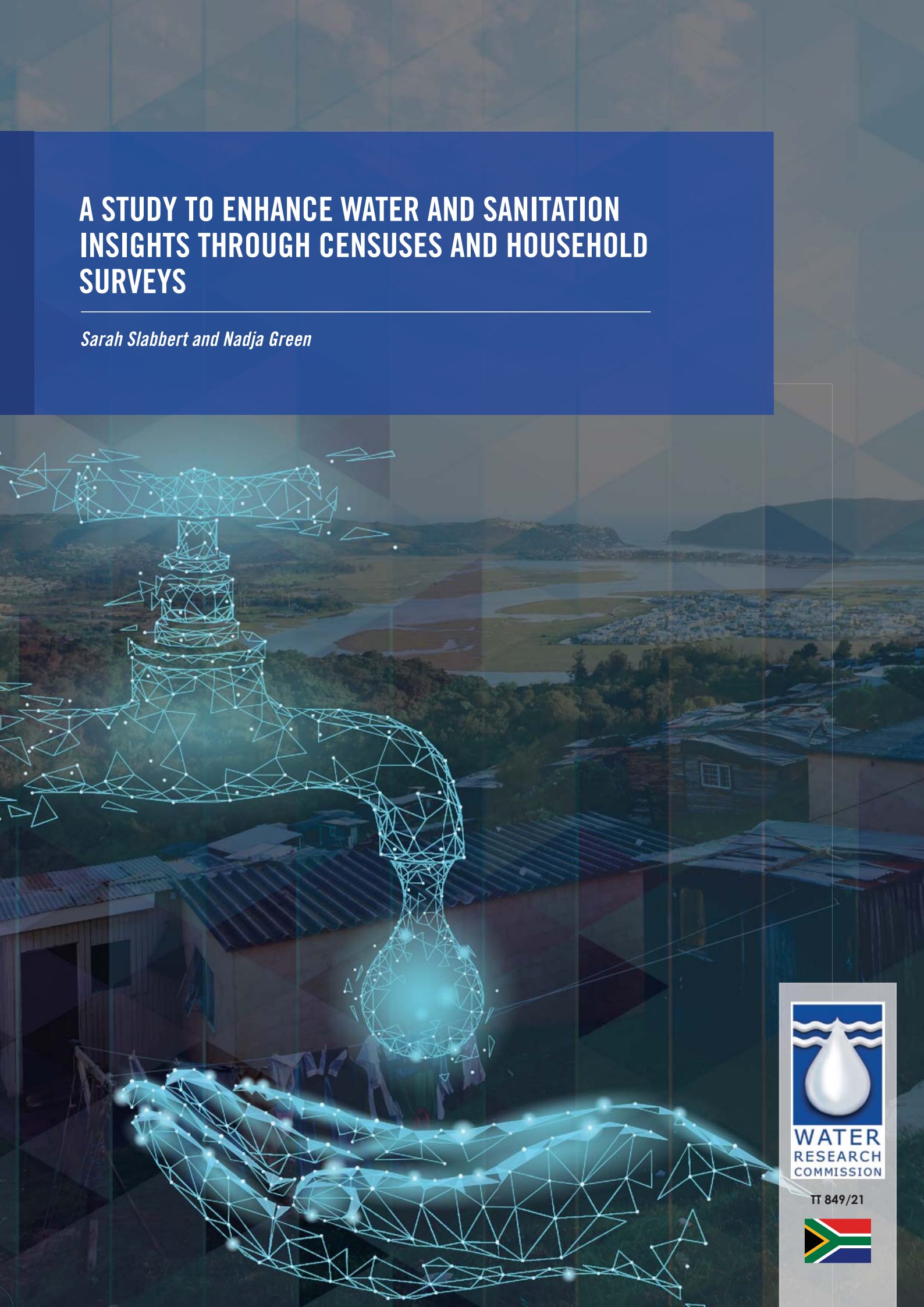
A STUDY TO ENHANCE WATER AND SANITATION INSIGHTS THROUGH CENSUSES AND HOUSEHOLD SURVEYS

Sarah Slabbert and Nadja Green



WATER RESEARCH COMMISSION

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A Study to Enhance Water and Sanitation Insights through Censuses and Household Surveys

A report for the **Water Research Commission**

by

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This report emanated from Water Research Commission (WRC) research project, C2020/2021 – 00207 titled ''Evaluation of the National Census water and sanitation questions as a mechanism to determine the status of services delivery from the perspective of the consumer''.

