interviewee A started the construction after considerably longer time. Interviewees D, which constructed their improved sanitation solution six months after settling in the Study Area apparently prioritised the bathroom high enough to invest despite their, in comparison to Interviewee A, low income. However, Interviewee A mentions the hard ground being a barrier, difficult to overcome. Thus, the ground condition might be the reason why the construction of the improved sanitation solution has not been realised earlier.

The difficult ground conditions are also mentioned by Interviewee C, who is currently constructing a bathroom with a pour-flush toilet connected to an improved pit. The construction could begin after having an excavator on the plot. Since the ground conditions is mentioned to be a barrier for some interviewees and not mentioned at all by others, the conclusion is that the ground conditions vary within the Study Area, which was furthermore confirmed through observations. However, cooperating during construction could enable the inhabitants to overcome the barrier related to the difficult ground conditions. For example, several households could hire an excavator together which would probably lower the cost dramatically for each household compared to hiring it for one job at the time. However, this practice has not been identified in the Study Area. The families with the lowest income might not have the financial possibility anyhow. Collaboration in the Study Area primarily consists of family members helping to construct, providing knowledge and/or practical skills. Interviewee A lacked both knowledge and skills considering construction. The neighbour wanted to help by digging but was not able to manage the difficult ground conditions by hand. Interviewee A later got support from PROCASHA, but the children also helped. Other interviewees getting help from family members are Interviewee B, who got help from one of the adult sons and Interviewees D, getting construction support from the father.

People who lack knowledge, skills and possibility to get support from family members have to rely on external support, e.g. from NGOs or hired skilled workforce. Hiring external workforce requires money, something that people in the Study Area generally do not have in abundance. In Interviewee A's case, PROCASHA provided knowledge and funding, which enabled Interviewee A to realise the construction. Interviewee E hired skilled workforce to construct the bathrooms and the septic tank. However, at what cost and in relation to what income is not clear.

As previously stated, money is said to be a strong factor influencing the possibility to implement improved sanitation. In contrast, this does not seem to correlate in the case of Interviewee B. Interviewee B is economically supported by the adult children and has got a monthly income of approximately 1000 Bs. Despite this, the construction could start rather immediate when making the decision to implement. However, the interviewee had been living in the Study Area for seven years before the construction started. The reason for not constructing it earlier was, according to Interviewee B, the uncertain housing situation, which is the same for all households in the Study Area.

Interviewee C is constructing the sanitation solution little by little as there is money and material. The same pattern is stated by Interviewee E. Interviewee F started to construct the sanitation solution immediately after settling permanently in the Study Area, due to the regulation by the Settlement Community Organisation and the perception that sanitation is fundamental. Moreover, Interviewee F states that

practicing open defecation is unpleasant due to snakes and scorpions and also that it contaminates the environment.

7.3.1 Time living in the Study Area before implementing improved sanitation

When analysing the time each of the six interviewees, A to F, lived in the Study Area before implementing improved sanitation, in comparison to their monthly household income, there is no clear pattern, see Table 6.2. Interviewees D, with the lowest monthly household income compared to the number of household members, were the first ones to construct a bathroom and an improved pit. I contrast, Interviewee C who has the highest monthly household income was the last one to start the construction. Hence, implementation of improved sanitation can be considered a matter of prioritising rather than directly related to income. However, Interviewees A, B and C have more difficult ground conditions on their plots than Interviewees D. Consequently, they have needed external support for digging which implies a higher implementation cost. As the cost for hiring an excavator is unknown to us, further analysis is difficult.

Table 7.4 Current and previous sanitation solutions in relation to monthly household income (where information is lacking, the cell is marked with grey): *PF=pour-flush, ST=septic tank, IP=improved pit, UPL=unimproved pit latrine, OD=open defecation*

	Interviewee A	**Interviewee B**	**Interviewee C**	**Interviewees D**	**Interviewee E**	**Interviewee F**
Years in Study Area	9	9	10	10	8-10	5
Years with current solution	1	2	10	9,5	5	5
Monthly household income	2100 Bs	~1000 Bs	2250 Bs	~1200 Bs		
Household members	5	1	4	6	3	3
Current sanitation	PF to IP	PF to IP	OD. PF to IP under construction	PF to IP	PF to ST	PF to IP
Previous sanitation while living in the Study Area	OD	UPL and OD	OD	UPL	UPL	OD[81]
Sanitation at previous location	IPL			PF to IP	PF to IP	PF to IP

