

Papua New Guinea

Sanitation, Water Supply and Hygiene in Urban Informal Settlements



Social Research Findings and Recommendations

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Abbreviations and Acronyms

ADB	Asian Development Bank
CLTS	Community Led Total Sanitation
DSIP	District Services Improvement Program
EU	European Union
LLG	Local level government
MDG	Millennium Development Goal
NCD	National Capital District
NCDC	National Capital District Commission
NDOH	National Department of Health
O&M	Operation and maintenance
PNG	Papua New Guinea
RWSSP	Rural Water Supply and Sanitation Program
VIP	Ventilated improved pit
WASH	Water supply, sanitation, and hygiene
WSP	Water and Sanitation Program (of the World Bank)

Exchange Rate

PNG Kina 1.00 = US\$0.4040 (US\$1.00=PNGK2.47525)

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Executive Summary

During the 2012 Papua New Guinea Service Delivery Assessment of rural and urban water and sanitation services, and the development of the country's first National Water, Sanitation and Hygiene (WASH) Policy in 2013-14, the need for services in urban informal settlements emerged as a recurring theme. To address the gap in knowledge about the WASH situation in settlements, stakeholders and the Water and Sanitation Program (WSP) of the World Bank, set out to conduct research in early 2014. Port Moresby, the nation's capital and home to almost 80 settlements, and the town of Wewak (representing PNG's 20 provincial capitals) were selected for the research. Investigations were made using household surveys, focus group discussions, observations, and consultations.

The findings confirm that informal settlements are an established and permanent feature of the urban landscape, many existing for 20 years or more. Yet they have long been overlooked and ignored for water and sanitation services because settlements exist outside of the official town planning areas, often on customary land, and are institutionally orphaned. Despite this, they are home to up to 50% of the urban population, possibly housing as many as 250-350,000 people in Port Moresby alone. Compared to Asian settlements, housing density is low but there are many people living in small overcrowded houses, with little education and low incomes.

Surprisingly, most households do have access to a toilet, but these are overused, sometimes shared by more than 60 people, are basic dry pit latrines unsanitary in both their design and use, and need to be rebuilt frequently when pits fill. They often present health risks by overflowing in the wet season, and the biggest complaint is that they smell. Defecating in the open does occur, particularly among children under five who do not use toilets, as they are often frightened or disgusted by pit latrines, or not encouraged to use them by their parents. Public toilets are not appropriate due to maintenance issues, while public sewerage is expensive.

Access to piped water supply varies between settlements but it is common for women to spend large amounts of time and energy filling and then carrying heavy loads of water from both legal and illegal connections. While piped water is treated by utilities, there are significant risks of contaminating clean water through illegal connections and risky collection practices. Many households are paying for water – to local “controllers”, water committees or through formal utility arrangements – but often at unit rates far above the official rates of water utilities and that paid by the general urban population. More than 90% of households want to improve their water supply. Quick fix solutions provided by politicians eg. paying off community debts, connecting to mains water only, or building rainwater tanks are not long term sustainable solutions for services.

Generally households understand how germs spread from faeces to hands to mouths, and the importance of washing hands to avoid diarrhoea, but rarely is handwashing practiced. No handwashing facilities were observed near toilets, and the diarrhoea rate in children under five is high.

Disputes and conflicts within communities over the sharing and use of water and sanitation resources is common, however, women and girls are at serious risk from poor WASH services in settlements. Collecting water at night or using a toilet far from the house exposes women to sexual and physical violence. Even intra-household discussions about the need to have a toilet or better water supply can lead to domestic violence. Women bear the heavy physical and time-consuming burden of collecting water. Despite women having primary responsibility for every household task using water, and cleaning toilets, they have no say in decisions about improving water and sanitation services.

There are steps that can be taken to improve WASH in PNG's settlements including: developing and trialing low cost toilet models for self building by households; improving awareness about safe containment of fecal waste, including infant's faeces; trialing alternative equitable water supply service delivery options; strengthening relationships between utilities and customers in settlements to improve sustainability, and revenue; promoting handwashing facilities near toilets and washing hands with soap at key times; and increasing awareness about safe water collection and storage. Internationally, and from rural PNG, there are many examples of approaches which could be modified to PNG's urban settlements. Critical to improving WASH in settlements is the involvement of all relevant stakeholders.

1. Introduction

In 2012 Papua New Guinea undertook a national Service Delivery Assessment of rural water, rural sanitation, urban water and urban sanitation services to identify coverage and targets, how well services are being delivered and the financing shortfalls in these subsectors. Immediately following this assessment, stakeholders, through a national policy task force, have developed a draft of the country's first National Water, Sanitation and Hygiene (WASH) Policy. During the course of the assessment and policy development, peri-urban and informal settlements have been consistently identified as areas which are underserved and overlooked for water and sanitation services. The need to provide affordable and appropriate services in settlements, as well as improve health and living conditions, was highlighted.

Amongst stakeholders, it was agreed that baseline information on WASH conditions in settlements was needed in order to develop strategies and to respond appropriately to needs of settlements in the future. Previous settlement research has focused on urbanisation, housing ownership, land issues, employment, and anthropology, but WASH has not been researched specifically or in depth. Therefore in 2014, the Water and Sanitation Program of the World Bank (WSP), together with key stakeholders, conducted research in informal settlements in the capital Port Moresby and a representative provincial town (Wewak) to understand the conditions, aspirations, barriers and opportunities to improve water, sanitation and hygiene for informal settlers.

The aim of this research was to:

1. Find out more about existing sanitation, water supply, hygiene and handwashing conditions in settlements
2. Find out what type of sanitation people aspire to and what are the barriers to sanitation
3. Support the national WASH policy process to plan a strategy for approaches to settlements
4. Help inform stakeholders about appropriate technical options for urban sanitation that can be considered as alternatives to high-cost sewerage-only approaches.

The research findings are also contributing to wider Pacific understanding about WASH conditions and services in urban settlements in Melanesia.

2. Approach and Methodology

2.1 Approach

The approach to the research has involved a high degree of collaboration with input and support from NGOs (WaterAid, World Vision, Anglicare), National Capital District Commission, Wewak Local Level Government (LLG), Department of National Planning and Monitoring, Office of Urbanisation, UN-Habitat, Eda Ranu, and Water PNG. Collaboration has involved the sharing of information, offering of local knowledge, suggestions for research needs, and provision of staff to undertake the interviews and facilitate community meetings. This high level of collaboration is indicative both of the interest in the topic from a variety of organisations, and the need for a multi-sectoral approach to tackle the problem. WSP's role has been one of designer and facilitator for the research. WSP employed a local Research Coordinator to undertake field work in collaboration with partner organisations.

Given the limited budget and available resources, only two towns were selected for the research: the national capital Port Moresby, and a typical provincial capital – Wewak, in East Sepik province. Port Moresby was selected because it is home to some 79 settlement areas, and within the city, settlements were chosen where partners had already had some (non-WASH) involvement; while Wewak was selected as a typical provincial capital, and because the research could be supported by partner organisation WaterAid.

The main challenges have been:

- The expectation of follow up support for water and sanitation infrastructure, especially when World Bank is mentioned
- The availability of staff from partner organisations to conduct interviews
- Security in settlements

These challenges have been overcome by clearly explaining that the purpose of the research was information gathering and that a follow up program cannot be expected; presenting the research as a collaborative effort with government and other partners; pacing the research so that staff would be available and recruiting additional enumerators when needed; and hiring security guards for the team.

Settlement residents were very willing to be interviewed and offer personal information to the interviewers. Many said this was the first time they had ever been asked this information.

This research has its limitations. It is not meant to be a serious statistical analysis but a broad brush picture on the situation in settlements in order to trigger further discussion and follow up detailed planning and perhaps piloting by stakeholders. Because of the approach chosen for the research there have been some unique data issues which have not affected the overall results. For example there was a tendency for survey questions to be answered by several people in the household, especially where the head of the household has seniority but may not have the capacity to answer questions (if elderly and mentally impaired). An interview may start with the male head of household but be completed by the female senior adult as interest waxes and wanes. This made it unfeasible to do much analysis between sex of respondents and other indicators. The research did not use professional interviewers but engaged local partners as a training and skill building exercise. This may have compromised the objectivity of the data but in the long term has helped build a deeper personal understanding of the situation in settlements.

The information is presented as an aggregate of all settlements visited to provide a general view of settlements in Papua New Guinea. Selected settlements are identified to illustrate key points only.

2.2 Research Methodology

The research used several methods to gather and cross check information:

1. Interviews with settlement leaders on history, ethnicity, size and WASH issues to provide context
2. Focus group discussions with men and women separately
3. Household survey – baseline situation of water, sanitation and hygiene practices in 25 households in each of eight settlements

4. Observation and photographs of WASH facilities, housing, general conditions
5. Review of other documents and data eg. census material, academic research, Urban Development Plans
6. Interviews with service providers (Eda Ranu, Water PNG), local governments, government departments, and community leaders
7. A workshop of stakeholders in August 2014 to present key findings and obtain feedback.

Twenty-four focus group discussions were facilitated by WSP’s Research Coordinator, using a question guide developed by WSP’s Water and Sanitation Consultant. Participants were selected by councilors with the help of community leaders. Participants selected were those that were seen as natural leaders in the community and those that had an interest in having community development in their area as a priority. The participants were divided into separate Females, Males and Leaders groups for the discussions. Male and female groups were asked the same questions, with the exception that the women’s groups were also asked about menstrual hygiene practices. Younger women were also included in the Female focus group discussions.

The household survey covered a sample of 200 households in Port Moresby and Wewak. The sample numbers by urban location are shown in Table 1. A sample size of 200 at a confidence level of 95% provides a margin of error of +/-6.89%. Given the survey implementation issues of cost, security, availability of interviewers, this sample size, and margin of error, was deemed to be acceptable for this broad type of research.

Table 1 – Household Survey Sample by Location

Town and Settlement Name	Number of Questionnaires (total=200)	% of Sample
<i>Port Moresby</i>	125	62.5
8 Mile	25	12.5
9 Mile	25	12.5
ATS	25	12.5
June Valley	25	12.5
Saigani	25	12.5
<i>Wewak</i>	75	37.5
Ward 10 (Boram)	25	12.5
Ward 4 (Old Airstrip)	25	12.5
Ward 13 (Nuigo)	25	12.5

The household questionnaire was developed by WSP’s Water and Sanitation Consultant and contains over 80, mostly closed-ended, questions. The questionnaire was translated into Pigin by interviewers during interviews.

WSP trained local interviewers from partner organisations and local communities for a day in the survey instrument and how to interview households. Some had no previous experience. Due to security concerns, interviews

were only conducted during the day, especially the morning. 25 households were randomly selected in each settlement. Although 97 females and 103 males were recorded as the primary interviewee, often the household interview involved several people from the family contributing at the same time. Of the primary interviewees, 50% were head of the household while 33% were the spouse of the head of the household and 17% were another adult living in the household.

WSP’s Research Coordinator provided field supervision and checked the accuracy and completeness of questionnaires. Data was initially entered into a customised Excel Spread sheet, and then data was cleaned by the WSP Water and Sanitation Consultant, and analysed using SPSS (Statistical Package for the Social Sciences) software v.20.

Feedback from local partners and interviewers provided the following suggestions or observations of the social research process:

- The questionnaire should be translated into Tok Pisin to save time during interviews
- Most places had never participated in such a survey so there was a high expectation of follow on programs. Some areas (Wewak) had participated in surveys eg. Water PNG, so queried why the same questions were being asked again.
- The experience of stakeholders in interviewing households improved their personal understanding of the conditions, and problems in different settlements
- No information comes into settlements.



Interviews in progress, 9 Mile, Segani, ATS and 8 Mile settlements. Interviews conducted by Anglicare, WSP, NCDC.

3. Settlements and Urbanisation Context

3.1 What is an Informal Settlement?

There is no consistent definition of informal settlements as conditions and characteristics vary between countries and regions. Formal definitions, such as the following from UN-Habitat, OECD and WHO, are simplistic for describing the characteristics of informal settlements in the Pacific:

Informal settlements: are defined as: i) residential areas where a group of housing units has been constructed on land to which the occupants have no legal claim, or which they occupy illegally; ii) unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing).

-UN Habitat; OECD; WHO

A description of informal settlements compiled from several sources more closely reflects the complexity of settlements:

Informal or unplanned settlements are residential areas that have developed outside of the formal urban planning rules of a city, usually in physically marginal or peri-urban areas. They are characterised by uncertain or illegal land tenure; minimal or no services such as water supply, sanitation, electricity, and roads; informal employment and low incomes; and lack of recognition by formal governments.

- author's definition, from several sources

For PNG this definition includes the following characteristics:¹

- Typically self-built houses, owned by the occupant
- Large and overcrowded households
- People from the same tribal group living in clusters
- Occupation of land may or may not be illegal
- An entrepreneurial self-employed population (which may include legal and illegal activities), high unemployment, with few people working in the formal sector
- Variable levels of electricity, water supply and sanitation services
- Health issues including HIV/AIDS and tuberculosis
- Tribal conflict and violence
- Environmental and ground water pollution from human and solid waste.

Traditional urban villages, for example Hanuabada in Port Moresby, are different from informal settlements. While housing and settlement is “unplanned” in a formal urban planning sense and some services are lacking, these villages do have a common ethnicity and a leadership structure and security of tenure as they occupy their traditional land. They are not specifically included in the research although some of the recommendations for water and sanitation will be relevant.

3.2 How many people live in settlements?

Port Moresby in 2010 was estimated to have 20 planned or formal settlements and 79 unplanned settlements (of which 32 are on state land and 47 on customary land), with 45% of the city's population living in informal settlements.² The urban population of Port Moresby at the beginning of 2012 was best estimated in the range of 500,000 to 750,000 persons which means about 250,000 to 350,000 people live in settlements.³ In the coastal city of Lae, it is estimated over 50% of the city's population lives in settlements, with rural urban migrants coming primarily from Mamose, the New

¹ Compiled from various settlement research documents including: National Research Institute, 2008. *Improving Access to Land within the Settlements of Port Moresby*. Special Publication No. 49. Port Moresby: NRI; UN-Habitat (2012) *Papua New Guinea National Urban Profile*. United Nations Human Settlements Programme.

² UN-Habitat (2010), *Papua New Guinea Port Moresby Urban Profile*, United Nations Human Settlements Programme.

³ PNG 2011 Census figures are widely thought to be unreliable. For example the PNG 2011 census indicates Port Moresby population as only 318,128 persons. Alternate population estimates are found in: Jones, P. (2012) “Managing Urbanisation in Papua New Guinea: Planning for Planning's Sake?” in *Alfred Deakin Research Institute, Working Papers Series 2, No. 33*. Alfred Deakin Research Institute, Deakin University

Guinea islands and Highlands Region. According to the District Administrator, in Wewak, 40-50% of the population lives in settlements, while in Goroka the proportion is as much as 60%.⁴ Squatter and informal settlements are a common feature in all of PNG's three cities and most larger provincial towns.

3.3 Urban growth and settlements

Squatters and settlements have become a 'permanent' feature of the PNG urban landscape. Especially in Port Moresby, many settlements are long established – some since the 1950s. Historically settlement growth has been due to high migration from rural areas in search of an urban life, increased population growth, and the lack of formal and affordable land and housing to match this increase. In Port Moresby recent growth has been triggered by resource projects driving up house rents, as well as the eviction of other settlements.⁵

PNG's high urban growth rate (around 2.14% between 2005 and 2010), is predicted to be higher in the future – up to 4% per annum between 2020 and 2030, and declining slowly after 2035. The urban population is expected to increase to 1.73 million and account for 17% of the total population by 2030.⁶ It is certain that settlements will continue to grow as urban populations rise and there is increased demand for housing and land. An analysis of the Port Moresby settlement inter-censal growth rate between 2000 and 2011 conservatively indicates an average annual growth of 5.0%.⁷ Other analysis of Port Moresby settlement indicates that "on average, a new informal settlement was established each year over the 20 years to 2000 and the settlement population grew at an annual rate of 7.8 per cent—twice the population growth rate of Port Moresby overall—in this period."⁸

3.4 Complex land ownership

Some 97% of land in PNG is customary in nature, with 2% government or state-owned and 1% freehold tenure. In PNG most informal settlements are on customary land held by traditional landowners, usually without formal registered title. Customary land cannot be bought or sold except through long and complex procedures. The government has no jurisdiction over customary land unless the landowners have entered into agreement with the government for use of the land. Customary land is not subject to government planning and development controls.

Some settlements are on "alienated" land, ie. land which has been removed from customary landowners and formally registered and titled by government or private owners.⁹ Much of the state owned land is undeveloped and abandoned and therefore used for informal settlement.

Customary land ownership arrangements for settlements are complex. Customary landowners either rent, sell, or provide land under kinship arrangements with relatives and tribal outsiders. The occupation of land by people who are not members of the descent group is permitted both by custom, and law.¹⁰ This flexibility provides urban land and a place to live, which the formal land system cannot deliver quickly or affordably. However the informal nature of these land dealings and settlement is prone to conflict. Systems of settlement on customary land range from explicit (and sometimes documented) arrangements on the purchase, sale, and rental of land and properties, to zero rental payments, and to overt occupation without any compensation.¹¹ Some landowners find it difficult to evict those settled on their land, and refuse any payments in fear of legitimizing the claims of the

⁴ UN-Habitat (2010), *Papua New Guinea Goroka City Profile*, United Nations Human Settlements Programme.