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Executive summary

Introduction

All over the world, governments use information emanating from data collected through a national census or large-scale surveys to measure progress on service delivery goals and targets from the perspective of the consumer and to adjust strategic policy decisions accordingly.

These strategic decisions rely on the integrity of the census and survey data. Research has shown that target audiences of quantitative research do not necessarily understand, mentally process, and respond to questions as the questionnaire designers intended. The gap between questionnaire designers and their target audiences is exacerbated by cultural, socioeconomic and language differences. This leads to response errors or inappropriate answering, which could seriously undermine data integrity, and ultimately the validity of the decisions that are based on the data.

In view of the challenges to get accurate data from Water Services Authorities, the instruments of StatsSA, like the National Census and the General Household Survey (GHS), have become key mechanisms that the South African government uses to generate data on consumers' access to safe and reliable water and sanitation services.

This implies that the perspective and experiences of consumers are an important information source for government on the actual state of water and sanitation services in South Africa. Their experiences reflect if the country's progress in terms of the Sustainable Development Goals (SDGs) is on track and whether water and sanitation projects remain operational and well-maintained.

It is therefore critical that the Census and GHS ask questions about the indicators of the SDGs and project health in a way that is relevant for consumers, easy to understand and easy to answer appropriately. Inappropriate responses to inappropriately posed or misunderstood questions can lead to serious under- or over-reporting of service delivery progress.

This study applied Cognitive Action Research, an innovative methodology, to:

a. Test if South African consumers understand the current Census water and sanitation questions and a selection of the GHS questions as intended, and can give answers that accurately reflect their water and sanitation realities, and
b. Analyse, revise and re-test the questions in several rounds to maximise understanding and minimise inappropriate answering.

Main finding

The research confirmed that inappropriate answering is a major issue for the key water and sanitation questions on the Census and GHS questionnaire.

Only half of the respondents could answer the first two water questions on Census 2011 and GHS 2018/2020 appropriately. Two thirds of respondents could answer the main sanitation question on Census 2011 and GHS 2018/2020 appropriately.

Inappropriate answering was much higher among respondents in informal and rural areas. These are the people still underserviced with safe water and sanitation in terms of national and international goals and targets**.** Most of them are poor, they do not understand English well and they bear the brunt of poor municipal service delivery.

It should be noted that only respondents with a basic conversational proficiency in English were interviewed. The actual levels of inappropriate answering might therefore be higher.

Reasons for inappropriate answering

The terminology of the questions and response options, structural aspects of the questions, and task issues were the main reasons for inappropriate answering.

Respondents do not understand key terms

The cognitive interviews revealed that, even though respondents could conduct a basic conversation in English, many of them struggled with the terminology used in the questions and response options. Key terms, like *household*, *main source*, *dwelling*, *piped water,* were a major barrier to appropriate answering for respondents in informal and rural areas. Often, they would ask the fieldworkers to explain the terms or translate it into their home language or show them the question on paper.

Respondents' non-verbal responses were another indication that the terminology was difficult to understand.

Inappropriate questions or inadequate response options

The gap between the reality that questions assume, and the actual realities of respondents, is well illustrated by the questions that ask about the reliability of water supply.

The Census 2011 and GHS 2018/2020 questions that ask about interruptions for longer than two days capture only once-off interruptions of piped water. As a result, respondents with any other type of interruption, for example daily interruptions for a few hours, answer ''No'' and are routed away. The research team referred to this as 'the domino effect'. The domino effect was compounded by the fact that the more than a third of the respondents did not understand the words ''interruptions'' and ''interrupted''.