7.3.2 Constructing little by little

Generally in the Study Area, construction work is carried out during a longer period of time. Construction material is bought little by little as the households can afford it and there is supply. This goes for construction of improved sanitation as well. According to Banerjee and Duflo (2011), this practice is common in low-income

[81] Interviewee F did not permanently live in the Study Area during that time

contexts and can be a way of saving. Instead of saving in the bank, construction material can be bought and stored at home until it is time to use it. Interviewee B, for example, has a pile of bricks outside the house which is being reconstructed even though the construction is on hold at the moment. However, there are some disadvantages with this way of saving. For example, materials can become damaged if not stored properly. Moreover, not finished constructions might be damaged by weather. As discussed earlier, see section 7.2.2.1, constructing little by little might moreover be a result of the indirect costs related to lost opportunity for income if staying at home constructing. Interviewee A is an exception of this common practice as the bathroom was constructed rather effectively. However, Interviewee A got support from PROCASHA which the other interviewees did not.

7.3.3 Financing

Out of the six interviewees A to F, only Interviewee B stated that money was not an issue when making the decision to construct a bathroom. This interviewee, as well as Interviewee C, had savings to use for the construction, see Table 7.1. Among the rest of the interviewees, Interviewee A got external support consisting of a loan and some material while Interviewees D and E state that they used their household income. However, whether their sanitation solutions were constructed little by little as they had possibility to buy material and/or pay for workers, or if the money was saved and used all at once, is unclear. Mara (2008) claims that people seldom get financial support from lending institutions such as banks or cooperatives. Contradicting, Interviewee A got financial support as well as help with the construction of the bathroom. Whether more of the interviewees have applied for financing without receiving any support is unclear.

7.3.4 External support

Four out of the six interviewees, A to F, got some kind of *external support* for the construction of their improved pit latrines and bathrooms, see Table 7.1 and Figure 7.3. Interviewee E hired external workforce while Interviewees B and D got help from family members. Interviewee A got support from PROCASHA, both considering funding and construction competence. Moreover, the children of Interviewee A helped with the construction. Furthermore, Interviewee C had contact with an NGO, providing support for ecological sanitation, see section 4.3.4. The prerequisite from the NGO was that five households would implement their sanitation solution and it does not seem to have been enough interest. Most common is support from family members which seems realistic as the Study Area is a low-income settlement and hired work force costs money.

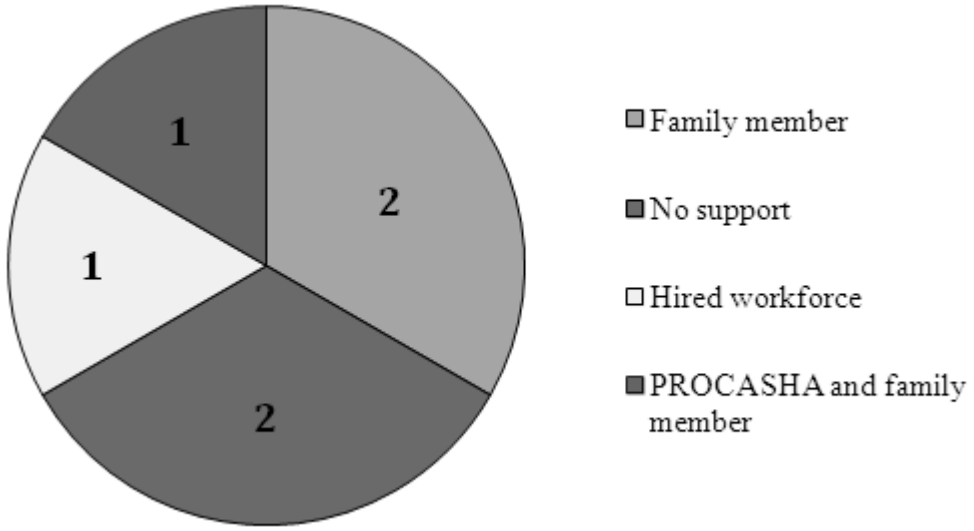

Figure 7.3 Use of external support for construction of improved sanitation among the six in-depth interviewees A-F

7.4 The choice of sanitation solution

Water-flush toilets connected to piped sewage systems is the dominant sanitation solution in the developed world (van Vliet, et al., 2011). In line with that, the majority of all interviewees, both 1 to 8 and A to F, state that a sewage system is the most desirable sanitation option. This corresponds to what in literature is referred to as lock-in or mental inertia (Unruh, 2000) and lacking imagination (Mara, 2008). As stated by Grübler (1998), areas lacking existing infrastructure, e.g. sewage systems, have greater possibility to choose other types of technical solutions and systems, not locked-in due to existing infrastructure. For example, there are various sanitation options and available techniques which could be more suitable than a sewage system in many areas. However, it is probably easier to implement another type of sanitation system than the conventional, in an area where there is no infrastructure favouring a certain system. However, this requires knowledge, among the potential adopters, about other available solutions and willingness to implement them.