⁵ For example in 2011 the NCDC Manager mentioned a staff member renting for K550/week but when the rent rose to K1000/week the employee was forced to move to a settlement. Evictions have occurred in Paga Hill and other areas of Moresby South LLG.

⁶ All population figures are sourced from: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2010 Revision and World Urbanization Prospects: The 2011 Revision* Wednesday, September 04, 2013; 11:51:51 PM. Viewed 5/9/2013. Available at: <http://esa.un.org/unpd/wup/unup>

⁷ 2000 census figure from Chand S, and Yala C. "Informal land systems within urban settlements in Honiara and Port Moresby" in AusAID (2008) *Making Land Work*. Canberra: AGPS Press; 2011 census figure from NCD LLG profile, National Statistics Office

⁸ AusAID (2008) *Making Land Work*. Canberra: AGPS Press

⁹ Land parcels are registered with the Department of Lands

¹⁰ Land Ordinance 1962, section 81.

¹¹ National Research Institute, 2008

settlers. “Third Party” settlers – those occupying customary land over which several customary owners are in conflict – live the most precariously, as they have no binding agreements and could be forced off the land at any time.¹² In Port Moresby land is constantly sold, bought and rented without prior knowledge or approval of the state or traditional land owners, and without going through formal processes to document land title.¹³ Land ownership disputes are perpetual.

3.5 Institutional Responsibility for Settlements

No particular ministry is responsible for dealing with settlement issues after a housing policy change in 1986 moved responsibility for housing development from the National Housing Authority to market forces. The Department of Lands and Physical Planning responsibility extends only to land settlement, land policies and allocation. Necessary policies and guidelines dealing with settlements are absent: no up-to-date guidelines for design and utility service provision in the informal settlements; no pro-poor policies to deal with settlements upgrading; and no pro-poor land policies.

The Office of Urbanisation, within the Department of Community Development, prepared the National Urbanisation Policy 2010-2030, which for settlements, advocates a “sites and services” upgrading approach. One of four pilots it is undertaking is customary land registration and development in Taurama Valley settlement in Port Moresby. However the Office has few resources and capacity, and government support for the Policy has been erratic.

Logically, settlements could be assumed to fall within the remit of urban LLGs (and rural LLGs where peri-urban settlements spill beyond declared town boundaries). However several LLGs can cover one urban area eg. Port Moresby. LLGs report to the central Department of Provincial and Local Government Affairs (DPLGA) and therefore feel little direct responsibility for settlements in the way that a municipal authority or city council might. Urban LLGs largely neglect and ignore settlements, and in some cases support forcible eviction.¹⁴ In Port Moresby, the NCDC is meant to be the main implementer of capital works, and the implementing agency for development of settlements and low cost housing.¹⁵ Despite having a Settlements Division, NCDC does not acknowledge settlers in its City Plan, and does not have the budget, power, or human resources to plan or implement any improvements, despite having an NCD Settlements Strategic Plan.¹⁶ On the positive side, the LLG and ward committee structure overlays settlement areas, and councillors and politicians can represent their constituent settlements through a formal government structure and process. Some ward councillors live in settlements and are an important community focal point.

¹² Dutton, PA, 1994. *Squatter Settlements of Port Moresby and the Urban Community Development Approach*. Brisbane: University of Queensland.

¹³ NCDC, 2006. *National Capital District Settlements Strategic Plan 2007-2011*. Port Moresby: NCDC Strategic Planning, Regulatory Services

¹⁴ UNHCR, 2010. *Housing rights assessment mission to Papua New Guinea*, 29 June - 9 July 2010

¹⁵ NCDC, 2006

¹⁶ Jones, P. 2012

4. Research Findings

The following section presents the findings from the social research under topics dealing with land and settlement, socio-economic conditions, sanitation, water, hygiene, gender, and development priorities and issues.

4.1 Settlements, land and housing

Settlements are a permanent feature of urban living

Most of the settlements studied had existed since the 1990s, and settlers had lived there for many years - typically 20 years and on average 17 years – while Segani (Konedobu) had been settled since 1954. For adults who had long since left villages, settlements had been their home for most of their adult lives, and were now a home for a second and third generation of children born and raised in settlements.

Local governments do have a vision relocating some settlements into more formalized allotments with services, however this is a long way in the future. Current attempts at relocating or providing land title are proving to be complex and time consuming. For example in Port Moresby, UN-Habitat with Office of Urbanisation, as well as NCDC are attempting to formalize selected settlements and allocate land title so that services can be improved. This is a painstaking process and favours state land settlements as the landowner is easier to identify. With 79 unplanned settlements in Port Moresby, and a lack of policy, human resources and finance, it will be a very long time before all these settlements are formalised.

Settlements are not high density but households are overcrowded

Generally, with the exception of Segani, settlements surveyed had low density housing compared to Asian settlements. Houses had clear separation from neighbours, and defined boundaries and land areas, usually delineated by fences. However household density is very high, with many people living under one roof. The average household size is 8.4 people, with the median household size 8.0. Households range in size from 1 person to over 30 people. A quarter of all households have between 10 and 30 people living in them, frequently in small houses in crowded conditions. This means that services such as toilets or water points may serve large numbers of people.

Recent population growth also gives settlers the feeling of overcrowding. An example is 9 Mile settlement which has absorbed people evicted from Port Moresby South LLG, leading to crowding of small sub-settlements such as 102 Turn Off, White Stone and Mat Mat (Cemetery) within 9 Mile.



An example of low density housing in 8 Mile settlement Port Moresby.

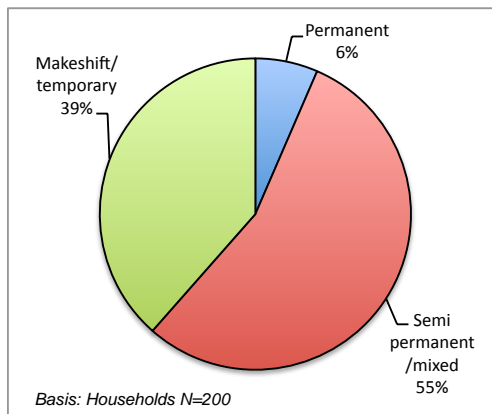


The inner city settlement of Segani (Konedobu) has high housing density

Housing is low standard

Housing is typically makeshift or semi permanent using recycled materials, with only 6% of houses using permanent construction (see Figure 1). This is a function of both land ownership – without land title there is little incentive to invest in housing - and low irregular incomes. Notable examples of permanent housing were found in ATS settlement and in June Valley. Households with regular incomes such as government jobs or even professional jobs such as lawyers, were more likely to have better quality and permanent houses.

Figure 1 – Type of Dwelling



Makeshift housing in 8 Mile settlement Port Moresby

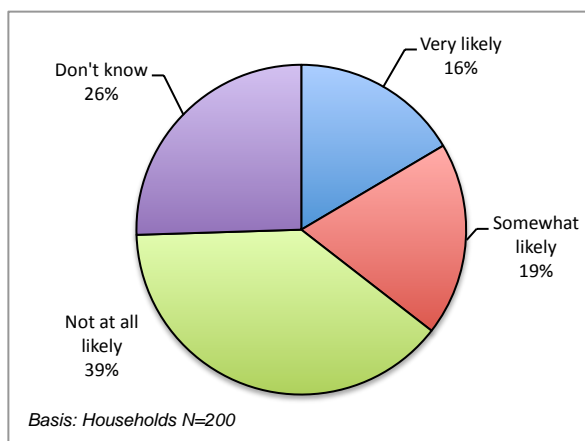


Temporary island-style housing Wewak

Houses are owned but the land is not

Most houses are owned by the household (86%), with 1% rented, and 13% other occupancy types. However there was less ownership of the land – only 35% of households saying they owned the land under the house. This was common in areas where there had been some previous formal agreement between settlement communities and traditional land owners. The feeling of ownership of land was changeable and could become stronger over time. Initially households might pay rent for the land (around K50/month) but after some time and occupier initiated improvements such as filling in and building up swampy land, the householder might feel they are closer to “owning” the house.

Figure 2 – Likelihood of Eviction



When asked about the likelihood of being evicted from the house, respondents were divided about whether this was likely or not likely (figure 2). The feeling in Wewak was that there were more land issues and a higher chance of eviction, and people interviewed felt they could be evicted.

4.2 Socio-economic conditions

Many males and young people live in settlements

There are more males than females living in settlements: 52% males compared to 48% females according to the household survey. The 2011 Census shows 54% males compared to 46% females live in Port Moresby settlements, while Wewak settlements have slightly more females (51%) compared to males (49%). There are many young people living in settlements – 48% are under 18 years of age in Port Moresby (compared to 37% for the city as a whole), and 41% under 18 in Wewak. 70% of households had a child under the age of five years.

Not all children are living a stable household. Women in 8 Mile settlement raised a concern about the large number of orphan children who are scavenging in the settlement. The women feared that when these children grow up, they will get involved in criminal activities.

Education is Low

Education levels are low, particularly amongst women, who are more likely than men to be illiterate or have achieved only primary level education. However during interviews it was observed that younger respondents had higher education levels than their parents, although it was also observed that many children in settlements are not attending school. Of primary survey respondents, 8% had no schooling (12% of women with no schooling compared with 4% of men), with 45% completing primary level education, and 29% achieving some high school education. (refer Table 2). The education level of the head of the household is slightly higher, however this is distorted because there are many more male household heads household (83%) than female (17%). Proportionally, 61% of female household heads were illiterate or achieved only primary school level compared with 43% of male household heads with primary education or less.

The low education level has implications for any awareness activities which must be suitable for an illiterate population. There is also a need to translate awareness activities and information into local dialects.

Table 2 – Level of Schooling of Respondent and Head of Household by Sex

Level of schooling	Respondent's Education				Head of Household's Education			
	Total		Percent by Sex		Total		Percent by Sex	
	Number	Percent of Cases	Male	Female	Number	Percent of Cases	Male	Female
Illiterate/No schooling	16	8%	4%	12%	16	8%	7%	12%
Primary	89	45%	37%	53%	75	38%	36%	49%
High school	57	29%	32%	25%	53	27%	30%	12%
Upper secondary	17	8%	12%	4%	21	11%	12%	6%
Vocational or technical	7	3%	4%	3%	12	6%	5%	9%
University or other tertiary	12	6%	11%	1%	16	8%	8%	9%
Don't know	2	1%	0%	2%	5	2%	2%	3%
Total	200	100%	100%	100%	198	100%	100%	100%

*Basis: No=200 Households;
Respondents: 97 Female, 103 Males; Head of Household: 165 Male, 33 Female*

The main employment is irregular informal work

Market selling was a main source of income for more than 40% of households with casual work, such as labouring, contributing to 10% of households. Income from private employer wages and salaries was present in 40% of households while government wages and salaries featured in only 12% of households. 2% of households relied solely on donations, gifts and charity.

Even though households are likely to underestimate their income in a survey, the dominance of informal work means that there is not much money coming into households in settlements. Household incomes average about K590 (US\$238) per fortnight but range between K20-K4,200 (US\$8-US\$1,696) per fortnight. The median household income was K400 per fortnight (US\$162) or K28 per

day (US\$11.31). The median income divided by the median household size (8 persons) gives a per capita daily income of just K3.50 (US\$1.45).

Those with regular government jobs appeared to have better housing and in some cases better sanitation facilities. Government employees with practical skills stood out even more. One government-employed mechanic in Wewak had a water meter registered with Water PNG (installed 15 years ago), a toilet and electricity, while neighbours had none of these.

Many houses are without electricity

About 60% of households have no electricity. Those that do have electricity, pay an average of K34 (US\$14) per month for the service.

Port Moresby settlements are ethnically diverse

Nearly all households in Wewak were from East Sepik Province, although representing a range of villages from all over the province. A few people from Morobe and New Ireland were included in Wewak settlements.

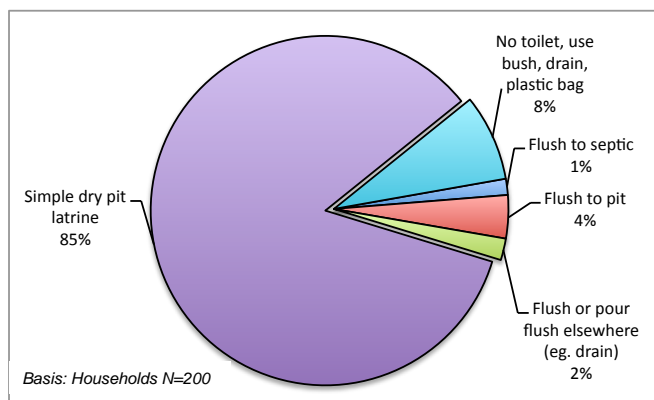
In Port Moresby residents are from many different provinces – from the settlements surveyed residents represented a dozen different parts of the country - but predominantly from Gulf, Morobe, Oro and Eastern Highlands Provinces. Due to the nature of the sample of settlements, the full range of origin of settlers was not covered.

4.3 Sanitation

Most households use a toilet

Most toilets (85%) used by a household are simple dry pit latrines, with about 8% of households practicing open defecation (figure 3). Most open defecation is occurring in Wewak. In the past the government had a bucket collection system of household sewage (night soil) but when this was made illegal in the 1980s pit toilets did not replace this system and households reverted to using the bush. Use of septic system is very rare and no one is connected to a sewerage system, although a system only exists in Port Moresby.

Figure 3 – Type of toilet



A recently built simple dry pit latrine (Port Moresby)

Lack of toilets is due to laziness, lack of land and money

The main reasons given in the household survey for a household not having a toilet (or its own toilet) were:

- Land issues/do not own the land (21%)
- Not enough space in the yard to build toilet (19%)
- Not enough money to build toilet, not enough materials (14%)
- Groundwater level is too high (12%)
- For health reasons/attracts flies and smells/want to avoid flies (7%)
- Soil is rocky, difficult to dig (5%)
- No water/not enough water to operate a toilet (5%)

Focus group discussions listed similar reasons for not having a toilet: laziness, no space to build toilets, and some cannot afford to build toilets. Women's focus groups gave reasons of: people not wanting a toilet near their house as it is not healthy especially when it smells and also when it rains and floods. Some households were not concerned to have a toilet of their own because they were comfortable using another household's toilet, while others did not mind using the bush. A men's focus group in Wewak thought some households did not have toilets because they preferred the sea or beach, had a shortage of land, or existing land was swampy and prone to flooding.

Importantly there are issues that are not perceived as barriers to having a toilet. Land ownership was not necessarily a major barrier to having a toilet. In Wewak despite a landlord *requiring* households living on his land to have toilets because it was healthier, some households did not build a toilet due to "laziness", difficulties with the high water table, and lack of materials. Not having available labour or knowledge in how to build a toilet were also *not* raised as barriers to having a toilet.

The main advantages of having a toilet were perceived as:

- Convenience, can use any time (23%)
- Privacy (21%)
- Healthier/prevent disease (21%)
- Safety, especially at night (12%)

Other notable advantages expressed were that if a household had its own toilet it did not have to share with others, and it would reduce conflict.

Pit latrine styles are varied but basic

There is a wide range of pit latrine styles across all the settlements surveyed. This indicates that there is no single design and choice of construction style is up to the builder and the individual household. However, most dry pit toilets are of a basic construction, many little more than a hole in the ground, and some without a roof. Toilets are usually made from timber off-cuts, roofing iron, trees from the yard or nearby bushes, with pits sometimes lined with oil drums or tyres. Few latrines used new materials.



Typical dry pit toilets are often dark and smelly

Some toilets appear difficult and dangerous to use and it is hard to see how they would be used conveniently by all family members.



An example of a treacherous toilet which is difficult to use for both adults and children



A few toilets were found to have elevated seats, but covering of the pit was rare

While sitting rather than squatting is thought to be preferred as this is perceived as more sophisticated¹⁷ few toilets had raised platforms or pedestals. This may be due to extra materials needed or no demand from within the household for a seat. The use of plastic seats was rare.

Toilets are located away from the house

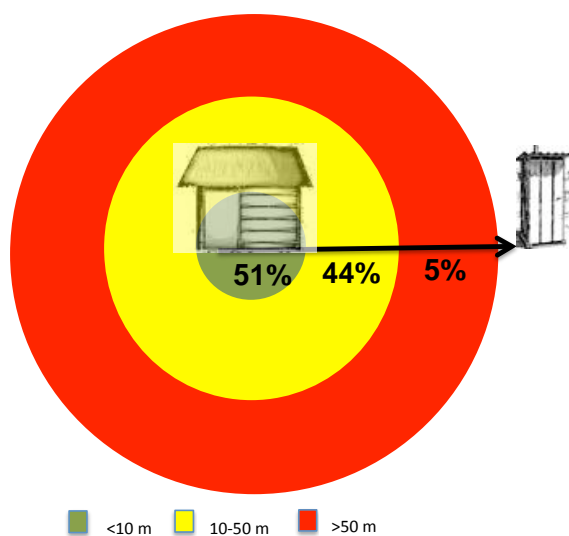
Only 1% of toilets are attached to the house, while most toilets (69%) are within the yard area of the household but away from the house, and 30% are located outside of the household yard or premises. The distance in metres from the house is shown in Figure 4. Building toilets away from the house is done because of the smell and flies. Local leaders in ATS settlement also mentioned a health program that had visited the community and advised people to build toilets 30m from their house.