Self-supply of water and sanitation services is a growing trend as municipal services deteriorate. This affects the affordability of services for poor people. The Census 2011 and GHS 2018/2020 water and sanitation questions inadequately captured self-improvement and the informal economy that it is creating.

For example, a respondent connected the communal tap to her yard, put up a pour flush toilet with a septic tank, but kept her old pit toilet for those days when the municipal water supply is interrupted. From a municipal service perspective, she has access to a communal tap and a pit toilet in her yard. From a self-supply perspective, she has a pour flush toilet and a tap in her yard.

These respondents reported on their self-improved situation (for example, piped water in the yard) and not on the service level that the municipality is providing (which is a communal tap). This fact is nowhere captured in the questions, which could lead to over-reporting of service delivery progress.

Other barriers to appropriate answering

Other factors that lead to inappropriate answers are discussed in detail in the report.

Summary

The research found that inappropriate answering is compounded by the complexity of the South African population and its stratification in terms of income, diversity, language, and history.

Many consumers, especially consumers in those vulnerable groups who are the target of improved water and sanitation delivery, are disempowered to report on their situation, because they are unable to answer the Census and GHS survey questions appropriately without the mediation of a fieldworker. The negative experience of vulnerable consumers entrenches inequality; it does not eradicate it. These consumers could well ask: *Why does government not want to hear my voice?*

Towards a solution

In Rounds 2, 3 and 4 of the study, the methodology of Cognitive Action Research was used to revise the questions and test the revisions. The revisions were made in cooperation with DWS and StatsSA to ensure that the revised questions remained on track in terms of their objectives.

The improvement in appropriate answering, and consequently data integrity, was substantial. This confirms that the methodology offers an effective solution.

Moreover, the way in which respondents engaged with the fieldworker, and the questions, changed. In Rounds 2, 3 and 4, the non-verbal responses were a testimony that respondents were much more comfortable with the questionnaire. It was no longer necessary for the fieldworkers to repeat the questions several times. As a result, the interviewing time was much shorter, and the interview flow was smooth without the respondents interrupting the fieldworker to ask them to clarify or repeat.

Outcome and potential impact of the study

The outcome of the study was a set of water and sanitation questions that respondents found easy to understand and answer. Census and survey questions that are easy to understand and answer will increase appropriate answering and hence improve the integrity of data that is critical for the water sector. It also removes the risk of fieldworker intervention and mediation.

Accurate data will ensure that the money spent on water and sanitation infrastructure and services meet the actual needs of consumers in those areas where improvement will make the biggest impact.

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The project team would like to thank Mr Jay Bhagwan for his guidance and valuable input, and Ms Charmaine Khanyile for their administration of the project.

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Mr Allestair Wensley	DWS
Mr Dennis Behrmann	DWS
Ms Iris Mathye	DWS
Ms Lusanda Mfenqa-Agbasi	DWS
Mr Niel Roux	StatsSA
Mr Stephen Marais	DWS
Mr Dave Still	PID Consulting Engineers
Mr Mark Schapers	JG Afrika

and the following Reference Group members:

Mr Jim Gibson	Maluti Water
Mr John Hillocks	DWS
Mr Lebogang Mlangeni	StatsSA
Mr Mark Bannister	DWS
Ms Monde Maluleka	DPME
Ms Norma Lerobane	DWS
Mr Robert Parry	StatsSA
Mr Viv Naidoo	DWS

A special word of thanks to Janet Jali, the fieldwork manager, and her team for their dedication and excellent work.