In the Study Area, all interviewees, except one, do want a sewage system, see Figure 7.4, and in the absence of one, they seem to strive to construct a sanitation solution as similar to a sewage system as possible. For example, a pour-flush toilet connected to an improved pit or a septic tank is the most common sanitation solution among the interviewees. From inside the bathroom or superstructure, there is no visual difference between their toilet and a toilet connected to a sewage system. Hence, the perception of a sewage system being the ultimate sanitation solution seems to be locked-in among the interviewees.

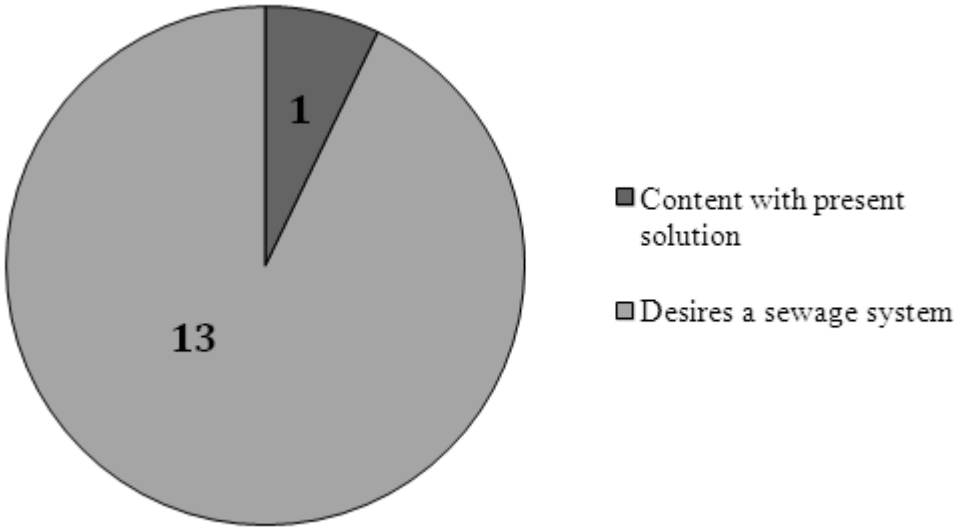

Figure 7.4 Satisfaction with current sanitation solution among the 14 interviewees 1-8 and A-F

On the contrary, one of the interviewees thought about implementing ecological sanitation, an EcoSan, but did not do so because of the perceived risk for misuse and higher construction and maintenance costs. An NGO offered some of the families in the Study Area to get the toilet for free if they constructed the superstructure and the pit themselves. The NGO needed a minimum of five households to participate in the project, otherwise the project would be cancelled. However, not enough households were interested, which can further stress the mental lock-in concerning sewage system being the most advantageous sanitation solution.

Mara (2008) states that the level of water supply affects which sanitation solutions are suitable. In accordance with this, Interviewee C mentions the choice of squatting toilet instead of a WC due to the less amount of water needed for flushing. Contradictory, none of the other interviewees mention the water use being a factor influencing the choice of sanitation solution.

The desire for a sewage system among the interviewees might derive from their previous experiences of different sanitation solutions. In the census data from INE (2013), see Figure 4.4 and Figure 4.5 in section 4.2, it seems that there is not a wide range of different sanitation solutions in Bolivia. For example, EcoSan is not represented in the data. If the economical margin is small, it is understandable if the adopter chooses a sanitation solution known to work satisfactory and which construction and maintenance costs are rather easy to predict due to personal experience. Moreover, the perception that a sewage system is the most desirable option might derive from the fact that the wealthier areas of the cities in Bolivia have sewage systems (Instituto Nacional de Estadística, 2013). Hence, identifying with the urban elite (Jenkins & Curtis, 2005) might be another reason, more than personal experience. Moreover, when comparing the interviewees' present sanitation solution with their previous ones, there seems to be a trend that people tend to have the same solution now as they did before, see Figure 7.2 and Table 7.4. The conclusion is that habit is a factor influencing the choice of sanitation solution.