In some settlements toilets are clustered together away from houses. Toilets may be shared between family groups. (Port Moresby)

¹⁷ Comment from Department of Health Head of Environmental Health, Joel Kolam

Figure 4 – Estimated distance between house and toilet (m)



Distance to the toilet is under 10m for half the households while the remainder are within a range of 10-50m, with only 5% having toilets estimated at more than 50m away. Toilets are used both day and night.

In Wewak in particular, toilets in swampy areas are difficult to access and may require traversing planks or tyres. This is a deterrent for their use and also a safety issue, especially at night.



Removed from the house, gaining access to this toilet in Wewak requires walking the plank



In Wewak's swampy settlements access to the toilet is via rubber tyre stepping stones

Sharing of toilets is common

Although there were some problems with understanding the survey question on sharing of toilets, the results broadly indicate that about half the households share a toilet with others, usually related family units and near neighbours. Most sharing occurs with two or three other families, but there are some cases of up to eight households sharing in settlements in both Port Moresby and Wewak. Even two or three households sharing could mean 16-25 people sharing one toilet, while eight households sharing could equate to more than 60 people sharing one toilet. Sharing toilets is a common cause of argument and conflict in the community.

Most Children under Five Years defecate openly

In 80% of the households with a child under five years of age,¹⁸ these children do not directly use the toilet where one exists, while 20% do use a toilet. When children under five defecate in the yard, parents sometimes collect the faeces or cover it (see table 3). During site observations, faeces was noted on the ground in the toilet area. These were from children who go to the toilet area but defecate in the open, beside or in front of the toilet, but not in the toilet. Given the poor condition, strong smell, and darkness of most pit latrines it is not surprising that children are reluctant or afraid to use toilets. Some of the reasons given for not using the toilet was fear of the pit and falling in, and fear of insects.

¹⁸ 70% of households surveyed had one or more children under the age of 5 years.

Table 3 – Disposal of Children’s Faeces

	No.	Percent of Cases
Defecate in yard and removed to toilet	25	23%
Defecate in yard and covered	23	21%
Defecate in yard and bury it	17	15%
Use children’s toilet/small pit toilet	12	11%
Use diaper	20	17%
Dog eats	3	3%
Use potty, then put in toilet	2	2%
Defecate openly with no specific disposal	3	3%
Wash faeces	1	1%
Put in plastic and throw	1	1%
No response	3	3%
Total	110	100%

Basis: No= 110 Households



Example of a **children’s toilet** – simple open outdoor pit in Wewak located near adult toilet

Some households have made toilets for children

A few households have constructed children’s toilets for use in the open air. Sometimes these are near adult toilets. Families have recognised that children have difficulty using adult toilets or find it unpleasant.

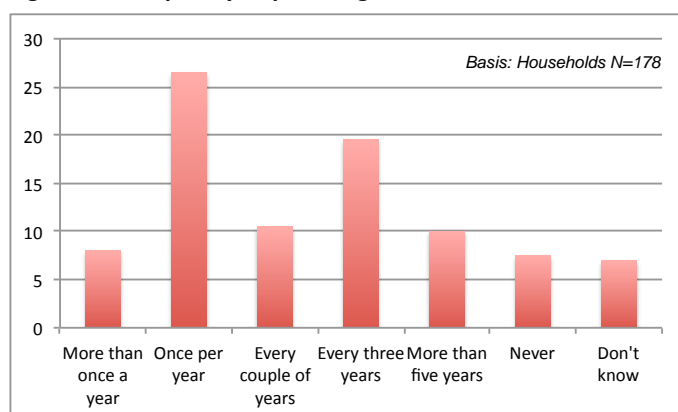
Disabled are not accessing toilets

About 8% of households had someone who had difficulty using the toilet (eg. disabled, elderly, ill, heavily pregnant). Their toileting was handled in different ways eg. defecation in the yard with the faeces then covered or collected and put into the pit; defecation at the beach; some continued to use existing toilets, including being carried to the toilet by family members when necessary; some use a special toilet (such as a commode).

Soil and site conditions are challenges to sanitation

Soil conditions in settlements are challenging, making digging toilet pits to any great depth difficult. Ground conditions include extremely rocky conditions, high water tables and sandy soils (which cause pit collapse).

Figure 5 – Frequency of pit filling



Pits fill quickly and are not emptied

According to households a large proportion of toilet pits are filled quickly – 35% fill within a year or less (see figure 5). This is due to a combination of factors including large household size and many users, shallow pits, and clayey soils which do not absorb and disperse liquid. Households whose pit latrine had never filled usually had only constructed the toilet recently.

When a pit is full, 90% of households build a new pit near the old pit and reconstruct the toilet superstructure. Only about 5% of households empty their pit (often into a drain), while 3% continue to use the pit even when it is full. There is no desludging or emptying of pits by external contractors.

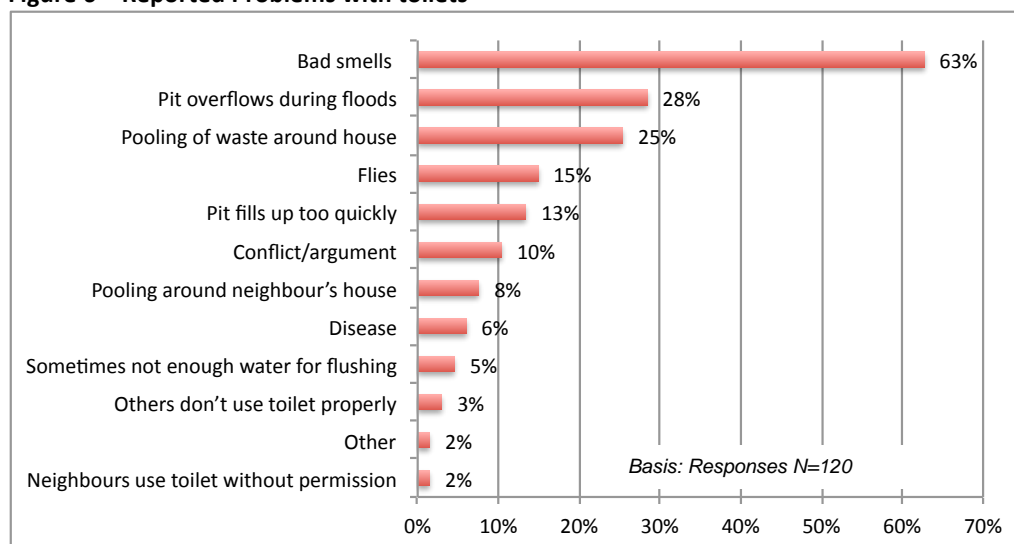
In Wewak, households realized they needed good toilets that last a long time, because with population increases in settlements and current pit toilets lasting only 1-2 years, there is no space to build new toilets. This was a reason given why some households do not build new toilets but resort to sharing

toilets with other families. The need for a toilet design that is appropriate for water logged areas was raised.

The greatest complaint about toilets is their smell

37% of households using a toilet said their toilet did cause problems for neighbours. The main problems were smell, followed by overflowing pits during floods and pooling of waste around the house. In 8 Mile settlement for example, during heavy rain toilets overflow and toilet waste can pollute neighbour's yards.

Figure 6 – Reported Problems with toilets



When asked about what householders disliked most about their toilet, the issue of smell was significant. Also, toilets are disliked as being unhealthy and dirty. Issues about sharing the toilet with others and the careless use of the toilet by others and inappropriate disposal of anal cleansing and sanitary materials, when combined, is also a significant reason for disliking toilets. Other problems included people not using toilets eg drunkards defecating wherever they like. About one fifth of households liked their toilets.

Table 4 – Dislikes about toilets

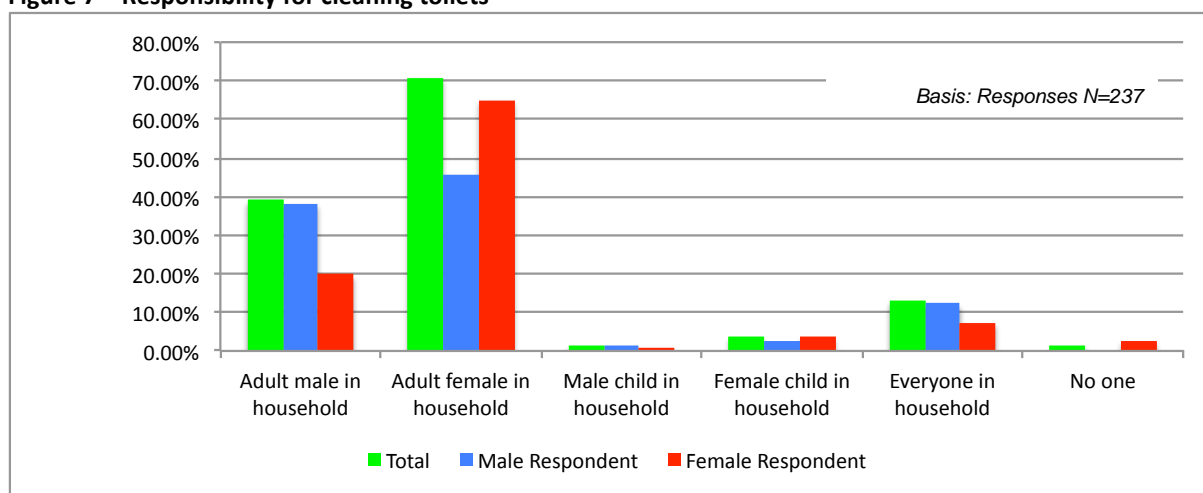
	Number	Percent of Cases
Nothing	36	20.50%
Smell	70	39.80%
Dirty/unhealthy	63	35.80%
Have to share with others	12	6.80%
Too far away from house	9	5.10%
Careless use of toilet/improper disposal sanitary pads	7	4.00%
Pit fills up too quickly/frequently dig new toilet	5	2.80%
No response	5	2.80%
Not safe	4	2.30%
Flies and other insects, cockroaches, fire ants, mosquitoes	4	2.30%
Temporary/poor materials/will need to be replaced	4	2.30%
Don't know	4	2.30%
Overflows when rains	2	1.10%
Use too much water	1	0.60%
Too close to house	1	0.60%
Animals come in	1	0.60%
Using sticks and stones in toilet	1	0.60%
When no water	1	0.60%
Bush, difficult access	1	0.60%
Total	231	131.20%

Cleaning toilets is a woman’s job

Feedback from the survey shows that cleaning of a toilet is mainly the role of an adult woman in the household (figure 7). While men do have some role in cleaning, this role is exaggerated when men are responding to the question as they claim they are more likely to do this work. On the other hand, women downplayed that cleaning a toilet was a shared household responsibility and attributed this task more to female children or no one cleaning toilets.

From observation it is difficult to believe that much cleaning is done at all. There was no evidence of cleaning materials or water in any toilet observed, nor evidence of having been recently cleaned.

Figure 7 – Responsibility for cleaning toilets



Everyone wants a better toilet

Having an improved toilet was almost a unanimous desire, and the likelihood of being evicted only had a marginal impact on whether households wanted to upgrade their toilet. 88% of households who said they were “very likely” to be evicted wanted to upgrade their toilet, compared to 96% of households who were “not at all likely” to be evicted. However it was more difficult to pinpoint exactly what type of improvement was preferred as there is low awareness of the range of sanitation options available. Given that most of the people have pit latrines in poor condition they saw a septic system as being cleaner and healthier but without understanding the costs involved and other options for better on-site sanitation. From focus group discussions, perceptions were that septic toilets were better than pit toilets as they used water, flushed, were cleaner and did not smell.

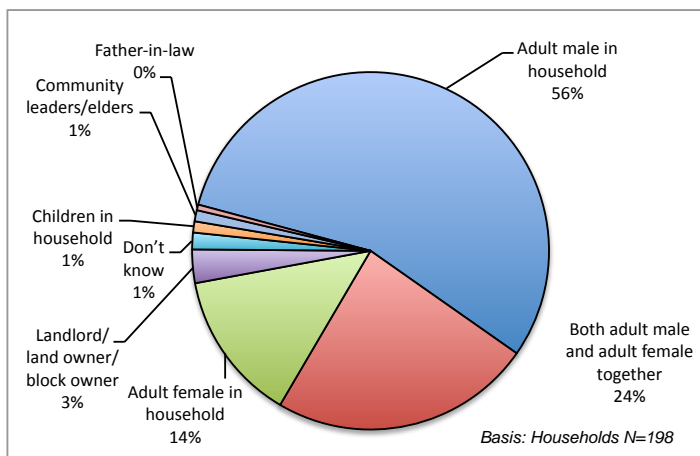
The results to this question on toilet improvements highlights a gap in knowledge about what makes a healthy and clean toilet and that a well constructed, appropriate and regularly emptied pit toilet does not need to be unpleasant. There is an association between septic toilets and better sanitation, yet there has clearly not been any exposure to positive models of dry or pour flush pit toilets which could be cost effective options. Similarly, some households stated that a connection to the sewerage system was a preferred upgrade as it meant no smell and a healthier alternative. The cost implications of a sewerage connection was not considered. Insecure land tenure was a barrier to investing in septic toilets as these were seen as a large and risky investment if there was a chance of being evicted.

Building toilets is a man’s job

Men play a dominant role in deciding whether or not to build a toilet, as members of the household but also in roles as landlords, community leaders, and extended family members (figure 8).

Because building toilets is hard physical work, according to both men and women, this is a man’s role. Digging the pit is difficult and construction may take a full week of work, and can be delayed due to difficult digging conditions eg. rocky ground, or in the wet season the pit walls collapse during construction. Also men were believed (by themselves and wives) to have the knowledge and skill to build pit toilets.

Figure 8 – Who decides to build/upgrade a toilet

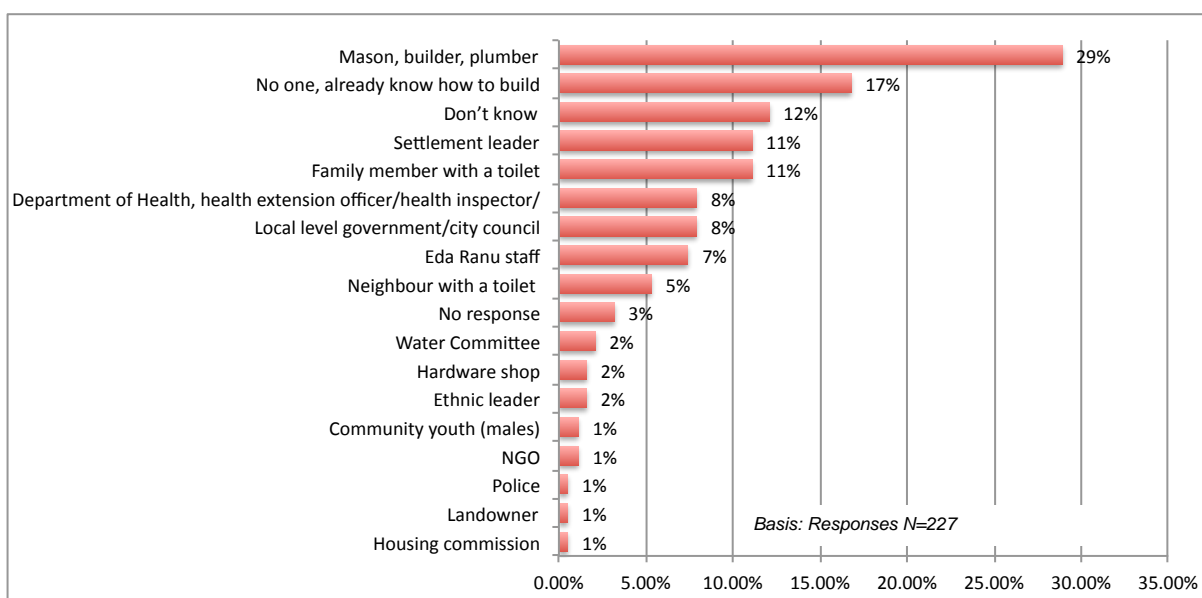


Technical advice from specialists and own knowledge

Advice on building a toilet would be sought primarily from specialists in the field eg. masons, builders and plumbers, however a number of households claimed they already had the knowledge on how to build a toilet (figure 9). The survey question did not differentiate between building a pit toilet or a septic toilet although in the focus group discussions some men suggested that building septic toilets would need technical advice from people who know

how to build these toilets. Given observation of the technical shortcomings of some toilets there is considerable scope for improving the knowledge of home builders.

Figure 9 – Where to get advice on toilet building



Households do spend money on sanitation

Building a simple pit toilet ranges in cost from K200-K500 (US\$81-\$202) with up to K1,000 (US\$404) and K2,000 (US\$808) when land is also purchased as part of the construction. Used vehicle tyres which are sold in town are used to support the pit walls from collapsing and cost K20 (US\$8) each. Other materials such as metal oil drums are used for pit lining (K10 each – and typically requiring 3-4 no.). Timber (K30-K100/US\$12-US\$40), roofing iron, sago leaves, nails and labour costs for helpers (including food for workers) are all expenses for building a simple pit latrine. Even the most basic toilets made from bush materials and timber off cuts incur costs such as transport of materials from outside settlements. Costs for rebuilding a pit toilet after the pit is full are difficult to calculate, however as a minimum it can be assumed to be equal to the cost of pit digging and lining materials.

Hardware is available but expensive

During the field work hardware shops in Wewak were visited to find out what sanitary hardware was available in a typical provincial town and what the prices were. Prices and products are presented in Table 5. A local PNG product - green plastic toilet unit consisting of pedestal with seat and lid for use in a pit toilet - were out of stock in two hardware shops due to popularity. These were often used in rural areas.

Table 5 – Prices for sanitary hardware

Sanitary Product	Price	Source
Ceramic Asian squat pan with trap	Was K150.95 but on sale for K67.30	Indonesia?
Ceramic cistern and pedestal toilet bowl	K278	Astra pak (Australia?)
Ceramic pedestal toilet bowl	K95	
Plastic toilet seat and lid combination	K35-K45	Plumbworx Australia
Plastic toilet seat and lid combination (Black or white)	K12.15	Indonesia
Plastic toilet stand and seat/lid (for pit toilet) (green)	K250	Tuffa (KK Kingston) Papua New Guinea
Plastic toilet stand and seat/lid (for pit toilet) (green)	K229	Belltech Papua New Guinea
PVC pipe 50mm Φ 5.8m	K65	Australia or New Zealand
PVC vent cap 50mm Φ	K4.50	Australia or New Zealand
1x 40 Kg bag cement	K33.35-K37.85	Papua New Guinea
1x 50 Kg bag cement	K37.90	

Some interest in financing of toilets

About half the households interviewed in the household survey said they would take a loan to build a toilet. The main reason given for taking a loan is that it provides financial support to enable a better quality toilet, the use of longer lasting materials, and the toilet could be built quicker as materials could be obtained faster than without a loan. Others simply wanted to take a loan as it was a way of improving the family health, sanitation and living. Those that were not interested in a loan had no regular source of income and could not meet bank requirements to obtain a formal loan, such as collateral or having a job. Others also felt that a loan would not work for people that were unemployed. For female respondents who were unsure about taking a loan indicated that this would be the husband's decision, and they could not comment.

Neighbours who think the same may upgrade toilets

About half the households thought their neighbour would improve or build their toilet in the next 12 months, mainly because they have the same concern to improve their health/toilet. Some of the reasons given why neighbours would not be likely to upgrade or build a toilet were that they had no money, were lazy, were comfortable using the bush and other's toilets.

The community can help the poorest households with sanitation

Responses to a question about how to help the poorest households in the community indicated a lot of good will and altruism towards others. There were many suggestions about helping the poor by providing materials, helping them to build toilets with community voluntary labour, or simply donating or fund raising money for toilet building. Youth groups were suggested as being key helpers to build toilets, in the survey, focus groups and the stakeholder workshop. Mention of the government or outside donors providing support for the poor was rare, indicating a low expectation of outside financial assistance.

Public toilets are not supported

Public toilets were widely thought to be an unsuitable solution to the sanitation problem as they would not be managed, maintained or cleaned properly. There is a feeling that they would also be targets for vandalism from drunkards or drug users, as well as expose women to risks from physical violence and sexual assault. Others did not want to wait in line to use the toilet. Women also suggested that some households might claim any public toilets as their own and control their use, leading to conflict. Women were adamant that public toilets should not be encouraged as no one would take ownership of them.

Of the very few people supporting public toilets, they saw them as a potential solution for households who could not afford toilets, but only if leaders guarantee that plans and regulations will be imposed for the management of the public toilets. This seems unfeasible.

Poor or no sanitation has safety, security and conflict implications

The issue of sanitation provides many opportunities for insecurity, conflict and physical and sexual violence in settlements. These examples were provided during the research:

- Often arguments occur as a result of excessive usage of other people's toilet, those that do not have a toilet feel ashamed when arguments occur and resort to using the bush or drains

- Arguments with neighbours also occur when pit toilets are full and there is argument about land space for building a new pit
- Sometimes when children defecate in the neighbour's area, it creates conflict and trouble with neighbours
- Using the bush is not safe as one can get bitten by snakes
- Girls can also get raped while using the bush as a toilet so it is not safe. In ATS and June Valley settlement focus groups said that it is not safe when women and girls are using the bush and the toilets at night, as they can easily be attacked by drunkards.
- Women said arguments between husband and wife and between families do arise just because of not having a toilet and it leads to domestic violence in the house.

I talk a lot about getting a toilet and my husband gets cross, domestic violence usually results.

– Woman, 9 Mile Settlement

Wastewater disposal adding to pollution

Most households dispose of household waste water in their yard or garden, while others have access to drains in their yard or to a street drain for disposal, or pour it into a creek or stream. Very few households (around 4%) dispose of waste water in toilets.

Wastewater from pigs and chicken raising were also mentioned as causing pollution in some settlements.

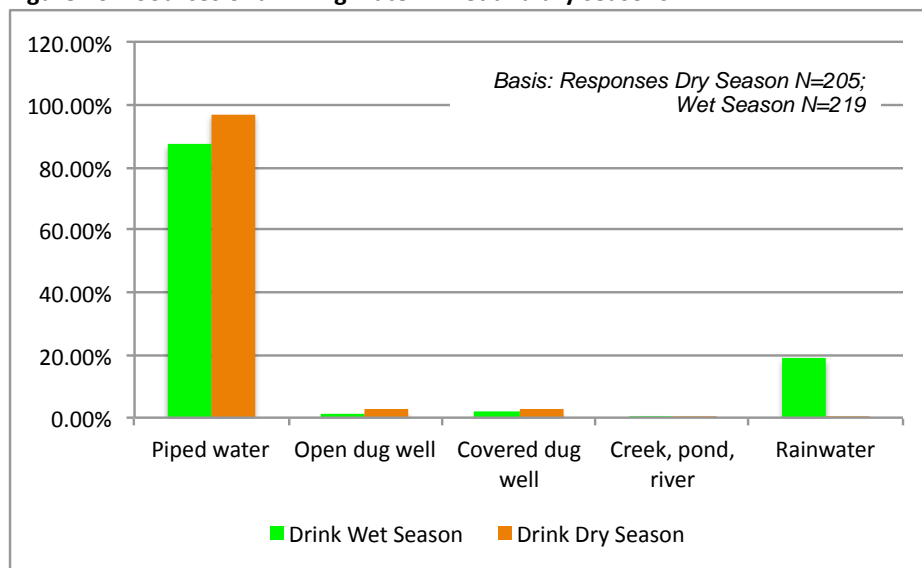
Drainage is a serious problem in some settlements particularly in Wewak where the water table is already high. Women raised concerns about people using drains for defecating and the health risk because women and children bathe in the drains, and when there is no water at all, the drains are also used to wash clothes and dishes.

4.4 Water Supply

High use of piped water for drinking, but access is poor

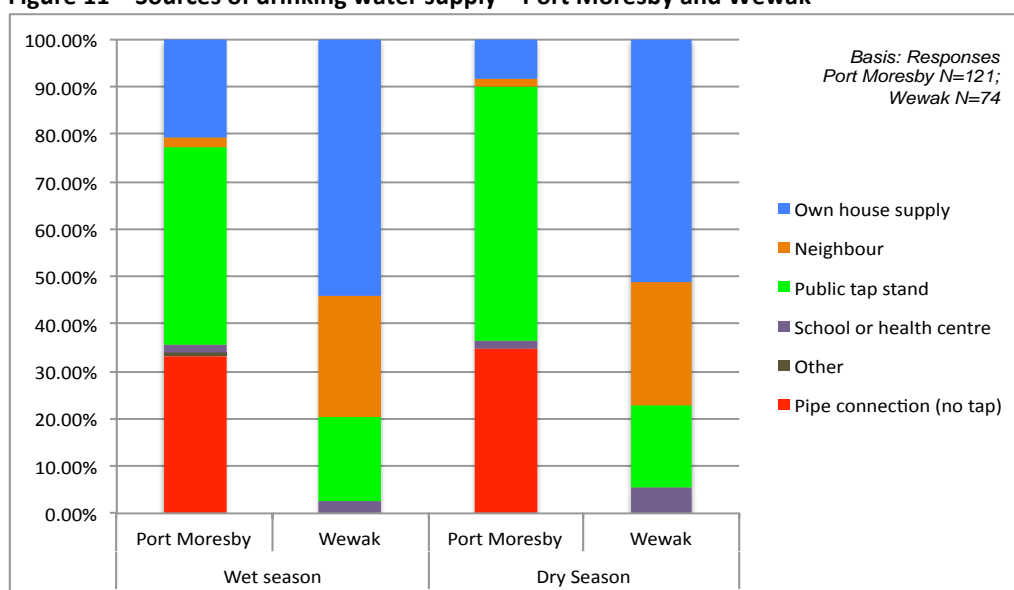
The majority of households use piped water (from Eda Ranu or Water PNG) for drinking in both the wet and dry season, although there is some substitution of rainwater for drinking in the wet season (figure 10). Focus group discussions in Wewak suggested that dug wells were a common source of drinking water, although this did not come out strongly in the household survey. A serious problem with dug wells was that they were polluted from toilet run off by flooding in the wet season.

Figure 10 – Sources of drinking water – wet and dry seasons



While there is little change in the location where water is sourced between the wet and dry season for either Wewak or Port Moresby, there are significant differences in where water is collected between these two cities (figure 11). Settlement residents in Wewak are more likely to get water from their own tap or a neighbour’s source, while Port Moresby settlers collect water from public tap stands or illegally tapped pipes.

Figure 11 – Sources of drinking water supply – Port Moresby and Wewak



Access to piped water through an unauthorised connection provides a low service level: low pressure, many users, time consuming, distance from household, and unsafe collection point. Wewak settlements had better access to piped water and a higher level of service than Port Moresby due to historical piped water connections to groups of households in some settlements. Expansion of existing

services was not occurring however, and there were no plans by Water PNG to improve accessibility of the service.

The water supply situation is dynamic in Port Moresby with recent connections and disconnections to settlements and different ways of accessing supply, including tap stands installed by Eda Ranu, illegal connections, and a combination of these. Recently politicians have been funding water supply to settlements which is then provided by Eda Ranu as tap stands for groups of houses, and managed by the community. In Segani settlement Eda Ranu installed additional standpipes in late 2013 (previously only two with irregular supply) however only four out of five water points were working due to low pressure. This places extra demand on existing standpipes, resulting in delays and queueing.

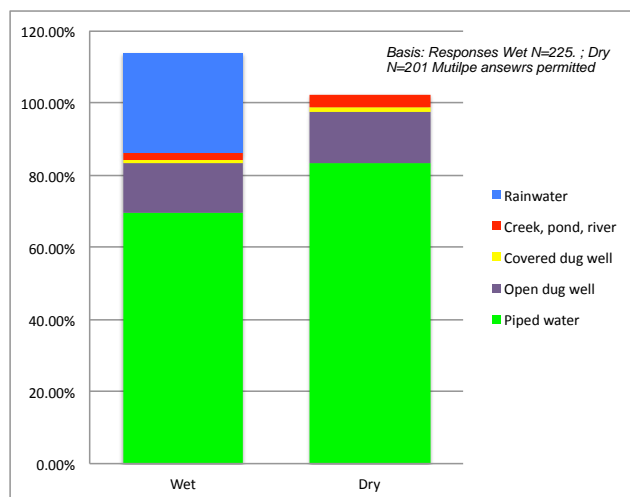
In 9 Mile settlement a local politician allegedly paid K100,000 for water to be connected in early 2014, after the community was presented with a bill from Eda Ranu for K87,222.

In June Valley water was sourced from illegal pipe connections into the network including some households with their own direct connection.



A poorly planned connection provided by local MP does not provide much service improvement for women who have to walk long distances and wait to fill containers

Figure 12 – Sources of domestic water – wet and dry seasons



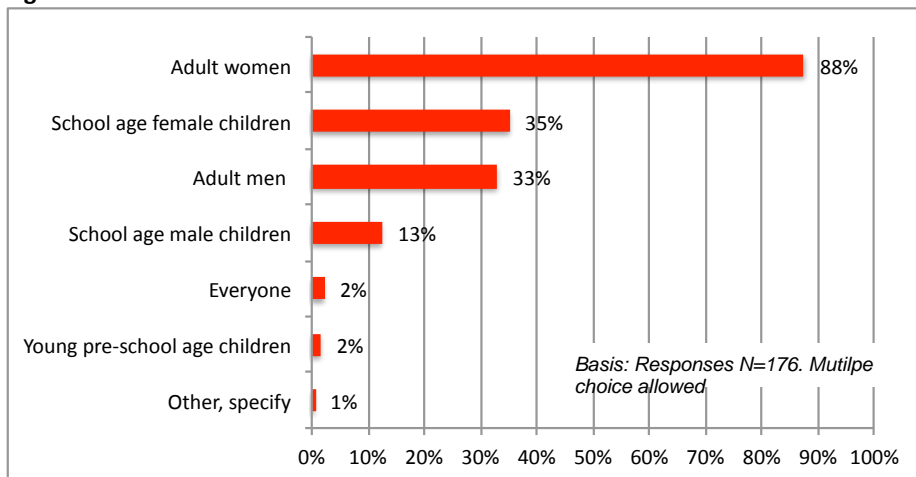
High use of piped water for domestic use in the dry season

The source of domestic water (for washing clothes, washing dishes, bathing etc) in the wet season is primarily piped water (70%), rainwater (28%) and open dug well (14%) (figure 12). In the dry season there is greater use of piped water (84%) with dug wells used about the same (14%) and a slight increase in the use of creeks and rivers. Use of small open ponds for domestic use such as washing dishes, laundry and bathing, was more common in Wewak, but also a problem for contamination from toilets due to the high water table and flooding.

Water collection wastes large amounts of productive time

The location of the water source has profound implications for the time spent in collecting water, and loss of productive time, especially for women to whom the burden of water collection mainly falls and for young girls (figure 13). This time could be better spent earning income for the family, in education, and other productive and beneficial work.

Figure 13 – Who collects water



In Wewak, off-premises water collection took between 5 and 30 minutes, while in Port Moresby, especially in the dry season water collection typically took two hours, but up to four or five hours for some households due to distance and waiting time. For example, In 8 Mile settlement the water pressure had recently been reduced, so while walking to the illegal connection might take 10 minutes, waiting in line and then filling containers can take hours. Because women are manually carrying water between the collection point and their home, they usually need to make multiple trips to satisfy water needs of large households. Even if water collection takes just one hour, this may be needed three times per day, taking three hours each and every day. For young girls, this responsibility may impact on school attendance. To avoid queues when collecting water, some women collect water late at night and/or very early in the morning, thus putting themselves at risk of violence.



Even if the connection is an approved one, due to low pressures and high demand from many households, collecting water is tedious and time consuming, taking several hours each day



Waiting in the queue for a trickle of water wastes time for many women in settlements



The long walk home – women carry at least 20 kg of weight in water

Women are also carrying heavy loads of water - 20-30kg at one time. Aside from immediate back pain and tiredness, frequent carrying of loads beyond the body's capacity for adaptation or repair has long term health implications and may lead to injury through fatigue failure, accumulation of fatigue damage or early degenerative changes in bone and soft tissues.

During fieldwork men in Port Moresby settlements expressed the strong need for water supply to relieve women of this time consuming and heavy task. Water shortages also affect children who are sent home from schools when there is no water.

Domestic violence and conflict occurs over water

According to a focus group discussion of leaders in 8 Mile settlement, domestic conflicts and violence usually occur when there is not enough water in the house. Women in ATS settlement stated that women and children who need to collect water at night (from the previously few collection points) are put at risk from physical and sexual violence.

For some women, water is not available within their residential block and they must walk to other blocks within the settlement. As a result, arguments with women and children arise over the water and they are forced to steal water from the other blocks.

I run a piggery. Water is my business, now without water it is really hard to look after my business and it affects my family as well, I give too much work to my children and they get tired and when I complain my husband gets on me, he chased me with a knife yesterday when I did not want to pay K100 for the connection of the water supply. I don't want to pay because I just came in last year and I should not be told to pay K100 at least a K50 would be reasonable. – Woman, 9 Mile Settlement

Disputes and conflict arise over contributions to shared bills eg. households sharing a tap stand or meter, or when one household takes over a water point and controls it. In Wewak billing by Water PNG was sometimes irregular (sometimes one month, sometimes two or three months) with a rising debt up to K,1000 and threat of disconnection. At this point some households were unwilling to make a contribution, leading to disputes and arguments. Water PNG in Wewak acknowledged that on occasion bills were not delivered to the correct person each month, especially if meter readers did not know the area and community well.