7.5 Methodology

As stated earlier, when asking people living in the Study Area for an interview, most of them said no. There can be various reasons for their unwillingness to participate.

For example, we were told that sanitation and money are sensitive topics to talk about. Moreover, there are reasons to believe that the somewhat cool interest to talk to us depended on, not only the sensitive topic but furthermore, previous experiences of missionaries walking around in the Study Area. Their presence had influenced the restrictive attitude towards strangers looking typically non-Bolivian. On the contrary, one of the interpreters told us that some interviewees might have had the impression that we would give them something in return for their participation, or that our study would result in direct benefits for them. Hence, that might have encouraged some interviewees to participate and consequently, some of their answers might have been given with that in mind.

The selection of interviewees was limited due to the time of the day the interviews were carried out. We were advised not to stay outdoors in the Study Area during dark hours or taking the bus after dark. This limited the number of potential interviewees as many of the inhabitants, especially men, are out of the Study Area during daytime due to work. However, as mentioned earlier, see section 3.2, there are no guidelines for the amount of interviewees needed to construct an adequate set of data. Furthermore, there are pros and cons with both conducting many and few interviews. In this study theoretical saturation is an ideal state which has not been reached due to time limit. For example, the time we had in the Study Area and Cochabamba was limited. Moreover, it was difficult to find people who were willing to participate in the study. However, some of the interviewees were more willing than others to tell us about their ideas and experiences and those are the ones we conducted in-depth interviews with.

Inherent in the interview study as scientific method is the unequal power division among researcher and interviewee. In this study, there were three researchers and one interpreter whereas the interviewee most often was alone. This might have resulted in an uncomfortable situation for the interviewee, despite the outspoken condition that participation was voluntary and that questions being uncomfortable were not needed to be answered. The interpreters were the first to make us observant to the fact that the topics covered by our questions were more or less unpleasant to talk about. Even though the interviewees were promised that they would be anonymous, the interviews exclusively took place outdoor and people passing on the street were sometimes able to overhear the conversation. Hence, this might have influenced the answers from the interviewees. Moreover, sometimes the sound quality of the recordings was poor and thus, the transcription work was difficult. The transcriber made us observant to the fact that some of the interviewees were not as good at Spanish as we assumed, as many of them do not have Spanish as mother tongue. This did not reveal to us until after the interviews were completed and did not do so because of the lacking Spanish skills that we possess. Also, there was often a confusion of concepts which might have caused failures in the data. Moreover, the information has passed many levels of translation from the interviewee to our final interpretation of it.

7.6 Further research

Even though some patterns have emerged during this study, the data set constitutes of a context specific description. The results cannot be used for general conclusions, and nor was the intention. However, some drivers and barriers identified during the interviews exist in the studied literature as well. Though, those trends need further verification before conclusions about implementation of sanitation in general can be drawn. However, general conclusions might not be possible anyhow due to context specific conditions.

8 Conclusion

The sanitation practices identified in the Study Area are open defecation, unimproved pit latrines and pour-flush toilets connected to improved pits or septic tanks. Most interviewees have improved sanitation. However, they state that most people in the Study Area do not.

The drivers identified among the interviewees are; safety, cleanliness and hygiene, habit, social pressure, children, smell, comfort, the perception that sanitation is fundamental, regulation, functionality and aesthetics. Moreover, safety, and cleanliness and hygiene are strongly related to children among the interviewees who have children. The identified barriers are; lack of funding, lack of knowledge, ground conditions and the uncertain housing situation. However, lack of funding seems to be the key barrier in order to overcome the others.

For some interviewees, the final decision to construct a pour-flush toilet and an improved pit has been preceded by a tipping point. Out of the identified ones, only one seems to be directly related to overcoming the barriers whereas the others seem to be more of *"the straw that broke the camel's back"*. Moreover, most interviewees used some kind of external support, either family members, PROCASHA or hired work force for the construction. Furthermore, most improved sanitation solutions among the interviewees have been constructed little by little.

The interviewees have stated a desire for sewage system. However, as that is not an option at the present, pour-flush toilets connected to an improved pit or a septic tank are the solutions most common among the interviewees. Moreover, the choice of sanitation seems to correlate with the solution each interviewee has had at previous location. Hence, habit seems to be an important factor when choosing sanitation solution.

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