Illegal connections increase risk of water contamination

Most households (75%) do not treat their drinking water as there is a common perception that piped water is good quality because it is already treated by utilities. Some households boiled water and/or let it settle as forms of treatment. Breaks in supply eg. when the main network is turned off and then reinstated, are also a potential source of contamination. Some households had observed that when the water is cut off and supply is then resumed, there is a lot of dirt in the pipes and there was concern about the quality of water when this happened. Drinking water was avoided as in the past children got diarrhoea.

While the need for household treatment of drinking water is low given the widespread use of treated piped water, the practice of collecting water from illegal connections and cut pipes poses a contamination risk from both the water containers and the water point. More than 90% of households store water in the household. Many households collect and store water in PET Coke bottles for drinking water, and jerry cans for cooking and other domestic water, but some use recycled bottles previously used for oil or chemicals such as acids. Dirty and muddy polluted water around the collection point can easily enter containers and contaminate water. According to NGOs working in settlements, containers are not cleaned and often contain mould.



Not only is the water pressure low, but there is a risk of contamination while collecting water from these illegal pipe tappings

Settlers are paying for water, but not always fairly

Just over half (55%) the households surveyed are paying for water. Methods range from paying someone who controls an illegal connection K2 per bucket or K2 per load of containers or K2/K5 per day in 8 Mile and 9 Mile, to K10 per month from community managed public tap stands in Segani, to monthly (or more infrequent) payments through formalized water billing for a shared tapstand from Water PNG in Wewak. For those households paying for water, the estimated average monthly amount paid for all sources of water is K43 (US\$17.37).

A sample of household payments and quantities of water, obtained from the household survey and interviews, are presented in table 6. What this selection shows is that there is wide variability and inequity in what households are paying for water, especially based on their consumption per month. The estimated unit costs per kL (1,000 litres or 1 cubic metre) ranges from K3.79 (US\$1.53) to K100 (\$US40.39). By comparison, the Eda Ranu regular tariff is K1.00 (US\$0.40) per kL, up to the first 15 kL consumed per month. Water PNG has a minimum charge of K16 (US\$6.46) for 0-12kL. Clearly some settlers are expending a lot of effort to get a little water and paying a lot more for it than households in formal areas with connections directly to their house.

Table 6 – Sample household water consumption and payments

Location	Household size (No.)	Price (Kina)	Unit of Payment	Quantity (Litres)	Other source/use	Frequency	Calculated household consumption per month (litres)	Estimated unit cost per kL (Kina)	Calculated total spent on water per month (Kina)
8 Mile	unknown	K2	Container	20 L		4 xs per week	347	K100.00	K34.67
9 Mile	3	K0	various containers	78 L		every 2 days	1,186	K0.00	K0.00
ATS	unknown	K2	Load	111 L	Use creek for washing clothes	1-2 xs per week	722	K18.02	K13.01
ATS	4	K2	Load	90 L	Use rainwater for washing clothes	Daily	2,700	K22.22	K60.00
ATS	7	K2	Load	160 L		2-3 days	3,328	K12.50	K41.60
Segani	14	K10	Month	88 L	Water supplied by Eda Ranu standpipe	Daily	2,640	K3.79	K10.00
Wewak					Water standpipe supplied by old PNG Waterboard				
Ward 10	Varies	K10-20	Household	Varies		Month	unknown		K15.00

Note: volumes were calculated based on the observed size and volume of containers, with collectors asked how frequently they collect this quantity and how much they paid per unit

Willingness to pay for a better service

90% of households want to improve their water supply, and of these, 94% are willing to pay for better water supply. For example, June Valley residents were willing to pay for a better service and thought if five or so households had a dedicated tap stand then collecting money from every household clustered around one tapstand would be feasible.

If we ask every household to pay K5 every month then it is very easy.

– Man, June Valley Settlement

Even households with illegal connections wanted a better service. For example a household with an illegal connection to Eda Ranu water said they wanted to improve the reliability of their erratic supply and “go straight” and were willing to pay for the better service.

There was a general sense that settlements had “learned their lesson” from the past when water had been supplied but was cut off due to non-payment. Many people expressed a willingness to pay for better access to larger quantities of water as it was critical to family life and health.

Wara em laif – water is life.

- Highlands Woman, 8 Mile Settlement;
- 50 year old man, 9 Mile settlement;
- 34 year old man, ATS settlement

Preference for household water connections

Most households were interested in having a household connection with a meter for the following reasons

- do not have to share with others; avoid conflict and disputes over water usage
- reduced cost – can control the water usage and pay for what is used
- convenient and easy access for household water use;
- more private, healthier and safer; can use night and day; avoid vandalism of tap stands, and avoid others claiming the supply and selling water
- saves time; tired of walking long distances.

As one respondent put it: *My body aches from carrying water so I want water to come into my household.*

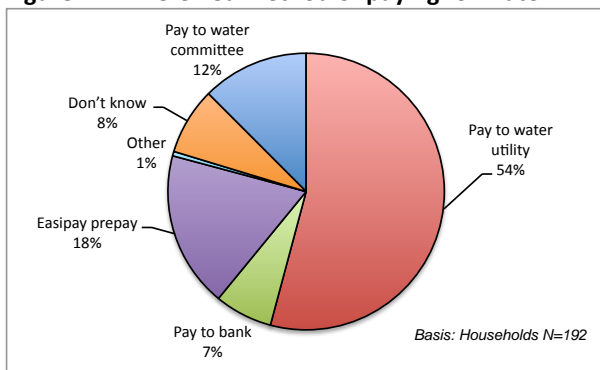
Regular payments to utilities preferred

A monthly payment frequency was preferred although it is thought that households did not understand the concept of paying a smaller amount more frequently. A more frequent payment option eg. fortnightly, which would be sensitive to the cash flow needs of low and informal income households, could be explored further by water utilities as a way of improving payment recovery rates and contributing to non-revenue water reduction.

Paying water bills to water utilities was the preferred payment method as the money was seen as going straight to the service provider as direct payment for the service (figure 14). While a few households were comfortable paying the water committee, partly due to their presence in the community, many were not and expressed a strong distrust of the water committee’s ability to manage the finances honestly and without misuse. Some settlements previously paid water committees or leaders but this had failed. In 8 Mile settlement past water payments had been collected by a water committee but the monthly fee was not paid to Eda Ranu and eventually the water was cut off. Support for paying through banks and easipay¹⁹ was because these methods provided a receipt and evidence of having paid and the money would be safely used for the purpose intended. In Wewak, where there had been some slow billing and disconnections, easipay was thought to be better for avoiding disconnections as the current charge could be paid on time and access retained.

¹⁹ Easipay is a prepaid method of paying for electricity supplied by PNG Power via a Digicel mobile phone. Consumers can make a minimum K15 payment against their meter number. The advantage is that consumers can check their balance, pay small amounts at a time, buy units 24 hours a day, make payments without visiting the PNG power office or agent, and avoid disconnection.

Figure 14 – Preferred method of paying for water



Where piped water is formally available in settlements, payment collection is rather sporadic and unequal. For example in Segani settlement, households are billed K10 per month through a well organized water committee, which publically displays the amount owing for each household, but some ethnic groups refuse to pay for water, and not all installed taps are functioning.



Segani local councillor publically displays records of which households have paid their monthly water bill and which ones are owing payments.

Utility policies are a barrier to accessing water

Both Water PNG and Eda Ranu have policies that prohibit household connections in settlements where the landowner is unknown, however neither utility discloses its connections policy or procedure on their website. A men’s focus group in Wewak stated strongly that Water PNG must change its eligibility guidelines or criteria as these are a barrier and stop people from being connected to the water supply. The community thought that a connection could only be obtained with three approvals – from landowner, ward councillor, and Court House. Clarification from Water PNG in Wewak was that applications are made by completing an application form with some proof of ability to pay eg. electricity bill, work pay slip; and some identification or statutory declaration. It was also mentioned that Water PNG will not supply to an area if there is substantial debt, unless an individual can show some proof of ability to pay. Another technical barrier, that overrides any connection policy, is the lack of a mains pipe in the area and sufficient pressure in the network, and sufficient water treatment capacity, and ultimately sufficient raw water to supply water.

4.5 Hygiene Behaviours

Some understanding of Fecal-Oral Transmission

Defecating in the open was widely stated in focus group discussions as a way of transmitting disease including diarrhea, and cholera, but also TB. Open defecation in bushes was thought by men and women to be unhealthy, smelly, and brings diseases and sicknesses through flies landing on faeces and then food.

The potential for toilets to cause sickness were also expressed eg. when pit toilets overflow during floods, and also septic systems discharging waste to street drains and causing the same health and disease problems as open defecation.

Diarrhoea is common in children under 5

Of the 140 households with a child under 5, 34 households had a child in this age group with diarrhoea in the last two weeks. This gives a *household* prevalence rate of 24% of households with a child under 5 with diarrhoea.

Survey respondents stated that the main causes of diarrhoea in children were dirty hands, dirty water and dirty food (table 7).

Table 7 – Causes of diarrhoea in young children

	Number	Percent of Cases
Dirty hands	98	49.00%
Bad/dirty water	69	34.50%
Bad/dirty food (incl fast food, cold food, eating too much protein)	63	31.50%
Flies	43	21.50%
Poor hygiene	42	21.00%
Feces/defecating in the open	23	11.50%
Germs	18	9.00%
Don't know	16	8.00%
Rubbish/drain waste	3	1.50%
Dust/dirt	3	1.50%
Dirty utensils	2	1.00%
Oily food, eating too much oil/butter	2	1.00%
Food allergy	1	0.50%
Lactating mothers with dirty breasts	1	0.50%
Total	384	192.00%

The main ways suggested to prevent diarrhea in young children were:

- Wash hands ❖❖❖❖❖
- Drink clean water ❖❖❖
- Use soap ❖❖
- Prepare food hygienically ❖❖
- Use a toilet to defecate ❖
- Dispose of children's faces in a toilet ❖

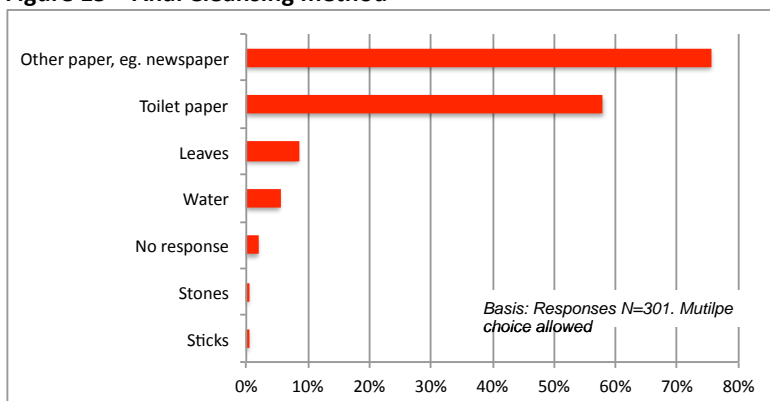
Handwashing knowledge but not practice

Knowledge of the importance of clean hands as diarrhoea prevention in young children is high. The survey found that the most important times to wash hands were: after defecating, and before eating, followed by preparing food. This indicates that hygiene knowledge is reasonably good, however there is a gap between this knowledge and actual practice. According to the household survey only one third of households had a place for washing hands. This place was commonly either a yard tap which may or may not have soap, or a bucket of water outside. Observation during the field work showed that rarely were handwashing places located close to the toilet, and handwashing appeared to be seldom practiced.

Newspaper is the most common anal cleansing material

The survey and observation shows that newspaper is the most common anal cleansing material (figure 15). A telephone Yellow Pages was also observed in one toilet. Although the survey indicated toilet paper was also used this was rarely observed, and households may think of newspaper as toilet paper or use toilet paper for a limited time. A few households use leaves and water, and some households use sticks and stones.

Figure 15 – Anal Cleansing method



Newspaper as anal cleansing material observed in toilets

Menstrual Hygiene practices

During menstruation, women clean up by bathing, sometimes at the same place they collect water for cooking and drinking. Some women prefer privacy and carry the water all the way back to their homes to clean up or bathe. In Wewak during menstrual periods women use the same area they normally bathe in, but when there is no water they walk long distances to bathe or at least clean and change, while others go to the sea. Sometimes women steal water from others because they are desperate to clean themselves.

Women and girls use sanitary pads bought from the small canteens in the settlement, others use babies diapers because it is less expensive than the sanitary pads, toilet paper and also pieces of cloth, or face towels when there is no money at all to buy sanitary pads.

During menstrual flow, most women usually dispose the used sanitary pads in pit toilets; others store the waste pads in plastic bags and then dump these in places where all the rubbish is disposed. A hazard of this practice is that sometimes dogs scavenge in the rubbish for food and drag out the sanitary pad waste and expose it openly which causes a lot of embarrassment for women. Many women dispose of pads into creeks or drains. Some women store the waste pads and carefully burn them later. Pieces of cloth or face towels or cloth nappies are washed and dried for use again later.

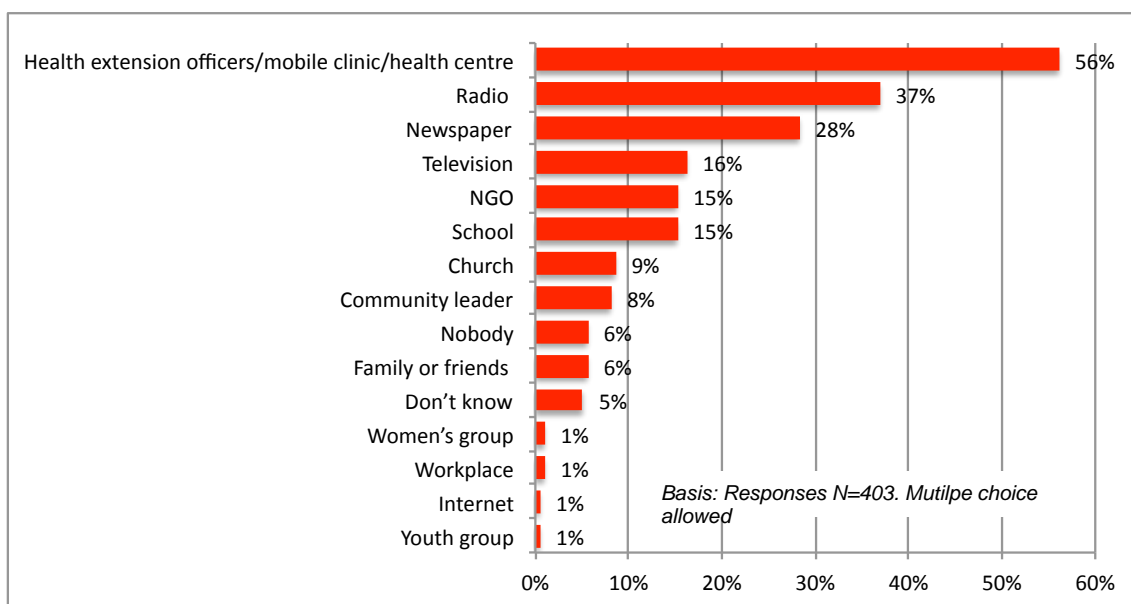
Health staff are the main sources of hygiene information

The main source of information about personal and household hygiene is from health extension offices, hospitals, and clinics (figure 16). Mass media also plays an important role in spreading information, particularly via radio.

In some settlements health staff never or rarely visit and for some residents the only contact with health staff is when they visit a health centre or hospital. In ATS settlement hygiene and health awareness was from visiting hospital, the sister from the *haus sik* coming to the settlement, and also *Susu Mamas*²⁰ mobile clinics in settlements. Settlers in Segani also mentioned World Vision as bringing health information.

²⁰ *Susu Mamas* is a non-government organisation (NGO) that was formed over 30 years ago to support and promote breast feeding for infants. It now provides primary health care services.

Figure 16 – Source of personal and household hygiene information



4.6 Gender Aspects

The research highlights very clear divisions of labour around water supply and sanitation and in the decision making and control of resources which would lead to improvements in services. Men are responsible for ultimately deciding whether to build a toilet or not, providing the money or taking a loan for this, and are the ones who physically build toilets. Women are users of toilets but also look after the toileting needs of others eg. infants, sick and elderly, and also have special needs in terms of menstrual hygiene and sanitary materials disposal (or reuse). Women and girls are at risk of physical and sexual violence if defecating in the open or using a remote toilet at night. However women have little say in whether a toilet is built and the type of toilet that is built and where it is located.

There is an opportunity for sanitation promotion and marketing to recognize the unique roles of men and women and tailor approaches and information to men and women. For example technical information on different improved toilet models might be primarily targeted at men. Men might be more supportive of better sanitation if they are persuaded that it protects women and girls and has a better health outcome for their family. There is likely a degree of pride for men in having self built an improved odourless toilet.

Women are the prime collectors of water for all household needs yet have no influence on the provision of water to their household and community. While some men sympathise with the physical burden of women in fetching water, they do not share this function. Women and girls are also exposed to physical and sexual violence if collecting water far from home at night. Clearly women need to be brought into the planning and implementation of any water supply improvements as this has a direct effect on their everyday lives. Men may be a powerful voice in advocating for better water supply if they are persuaded that paying for a better water service reduces the physical and time burden for their female family members.

Awareness and promotional approaches for water, sanitation and hygienic behaviour will need to consider the generally low level of education in the community, but the particularly low education of women.

4.7 Development Priorities

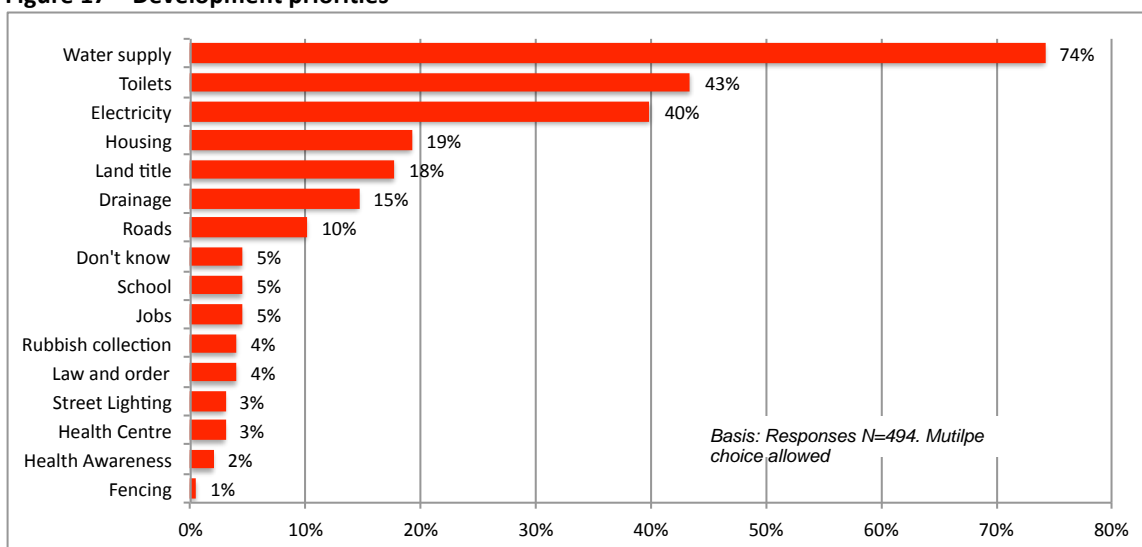
Water supply was the most important development priority expressed by households followed by toilets and electricity (figure 17). Notably housing and land title each were not listed as top priorities although in some of the focus group discussions, obtaining land title was seen as a major priority and the key to unlock improvements in access to services and infrastructure. Non-ownership of land had been the basis of refusal for connecting water services in the past. Women in 8 Mile said they hesitate

to upgrade water and sanitation in fear that they can be evicted from the area when NCDC wants to develop the land. Men in 9 Mile settlement felt gaining land title would bring access to services and security as being on customary land they could be evicted at any time despite the settlement existing for 20 years.

For women, a better water supply was critical as they are the ones that spend the time and energy collecting and carrying water.

As settlements have different local physical and social conditions, other priorities for development vary according to these local needs. These were expressed as: drainage, solid waste collection, sealed roads, development of different skills for youths so they can get a job, also education programs like early childhood and adult literacy, and addressing law and order issues related to alcohol abuse and marijuana use by youths.

Figure 17 – Development priorities



Suggestions from the community and local leaders specifically on water supply and sanitation included:

- Conduct awareness on how to build good toilets, using toilets, cleaning and maintaining the toilets
- Provide technical advice on building appropriate toilets
- Provide combined septic tanks between 4-6 households
- Provide loans to build toilets
- Conduct more awareness of water supply system and treatment, including more engagement with utilities, so leaders and community members can better understand the need to pay for water
- Conduct community awareness within settlements including with the Police and NGOs.
- Improve management skills of leaders so they can mobilise the community to develop, use and pay for services.

Community Leadership needed

The role of the local councillor and/or community leaders in mobilizing and coordinating community resources was seen as important in both helping the poor but solving sanitation and water supply issues generally. However, households were frequently critical of government leaders being too self-centered and not doing their job to help people. The support of leaders for project initiatives was felt to be missing, and meant that sometimes individuals in the community took it upon themselves to solve problems. For example, in Wewak a group of women organized themselves to make a water connection application which they presented to the mayor, however they were told there is a holdup due to lack funding for household water connections. In June Valley a mothers group is closely following the progress of a plan from Eda Ranu to supply water through shared taps.

We would be willing to pay for better water and sanitation services, we can be creative with our own initiatives to raise funds and start projects however the community is not too supportive in helping us, we have our own little group we formed to try to help our women and youth in the community.

– Woman, Wewak Settlement

Where there are strong local leaders they can be quite influential in the community, but only up to a point. For example in Segani the community leader had developed a transparent payment system for water supply, however a different clan group refused to pay the water bill, which indicates that community leadership does not override social and cultural networks.

There was a high degree of support expressed for any organization willing to bring better water and sanitation services to settlements. From the community, this support is more likely to be in the form of labour and mobilisation rather than cash.

4.8 Comments

Comments were received from only 68 out of 200 households surveyed. Comments focused on reiterating the need for water supply and sanitation, questioned what the government is doing about the issue, including land title, and also what will happen after the survey.

- *After 20 years without proper water supply; we have been neglected, we need services*
- *Government must help us earn land title and provide proper water and electricity; government must help us to build septic toilets connected to sewage pipes*
- *Every household should have their own toilet, women also bath at the public taps which they should not be doing that, it is very unhealthy*
- *Main waste water drain flooding during wet season leaving debris, waste and faeces everywhere which brings all kind of diseases, we would like proper drains and proper sewerage system in place.*
- *Most people use the beach and mangrove for toilet and it is unhealthy*
- *Our area needs improvement of drainage and rubbish collection, also improve housing and support from healthy island programmes; we need clean piped water, good drainage and awareness on hygiene*
- *We need each household to have toilets and water supply to avoid conflicts*
- *We need proper water and sanitation to prevent diseases affecting our health*
- *Bring water into the settlement so I can bring it to my yard. My back is aching from carrying water*
- *We just need water to come inside our households, it is a great need, Water is life.*
- *Eda Ranu should improve water pressure so every household should collect their own water*
- *Water is important; water is the major problem, water is the key*
- *Clean water is needed, we suffer during frequent floods*
- *Would like these basic services to come into the settlements so our lives would change*
- *Thanks for coming, water and sanitation is a great need in this community, many children under 5 usually suffer from diarrhoea*
- *After this survey what happens?; appreciate this survey; happy about this study*
- *If this kind of survey is conducted every quarter every year to conduct the healthy island concept it would be good.*

5. Sanitation and Water analysis using SaniFOAM

Further analysis of sanitation and water is considered appropriate, including summarising the findings within a structured approach, using SaniFOAM. SaniFOAM is a framework to analyze sanitation behaviors to design effective sanitation programs. Developed in Durban, in February 2008, at a workshop attended by participants from 6 organizations including UNICEF, the London School of Hygiene and Tropical Medicine, USAID and AED/Hygiene Improvement Project, SaniFOAM is designed to assist program managers and implementers in answering questions about sanitation behavior including the barriers and motivators for change.

In the acronym SaniFOAM, FOAM stands for:

- *Focus*: - who is the target for sanitation behavior and what is the behavior to be changed?
- *Opportunity*: - does the individual have the *chance* to perform the behavior?
- *Ability*: - is the individual *capable* of performing it?
- *Motivation*: - does the individual *want* to perform it?

This SaniFOAM framework is used to analyse the sanitation and the water supply situation in PNG settlements. The framework boxes (in bold) are populated with findings from the PNG settlement research for Sanitation (figure 18) and Water (figure 19).

Figure 18 - SaniFOAM – Sanitation in PNG Settlements

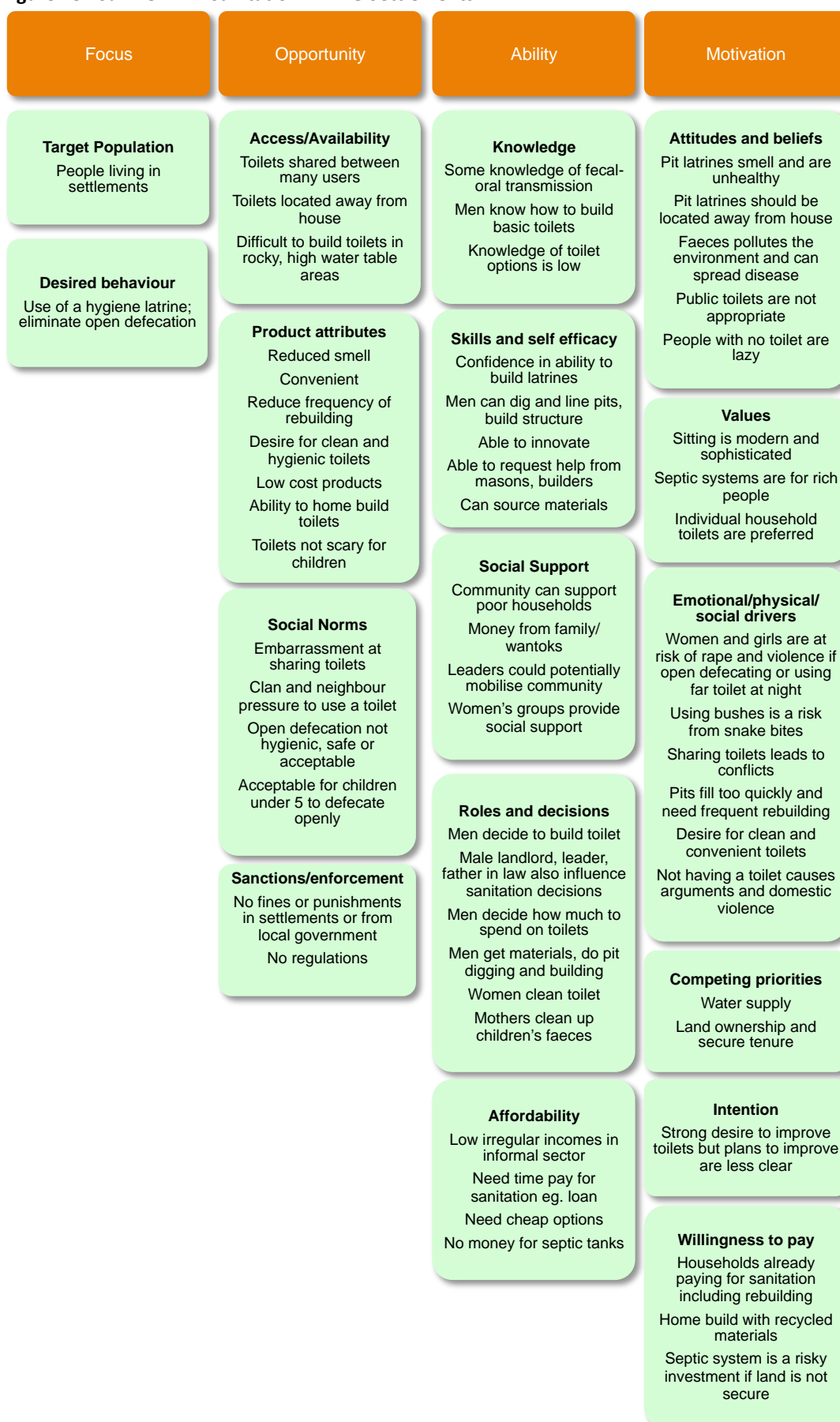
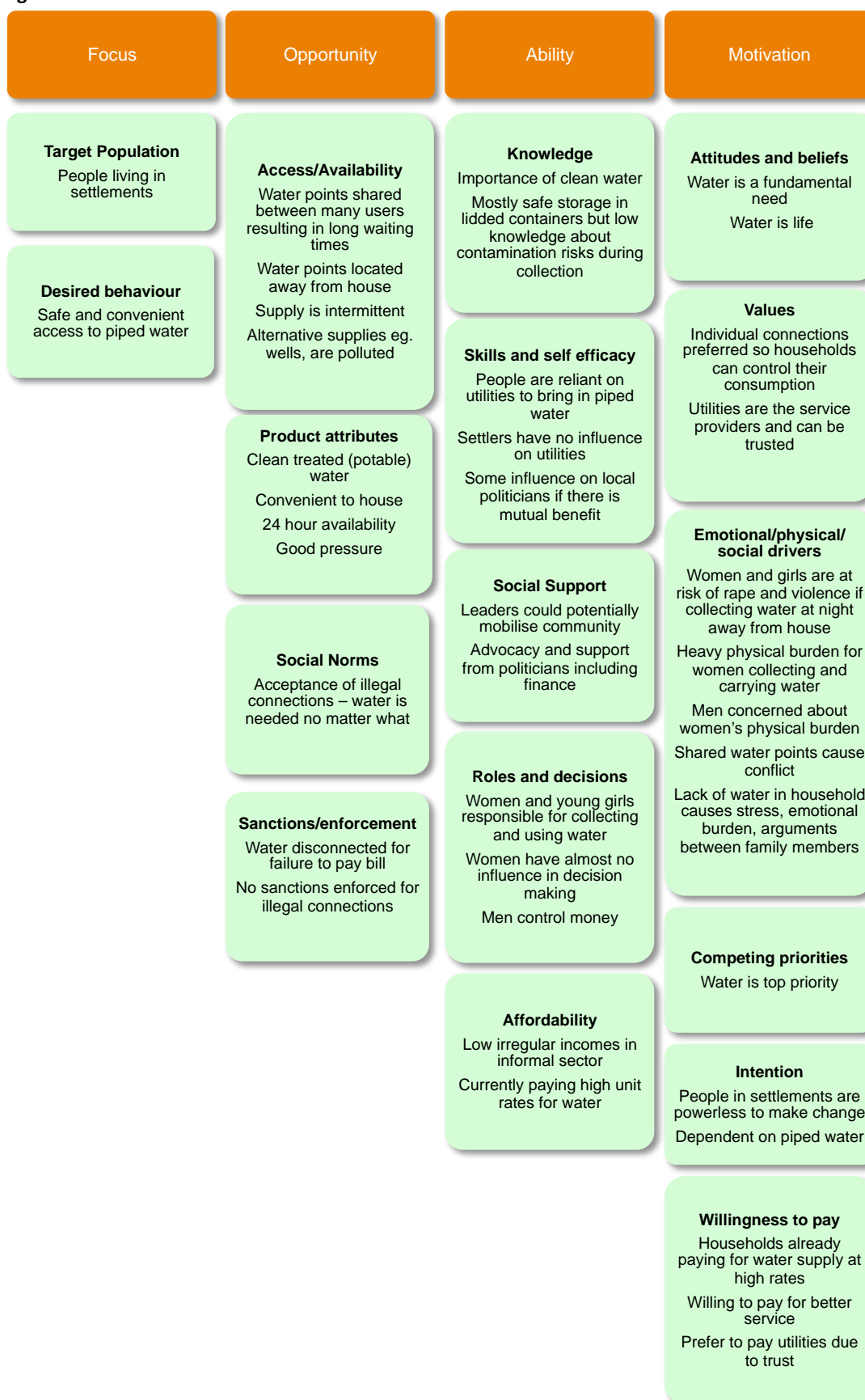


Figure 19 – SaniFOAM – Water in PNG Settlements



6. WASH models and initiatives

The follow section provides a brief introduction to existing and potential models of water and sanitation and lessons learned.

6.1 Sanitation

The ADB Provincial Towns Water Supply and Sanitation Project (2000-2008) included a Low-Cost Sanitation and Community Awareness and Health Education (LCS-CAHE) Program in Alotau, Lae, Madang, Mt. Hagen, and Wewak, targeting poor households in urban fringe areas out of reach of sewerage systems. The component attracted high demand for VIP latrines, although the cost of these was not “low cost” at an average unit cost of K3,340 (US\$1,200). Opposition to pit latrines from the Local Level Government in Madang reduced the impact of this sanitation improvement as septic tanks were insisted on. This project experience highlights two important points. (1) Engaging with LLG is critical in the planning and implementation of any improvement program. Wewak LLG, for example, is very willing to support improvements in settlements, even if this is improving on-site sanitation; others may be less willing. (2) project supplied sanitation is not low cost, and does not achieve wide scale impact. A better approach is to provide knowledge, skills, financing mechanisms, supervision, and monitoring for households to improve their own sanitation.

In 8 Mile settlement, NCDC is trialing a combined septic tank for residents of one block (from lalibu, Southern Highlands). According to people on site during this settlement field work, NCDC is paying for the communal septic tank and the cost of toilets (ceramic pedestal) and connections to the system. It is not clear which section within NCDC is supporting this initiative, nor how the issue of low water pressure (Eda Ranu closes supply between 4pm and 8am) will be overcome. It is also unknown what arrangements are made for user contributions and emptying.

A demonstration toilet exists in the Department of Health Environmental Health Division in Wewak, built in the 1980s during a period of active promotion of rural sanitation. As a demonstration model it has endured in good condition over the last 30 years but uses expensive materials eg. ceramic pedestal with cistern and a concrete slab. The pit is offset with a T-junction vent and no outlet. The reason for the offset is that a new pit could be built and the lining reused without destroying the toilet housing and slab. The principle of a demonstration toilet is good, however issues of affordability also need to be considered if a demonstration is to be effective.

The EU Rural Water Supply and Sanitation Program provides some good examples of simple improved sanitation backed by sanitation promotion such as Community Led Total Sanitation (CLTS), which could be applicable in urban settlements.

Internationally there are many examples of low cost toilets which focus on both the technical – pit design, ventilation, product durability, and social - user preferences and innovation, ease of use, odour and fly elimination.

The range of technical options for settlements is outlined in the following list, however the options depend on what the sanitation chain is in the wider urban area, including removal, treatment, and reuse of fecal waste.

- Ventilated Improved Pit (VIP) latrine
 - Relocate or arborloo
 - Empty and reuse the pit
 - Keep structure and move offset pit
- Sanplat with lid/cover
 - Relocate or arbor loo
 - Empty and reuse the pit



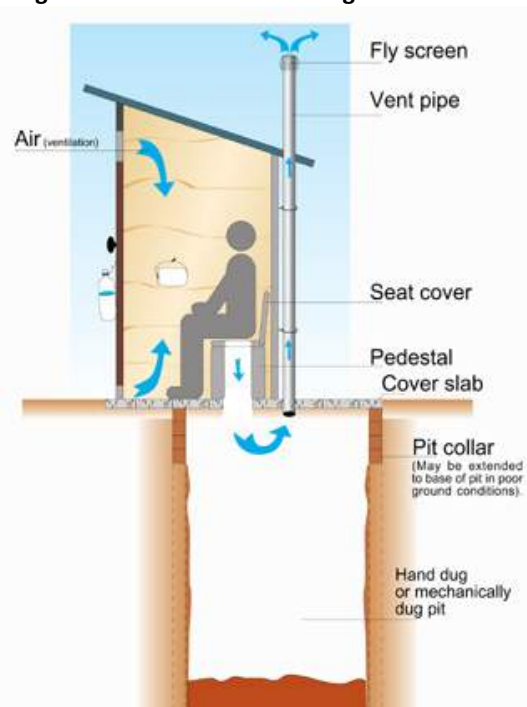
Low cost and hygienic pit latrine, Sibilai, Milne Bay (EU-RWSSP)

- Water-seal pan to pit
- Water toilet to septic tank
- Connection to sewer – where they exist

Cleaner slabs, pans and seats – with no smell



Figure 20 – VIP Schematic Diagram



6.2 Water supply

Local politicians are funding water supply in some settlements but without thorough consideration of payment mechanisms and sustainability. In Wewak local politicians are paying for water connections and water tanks to some settlements where Water PNG is able to provide sufficient pressure, or wiping outstanding debts of residents to reinstate supply. In 9 Mile a local politician had only connected water in early 2014 (to a main and poly pipes). No water committee had been formed or trained or tasked with collecting fees from households, although there was some discussion that K10 would be collected from households. In this vacuum some households near the start of the supply control and sell the water. While this shows some entrepreneurship on one level it is illegal and unfair. Similarly in Wewak where politicians give water tanks these are taken over by one family.

In ATS settlement, during the household survey, Eda Ranu began supplying water to tap stands serving between 5 and 9 households. The payment method for water was rather unclear, depending on who was asked, - ranging from paying per use or each household pays K10 per month to a household in charge of each tap stand.

Overseas examples suggest:

- Capitalizing on existing entrepreneurship in the community through formalized and metered water vending or water selling points/water kiosks – this provides jobs within a community
- If tap stands are provided, it is good practice to meter standposts to see which ones are being used excessively, are in high demand and which ones are not in use or not working effectively or not well used. This approach was suggested in Segani as there is conflict over use and payment of the tap stands and settlers feel it would be fairer to know how much water is used by different groups.
- Extending household connections to settlements through private or public utilities and Output Based Aid. This approach refocuses service provision on meeting household needs with operators receiving a subsidy payment only after an independent agent has verified that they have delivered working connections to the households.

In PNG settlements there is potential for greater awareness on water use, payments etc. Widespread awareness should precede water installation so that everyone in the community knows what to expect and what responsibilities are. ATS is an opportunity missed in this regard, clearly there is some confusion about who pays and how much.

7. Recommendations

Based on the research findings, the following next steps are recommended:

7.1 Sanitation

- Conduct market study on sanitation hardware and potential for low cost sanitary products to be available from local and international suppliers
- Using examples from PNG (including Department of Health's rural sanitation handbook) and internationally, develop a range of appropriate urban **low cost** on-site sanitation options which are acceptable, eliminate odour, are convenient and safe and can be built by the householder. These should focus on the safe containment of fecal waste below ground. Fully cost each option including separate costs for pit/below ground; slab/seat; and toilet superstructure.
- Develop toilet options such as septic tanks for difficult ground conditions eg. high groundwater table, rocky ground, clay soils
- Conduct pilots of limited sanitation options in settlements (preferably located on state land) and monitor use and performance. Wewak LLG and WaterAid have offered to support a pilot during 2014-2015.
- Develop and implement community awareness such as CLTS with sanitation marketing, so householders reject open defecation, realise the need for sanitation, and choose the sanitation options themselves
- Investigate financing options for improved toilets including low interest loans. Adopt a no-subsidy approach except in challenging environments
- Research the fecal sludge flow diagram in urban areas, beginning with the pilot town of Wewak and investigate opportunities for fecal desludging of pit latrines in Port Moresby and provincial towns
- Improve fecal sludge management and treatment such as developing and maintaining septage ponds
- Conduct an assessment of the potential for reuse of fecal sludge eg. as a fuel or fertiliser.

7.2 Water Supply

- Shortlist and trial suitable management options for improving water services in settlements eg. Output based aid, private water kiosks etc
- Review water tariffs and charging mechanisms and standardize for settlements to ensure equity and value for the level of service provided. Develop a policy on fees and charging mechanisms for settlements which is broadly consistent between utilities.
- Improve capacity of water utilities to engage with settlement communities including consultation with men and women.
- Increase awareness of settlement residents on how water is provided through field visits, education of leaders and ward councillors, presentations at community meetings.

7.3 Hygiene

- Conduct a detailed study on hygiene behaviours of specific target groups in order to develop behavior change communications
- Promote handwashing with soap at key times especially after defecating before eating, after cleaning up children's faeces.
- Introduce and pilot low cost handwashing facilities near toilets, and monitor use.
- Increase community awareness about health impacts of open defecation
- Promote the safe disposal of infant and children's faeces. Encourage the use of diapers, potties, and pooper scoopers to collect faeces and improve safe disposal.

7.4 Gender

- Involve women and girls in planning and decision making around improved water and sanitation facilities and services
- Target men and women separately for awareness and hygiene promotion activities according to their roles and needs.

7.5 Policy

- Include guidance on WASH in urban informal settlements and the need to provide services to all urban dwellers as a human right in the National WASH Policy.

Appendix 1 References

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- National Research Institute, 2008. *Improving Access to Land within the Settlements of Port Moresby*. Special Publication No. 49. Port Moresby: NRI
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- National Statistics Office, 2014, Census profiles for NCD and Wewak
- NCDC, 2006. *National Capital District Settlements Strategic Plan 2007-2011*. Port Moresby: NCDC Strategic Planning, Regulatory Services
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- UN-HABITAT, 2010, *Papua New Guinea Port Moresby Urban Profile*, United Nations Human Settlements Programme
- UN-HABITAT, 2010, *Papua New Guinea Goroka City Profile*, United Nations Human Settlements Programme
- UNHCR, 2010, *Housing rights assessment mission to Papua New Guinea*, 29 June - 9 July 2010

Appendix 2 Household Questionnaire

A-LOCATION			
City Name		Q No.	
Settlement Name		Date of Interview	
Interviewer Name		Tick when data entered	

My name is and I am working on a water supply, sanitation and hygiene improvement study for the Government of PNG. Your household has been **randomly selected** to participate in a survey to understand water and sanitation practices, services and desired improvements.

I would like to interview the head of the household or their spouse, or another adult who lives in the house. The answers will be used for the purpose of this study only and will be **confidential**. Your co-operation will greatly help in assessing water supply and sanitation improvements in your area.

Are you willing to answer questions about your household: Yes/No? If NO, thank the person and move to next house.

B-PERSON INTERVIEWED	
NAME OF PERSON INTERVIEWED	
SEX OF PERSON INTERVIEWED	Male..... 1 Female 2
RELATIONSHIP OF PERSON INTERVIEWED TO HEAD OF HOUSEHOLD	Head of Household..... 1 Spouse of Head of Household 2 Other Adult 3 No response 99
AGE OF PERSON INTERVIEWED	
HIGHEST LEVEL OF EDUCATION COMPLETED OF PERSON INTERVIEWED	No schooling..... 1 Primary 2 High school..... 3 Upper Secondary 4 Vocational or Technical 5 University or higher education 6 Don't know..... 96

C-HOUSING			
NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
1.	Type of dwelling? [OBSERVE THE MATERIALS THE HOUSE IS MADE FROM; CIRCLE ONE]	Permanent house – made from cement or brick ... 1 Semi permanent house - mixed construction, timber 2 Makeshift house – grass, recycled materials..... 3	
2.	Do you own this house?	Own house 1 Rent house 2 Stay in house for free 3 Don't know 98	→4 →4 →4
3.	Do you own the land this house is on?	Yes 1 No 2 Don't know 98	
4.	How likely is it that you could be evicted from this dwelling: very likely, somewhat likely, or not at all likely?	Very likely 1 Somewhat likely..... 2 Not at all likely 3 Don't know 98	

		No response	99	
5.	How long has your family lived in this house?			
6.	How many people usually live in this household? [INCLUDE ALL AGES; CHECK THAT MALES PLUS FEMALES EQUALS TOTAL NUMBER]	1. TOTAL	2. Males	3. Females
7.	How many infants and children under 5 years of age (0-4 years) live in this household?	Number of children <5 years:		

D-EXCRETA DISPOSAL

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
8.	What type of toilet facility does this household use? (<i>circle one</i>)	Flush to piped sewer system 1 Flush to septic system 2 Pour-flush to pit 3 Flush or pour flush elsewhere (eg. drain) 4 VIP Ventilated Improved pit latrine 5 Simple dry pit latrine 6 Bucket latrine (manual removal) 7 No toilet, use bush, drain, plastic bag 8	→ 12 → 12 → 12 → 22...
9.	If pit or septic tank, how frequently does it become full?	More than once a year 1 Once per year 2 Every couple of years 3 Every three years 4 More than five years 5 Never 6 Don't know 98	→ 12 → 12 → 12
10.	What did you do the last time the pit/septic tank was full?	Built a new pit or septic tank 1 Household emptied it 2 Private company emptied it 3 Government service emptied it 4 Other, specify 96 Don't know 99	→ 12
11.	How much did it cost you to build new/empty pit or septic last time the pit was full? [IF COST NOTHING, WRITE '0']	_____ kina Don't know/don't remember 98 No response 99	
12.	Where is this toilet facility located?	Inside or attached to this house 1 Elsewhere on premises/in the yard 2 Outside premises/away from house 3	→ 14
13.	How far is this toilet from where you live? [IF FEASIBLE, OBSERVE]	Less than 10 metres 1 10 to 50 metres 2 Over 50 metres 3 Don't know 98	
14.	Do children under 5 years old use this toilet facility?	Yes 1 No 2 Sometimes 3 Not applicable/no children under 5 97 Don't know 98	→ 16 → 16
15.	If NO, what happens to their faeces?		
16.	Is the toilet facility used day and night?	Day and night 1 Daytime only 2 Night time only 3	

		Don't know 98	
17.	Does your toilet facility cause any problems for you and your neighbours?	Yes 1 No 2	→ 19
18.	If YES, what problems? [DO NOT READ OUT; CIRCLE ANY MENTIONED, M]	Pooling of waste around house 1 Pooling around neighbour's house 2 Pit overflows during floods..... 3 Pit fills up too quickly 4 Sometimes not enough water for flushing 5 Cannot afford cost of emptying pit..... 6 Bad smells 7 Flies 8 Conflict..... 9 Disease..... 10 Other (specify) 96 Don't know 98	
19.	How many other households share this toilet facility? [ASK REGARDLESS OF LOCATION]	Number of households <input type="text"/> <input type="text"/> Not shared 00 More than 20 21 Don't know 98	
20.	Who is responsible for cleaning the toilet? [CIRCLE ALL THAT ARE MENTIONED, M]	Adult male in household 1 Adult female in household 2 Male child in household 3 Female child in household 4 Everyone in household 5 No one 6 Other, specify 96 Don't know 98 No response 99	
21.	What do you dislike about your toilet?	Nothing 1 Smell..... 2 Dirty 3 Unhealthy 4 Too far away from house 5 Not safe 6 Have to share with others 7 Have to wait to use/ queue up 8 Other, specify 96 Don't know 98 No response 99	

Only complete questions 22 and 23 if HOUSEHOLD DOES NOT HAVE A TOILET in Q8, or "Outside premises/away from house" selected in Q12; others skip to Q24

22.	What is your main reason for not having a toilet at home? [DO NOT READ OUT; CIRCLE ALL THAT ARE MENTIONED, M]	Land issues/don't own the land 1 Not enough space in the yard to build toilet 2 Not enough money to build toilet 3 No water or not enough water to operate toilet 4 Don't know how to build toilet 5 Groundwater level is too high 6 Soil is very rocky, difficult to dig 7 No labour in household to build toilet 8 Too lazy to build toilet 9 Not part of culture to use a toilet..... 10 Other priorities come first 11 Husband does not want one 12 Other, specify	
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	 96 Don't know 98	
23.	What do you think would be the advantages of having your own toilet facility? [DO NOT READ OUT; CIRCLE ALL THAT ARE MENTIONED, M]	No advantage/benefit 1 More private 2 Convenient, can use any time 3 Safety, especially at night 4 Easier for elderly, sick, children, disabled 5 Healthier 6 Cleaner 7 Modern/suitable for urban living 8 Don't have to share with others 9 No shame/embarrassment 10 Reduce conflict 11 Other, specify 96 Don't know 98	
24.	Are you interested in improving your toilet facilities?	Yes 1 No 2 Don't know 98	→ 30 → 30
25.	Which of these options is of most interest to you for improving your toilet facilities? [READ OUT, S]	Community toilet (shared between several households, pay per use, community maintains and cleans) 1 Own toilet – pit latrine (cheapest, convenient, but pit filled within 1-3 years) 2 Own toilet with septic tank shared between 4-6 households (expensive, uses less land than own septic tank, but have to share maintenance and the cost of emptying) 3 Own toilet – septic tank (more expensive, convenient, but need space for tank, household has to pay the cost of emptying every 4-5 years) 4 Own toilet – sewerage system (expensive, ongoing cost for waste water disposal charges every month) 5 96 Don't know 98	
26.	If you decided to build/upgrade a toilet, who in your household would make the final decision to build/upgrade? [S]	Adult male in household 1 Adult female in household 2 Both adult male and adult female together 3 Children in household 4 Other, specify 96 Don't know 98	
27.	If you were to build a new toilet or upgrade your existing toilet, who would you most like to talk to for information and advice about technical options, products, cost etc? [DO NOT READ OUT, M]	No one, already know how to build 1 Neighbour with a toilet 2 Family member with a toilet 3 Ethnic leader 4 Settlement leader 5 Water Committee 6 Local level government 7 Department of Health, health extension officer 8 Water PNG staff 9 Mason, builder, plumber 10 NGO 11 Hardware shop 12 Other, specify 96 96 Don't know 98 No response 99	

28.	If it was possible, would you be interested in taking a loan or some other credit to build/improve your toilet?	Yes 1 No 2 Don't know 98	
29.	Why do you think this?		
30.	How likely do you think it is that your neighbour will build a toilet or improve their toilet in the next 12 months?	Very likely 1 Likely 2 Unlikely 3 Very unlikely 4 Don't know 98	
31.	Why do you think this?		
32.	Is there anyone in the household who has difficulty using a toilet eg. elderly, very ill, physically disabled, heavily pregnant women?	Yes 1 No 2 Don't know 98	→ 34 → 34
33.	If YES, what do they do?		
34.	What do you think is the best way that the poorest households in your community could be helped to get their own toilets?		
35.	Where does your household's domestic waste water discharge to (i.e. water from cooking, washing, cleaning, but not including toilet waste water)?	Septic system 1 Pour into toilet..... 2 Soak pit 3 Street drain 4 Throw on road 5 Throw on garden/yard 6 Pour into creek, stream 7 Other, specify 96 Don't know 98	

Questions 36-46 refer to drinking water only. Only answer for drinking water.

E-WATER SUPPLY				
NO	QUESTIONS AND FILTERS	CODING CATEGORIES		SKIP
36.	What is the household's main source of water for DRINKING? [S]	1. Wet season Piped water (Water PNG) 1 Open dug well..... 2 Covered dug well..... 3 Bore hole/Tube well..... 4 Creek, pond, river 5 Rainwater 6 Bottled water from seller.. 7 Other, specify 96	2. Dry season Piped water (Water PNG) 1 Open dug well 2 Covered dug well..... 3 Bore hole/Tube well..... 4 Creek, pond, river 5 Rainwater 6 Bottled water from seller.. 7 Other, specify 96	→ 38
37.	If you do not use piped water, for drinking what is the reason? [S]	There is no distribution pipe in my area 1 Water PNG cut supply 2 Cannot afford to pay for piped water..... 3 Applied, still waiting to be connected 4 Piped water is unreliable 5		

		Don't know how to make connection 6 Current water source satisfies household water needs, eg. prefer taste/free 7 Other (specify) 96																	
38.	How would you describe the quality of your main source of drinking water? [S]	<table border="1"> <thead> <tr> <th>1. Wet season</th> <th>2. Dry season</th> </tr> </thead> <tbody> <tr> <td>Good, looks clean, satisfied....</td> <td>Good, looks clean, satisfied</td> </tr> <tr> <td>Unsure, looks clean but worry about the quality 2</td> <td>Unsure, looks clean but worry about the quality 2</td> </tr> <tr> <td>Poor quality, looks dirty or smells bad, not satisfied .3</td> <td>Poor quality, looks dirty or smells bad, not satisfied .3</td> </tr> <tr> <td>Don't know 98</td> <td>Don't know 98</td> </tr> </tbody> </table>	1. Wet season	2. Dry season	Good, looks clean, satisfied....	Good, looks clean, satisfied	Unsure, looks clean but worry about the quality 2	Unsure, looks clean but worry about the quality 2	Poor quality, looks dirty or smells bad, not satisfied .3	Poor quality, looks dirty or smells bad, not satisfied .3	Don't know 98	Don't know 98							
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Don't know 98	Don't know 98																		
39.	Where do you collect drinking water from? [S]	<table border="1"> <thead> <tr> <th>1. Wet season</th> <th>2. Dry season</th> </tr> </thead> <tbody> <tr> <td>Own house supply 1</td> <td>Own house supply 1</td> </tr> <tr> <td>Neighbour 2</td> <td>Neighbour 2</td> </tr> <tr> <td>Public tap stand 3</td> <td>Public tap stand 3</td> </tr> <tr> <td>School or health centre.... 4</td> <td>School or health centre ... 4</td> </tr> <tr> <td>Pipe connection (no tap).. 5</td> <td>Pipe connection (no tap) .5</td> </tr> <tr> <td>Don't know 98</td> <td>Don't know 98</td> </tr> </tbody> </table>	1. Wet season	2. Dry season	Own house supply 1	Own house supply 1	Neighbour 2	Neighbour 2	Public tap stand 3	Public tap stand 3	School or health centre.... 4	School or health centre ... 4	Pipe connection (no tap).. 5	Pipe connection (no tap) .5	Don't know 98	Don't know 98			
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School or health centre.... 4	School or health centre ... 4																		
Pipe connection (no tap).. 5	Pipe connection (no tap) .5																		
Don't know 98	Don't know 98																		
40.	How long does it take you to go to your main drinking water source, get water and come back? (includes total time – travelling, waiting, filling containers, return travel)	<table border="1"> <thead> <tr> <th>1. Wet season</th> <th>2. Dry season</th> </tr> </thead> <tbody> <tr> <td>Minute <input type="text"/> <input type="text"/> <input type="text"/></td> <td>Minute <input type="text"/> <input type="text"/> <input type="text"/></td> </tr> <tr> <td>Source at house/in yard...97</td> <td>Source at house/in yard ..97</td> </tr> <tr> <td>Don't know98</td> <td>Don't know98</td> </tr> </tbody> </table>	1. Wet season	2. Dry season	Minute <input type="text"/> <input type="text"/> <input type="text"/>	Minute <input type="text"/> <input type="text"/> <input type="text"/>	Source at house/in yard...97	Source at house/in yard ..97	Don't know98	Don't know98	→42								
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Source at house/in yard...97	Source at house/in yard ..97																		
Don't know98	Don't know98																		
41.	If water is not on premises, who usually collects water? [M]	<table border="1"> <tbody> <tr> <td>Adult women..... 1</td> <td></td> </tr> <tr> <td>School age female children 2</td> <td></td> </tr> <tr> <td>Adult men 3</td> <td></td> </tr> <tr> <td>School age male children 4</td> <td></td> </tr> <tr> <td>Young pre-school age children..... 5</td> <td></td> </tr> <tr> <td>Other, specify 96</td> <td></td> </tr> </tbody> </table>	Adult women..... 1		School age female children 2		Adult men 3		School age male children 4		Young pre-school age children..... 5		Other, specify 96						
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Adult men 3																			
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42.	Do you treat your water to make it safer to drink?	<table border="1"> <tbody> <tr> <td>Yes 1</td> <td></td> </tr> <tr> <td>No 2</td> <td></td> </tr> <tr> <td>Don't know 98</td> <td></td> </tr> </tbody> </table>	Yes 1		No 2		Don't know 98		→44 →44										
Yes 1																			
No 2																			
Don't know 98																			
43.	What do you usually do to the water to make it safer to drink? [DO NOT PROMPT, M]	<table border="1"> <tbody> <tr> <td>Boil..... 1</td> <td></td> </tr> <tr> <td>Let it stand and settle 2</td> <td></td> </tr> <tr> <td>Add bleach/chlorine 3</td> <td></td> </tr> <tr> <td>Strain it through a cloth..... 4</td> <td></td> </tr> <tr> <td>Use a water filter (ceramic, sand, composite) 5</td> <td></td> </tr> <tr> <td>Solar disinfection 6</td> <td></td> </tr> <tr> <td>Other, specify 96</td> <td></td> </tr> <tr> <td>Don't know 98</td> <td></td> </tr> </tbody> </table>	Boil..... 1		Let it stand and settle 2		Add bleach/chlorine 3		Strain it through a cloth..... 4		Use a water filter (ceramic, sand, composite) 5		Solar disinfection 6		Other, specify 96		Don't know 98		
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Strain it through a cloth..... 4																			
Use a water filter (ceramic, sand, composite) 5																			
Solar disinfection 6																			
Other, specify 96																			
Don't know 98																			
44.	Do you store drinking water in the household?	<table border="1"> <tbody> <tr> <td>Yes 1</td> <td></td> </tr> <tr> <td>No 2</td> <td></td> </tr> <tr> <td>Don't know 98</td> <td></td> </tr> </tbody> </table>	Yes 1		No 2		Don't know 98		→47 →47										
Yes 1																			
No 2																			
Don't know 98																			
45.	What type of containers are used for storing drinking water? [S]	<table border="1"> <tbody> <tr> <td>Narrow mouthed eg. jerry can, plastic bottle 1</td> <td></td> </tr> <tr> <td>Open mouthed eg. bucket, drum, cooking pot..... 2</td> <td></td> </tr> <tr> <td>Both types..... 3</td> <td></td> </tr> </tbody> </table>	Narrow mouthed eg. jerry can, plastic bottle 1		Open mouthed eg. bucket, drum, cooking pot..... 2		Both types..... 3												
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46.	Are the drinking water containers covered?	<table border="1"> <tbody> <tr> <td>All..... 1</td> <td></td> </tr> <tr> <td>Some 2</td> <td></td> </tr> <tr> <td>None 3</td> <td></td> </tr> </tbody> </table>	All..... 1		Some 2		None 3												
All..... 1																			
Some 2																			
None 3																			
47.	What is the household's main source of water for DOMESTIC use eg. washing clothes, washing dishes, bathing,	<table border="1"> <thead> <tr> <th>1. Wet season</th> <th>2. Dry season</th> </tr> </thead> <tbody> <tr> <td>Piped water (Water PNG) 1</td> <td>Piped water (Water PNG) 1</td> </tr> <tr> <td>Open dug well..... 2</td> <td>Open dug well 2</td> </tr> </tbody> </table>	1. Wet season	2. Dry season	Piped water (Water PNG) 1	Piped water (Water PNG) 1	Open dug well..... 2	Open dug well 2	→52										
1. Wet season	2. Dry season																		
Piped water (Water PNG) 1	Piped water (Water PNG) 1																		
Open dug well..... 2	Open dug well 2																		

	flushing toilet? (not drinking). [M]	Covered dug well..... 3 Bore hole/Tube well..... 4 Stream, pond, river 5 Rainwater 6 Bottled water from seller.. 7 Other, specify 96	Covered dug well..... 3 Bore hole/Tube well..... 4 Stream, pond, river 5 Rainwater 6 Bottled water from seller.. 7 Other, specify 96	→52 →52 →52 →52 →52 →52
48.	Does this house have its own piped water (Water PNG) connection?	Yes 1 No 2 Don't know 98		→52 →52
49.	Is there a meter connected to this supply?	Yes 1 No 2 Don't know 98		→52 →52
50.	Is the meter working?	Yes 1 No 2 Don't know 98		
51.	Is piped water available to your house every day of the month?	Yes 1 No 2		
52.	Does this household pay for water from any source?	Yes 1 No 2 Don't know 98		→57 →57
53.	If YES, when do you pay?	Every day..... 1 Every week 2 Every month 3 By volume/container/water meter 4 Other (specify) 96 Don't know 98		→55 →55 →55 →55 →57
54.	If you pay by volume/water meter, what is the unit?	Per cubic meter 1 Per litre 2 Per container (specify container and size) 3 Other (specify) 96 Don't know 98		
55.	How much do you pay per load, or volume unit?			
56.	How often do you buy this water?	All year round 1 Dry season only 2 Only occasionally (specify) 3 Other (specify) 96 Don't know 98		
57.	When there is a problem with your main water source who do you tell or ask for help? (M)	Nobody 1 Water committee 2 Person in the community responsible for maintenance 3 Water PNG 4 Local government. 5 Ethnic leader..... 6 Settlement leader 7 Other (specify) 96 Don't know. 98		→61
58.	Have you contacted this person or group before for a water supply problem?	Yes 1 No 2 Don't know 98		→61 →61
59.	If yes, was the person/group helpful?	Yes 1 No 2 Don't know 98		
60.	Was the problem solved?	Yes 1 No 2		

		Don't know 98	
61.	Are you interested in improving your water supply service?	Yes 1 No 2 Don't know 98	→ 69
62.	Are you willing to pay to improve your water supply?	Yes 1 No 2 Don't know 98	→ 68
63.	What type of water supply service are you willing to pay for? [READ OUT AND SELECT ONE, S]	Public standpipe shared between households (cheapest option but would still have to carry water to house)..... 1 Household connection (more expensive as requires more pipe and a meter, but water is available at house) 2 Other (specify) 96 Don't know 98	
64.	Why do you prefer this option?		
65.	If your household prefers its own connection with meter, how would you prefer to pay the connection charge? (You would also need to pay for how much water you use every month)	Pay all in a lump sum at the time of connection 1 Pay in monthly instalments over 6 months 2 Pay in monthly instalments over 12 months 3 Other (specify) 96 Don't know 98	
66.	How frequently would you prefer to pay for the piped water you use? [ie. Households could make smaller more frequent payments for water instead of one large monthly payment. READ OUT]	Weekly 1 Fortnightly 2 Monthly 3 Other (specify) 96 Don't know 98	
67.	How would you prefer to pay your water bill for the amount of water you use? [READ OUT]	Pay to water committee 1 Pay to Water PNG 2 Pay to bank..... 3 Easipay prepay 4 Other (specify) 96 Don't know 98	
68.	Why do you prefer this option?		

F-HANDWASHING AND HYGIENE

NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
69.	What do members of this household usually use to clean their anus after defecating? [M]	Water 1 Toilet paper..... 2 Other paper, eg. newspaper..... 3 Sticks 4 Leaves 5 Stones 6 Other, specify 96 Don't know 98 No response 99	
70.	Do you have soap in your household?	Yes 1 No 2	→ 73
71.	Have you used soap today or	Yes 1	

	yesterday?	No 2	→73
72.	What did you use it for? (DO NOT READ THE ANSWERS, ASK TO BE SPECIFIC, ENCOURAGE "WHAT ELSE" UNTIL NOTHING FURTHER IS MENTIONED AND CHECK ALL THAT APPLY))	Washing clothes 1 Washing cooking pots and dishes 2 Washing my body 3 Washing my children 4 Washing my child's bottom 5 Washing my children's hands 6 Washing hands after defecating 7 Washing hands after cleaning child's bottom 8 Washing hands before feeding/breast feeding child 9 Washing hands before preparing food 10 Washing hands before eating 11 Other, specify 96 Don't know 98	
73.	How many infants and children under 5 years of age (0-4 years) in this household had diarrhoea in the last 2 weeks? [ENTER '0' IF NO CASES OCCURRED]	Number of children <5 years with diarrhoea in last 2 weeks Not applicable/no children under 5 in <input type="text"/> <input type="text"/> household 97 Don't know 98	
74.	What do you think can cause diarrhoea in young children? [DO NOT READ THE ANSWERS, ENCOURAGE BY ASKING IF THERE IS ANYTHING ELSE UNTIL S/HE SAYS THERE IS NOTHING ELSE AND CHECK ALL MENTIONED]	Bad/dirty water 1 Bad/dirty food 2 Poor hygiene 3 Feces/defecating in the open 4 Dirty hands 5 Germs 6 Flies 7 Other (specify) 96 Don't know 98	
75.	Do you think diarrhoea can be prevented or avoided?	Yes 1 No 2 Don't know 98	→77 →77
76.	If yes, how do you think diarrhoea can be prevented or avoided? [DO NOT READ OUT; ENCOURAGE BY ASKING IF THERE IS ANYTHING ELSE UNTIL S/HE SAYS THERE IS NOTHING ELSE AND CHECK ALL MENTIONED]	Wash hands 1 Use soap 2 Use toilet facility to defecate 3 Dispose children's feces in toilet facility 4 Bury feces 5 Drink clean water 6 Store water safely 7 Treat water (boil, filter, chlorinate) 8 Prepare food hygienically/protect 9 Dispose of garbage properly 10 Breast feeding 11 Good nutrition 12 Other (specify) 96 Don't know 98	
77.	What can the community as a whole, not just you, do to prevent or avoid diarrhoea? [DO NOT READ OUT; ENCOURAGE BY ASKING IF THERE IS ANYTHING ELSE UNTIL S/HE SAYS THERE IS NOTHING ELSE AND	Provide clean water 1 Help to construct latrines 2 Make materials for latrine construction available at low cost 3 Make soap available at low cost 4 Make water disinfectant available at low cost 5	

	CHECK ALL MENTIONED]	Clean village campaigns..... 6 Train promoters 7 Other (specify)_____ 96 _____ _____ Don't know 98	
78.	When is it important to wash hands? [DO NOT READ OUT, CIRCLE ALL THAT ARE MENTIONED]	Before preparing food or cooking 1 Before eating 2 Before feeding children..... 3 After cleaning baby's bottom/changing..... 4 After defecating 5 After eating 6 Other, specify 96 Don't know 98	
79.	Is there a place where members of this household wash their hands?	Yes 1 No 2 Don't know 98	→81 →81
80.	Describe where the handwashing place is, how far from the house, and how far from the toilet? Is there soap? [IF POSSIBLE OBSERVE HANDWASHING PLACE]		
81.	What is your main source of information about personal and household hygiene? [DO NOT PROMPT, SELECT ALL THAT ARE MENTIONED, M]	Television 1 Radio 2 Newspaper 3 Health extension officers 4 Community leader 5 School..... 6 Workplace..... 7 Family or friends 8 Church 9 Women's group 10 Youth group 11 Local level government..... 12 NGO 13 Internet 14 Nobody 15 Other, specify 96 Don't know 98	

G-HOUSEHOLD INFORMATION			
NO	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
82.	What province/ethnic group does this household belong to?		
83.	Sex of head of household	Male 1 Female..... 2	
84.	What is the highest level of education of the Head of household ?	No schooling 1 Primary 2 High school 3 Upper Secondary..... 4 Vocational or Technical 5 University or higher education 6 Don't know 96	

85.	What is the main source of income for this household? [CIRCLE MAIN SOURCES MENTIONED, M]	Own business/employer 1 Agriculture/fishing/animal raising 2 Government wages or salary 3 Private employer wages or salary 4 Casual work eg. labouring 5 Market selling 6 Government allowance, pension 7 Donations, charity, family gifts 8 Don't know 98 No response 99	
86.	What is your average household income per fortnight (counting all sources of money including wages and salaries for all workers, market sales etc, and calculated on a fortnightly basis)?	Kina _____ per fortnight Don't know 98 No response 99	
87.	How much does your household pay on average for electricity each month?	Kina _____ per month No Electricity 00 Don't know 98 No response 99	
88.	What is the most important development priority for this community? [DO NOT READ OUT, CIRCLE UP TO THREE PRIORITIES MENTIONED, M]	Land title 1 Housing 2 Water supply 3 Jobs 4 Toilets 5 Roads 6 Law and order 7 Rubbish collection 8 Drainage 9 Electricity 10 Other (specify) _____ 96 Don't know 98	
89.	Is there anything else you would like us to know about your water and sanitation needs?		

Thank you for your cooperation