List of acronyms

AMCOW	African Ministers Council of Water
CAR	Cognitive Action Research
CoGTA	Department of Cooperative Governance and Traditional Affairs
Covid-19	Coronavirus disease 2019
DPME	Department of Planning, Monitoring and Evaluation
DWS	Department of Water and Sanitation
GHS	General Household Survey
GLAAS	Global Analysis and Assessment for Sanitation and Drinking-Water
JMP	Joint Monitoring Programme
LM	Local Municipality
MDGs	Millennium Development Goals
MTSF	Medium-Term Strategic Framework
NW&SMP	National Water and Sanitation Master Plan
NWRS	National Water Resources Strategy
SDGs	Sustainable Development Goals
SFWS	Strategic Framework for Water Services
StatsSA	Statistics South Africa
UNICEF	United Nations International Children's Emergency Fund
WHO	World Health Organisation
WRC	Water Research Commission
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSP	Water Services Provider

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Chapter 1: Introduction

1.1 Background

All over the world, governments use data that are collected through large-scale studies, such as a national census or surveys, to measure progress and identify gaps in service delivery, which in turn guide policy decisions.

These strategic decisions rely on the integrity of the census and survey data. Research (Slabbert, Van den Berg & Green, 2019) has shown that target audiences of quantitative research do not necessarily understand, mentally process, and respond to questions as the researchers intended. The gap between researchers and their target audiences is exacerbated by cultural, socioeconomic and language differences. This leads to response errors or inappropriate answering[1], which could seriously undermine data integrity, and ultimately the validity of the decisions that are based on the data.

Census and survey managers try to mitigate this risk with pilots and allowing interviewers to explain questions. However, survey pilots typically test a process. Testing understanding and appropriate answering are not the focus of survey pilots. Allowing interviewers to explain questions could increase the risk of inappropriate answering, because it assumes that all interviewers interpret and explain the questions in the same way and as intended. For a census, where large numbers of short-term interviewers are recruited and trained, this risk is larger than for a full-time established fieldwork team.

The South African National Census and the General Household Survey (GHS) are key mechanisms that the South African government uses to generate consumer data. Such data is used to measure the country's progress toward universal access to basic water and sanitation as expressed in the global development goals (Millennium Development Goals 2015 and Sustainable Development Goals 2030) as well as the South African Mid-Term Strategic Framework (2014-2019; 2019-2024) and the National Development Plan for 2030. As such, the Census and GHS data informs strategic water services policy decisions.

The Census 2011 questionnaire includes six questions that were developed by DWS. The questions aim to determine the actual status of water and sanitation services delivery from the consumer's perspective. The headings for these questions are:

- Access to piped water
- Source of water
- Reliability of water supply (two questions)
- Alternative water source, and
- Toilet facilities.

The GHS questionnaire varies from year to year. For example, some questions are only asked in alternate years. The GHS 2018 had 25 water and sanitation questions; GHS 2019 had 19; 2020 had 21. These questions are developed by DWS in close collaboration with StatsSA. The questions include the Census questions, with some variation. The additional questions ask more detail and other indicators.

[1] The term ''appropriate answering'' refers to respondents selecting a response option that is an accurate reflection of their reality. The term is not relevant for questions that ask perception or opinion. In the research that this paper reports on, the term was only applied when the fieldworkers were able to verify the respondent's response either by observation or with probing.

Discussions with DWS in 2019 and early 2020 indicated that there might be a significant gap between researchers' intention and respondents' realities and their interpretation of questions. Concerns included differences in the water and sanitation results of the Census and the GHS, and differences between implemented infrastructure and actual reliable and functional infrastructure. The SERI report (Royston, 2019) revealed in three case studies that the reality of water and sanitation delivery on the ground in informal settlements could be quite different from government's water and sanitation services policies.

Discussions about these concerns, and the research team's previous experience, led to this WRC study. The study applied Cognitive Action Research (CAR), an innovative methodology, to:

a. Test if South African consumers understand the current Census water and sanitation questions and a selection of the GHS questions as intended, and can give answers that accurately reflect their water and sanitation realities, and
b. Analyse, revise and re-test the questions in several rounds to maximise understanding and minimise inappropriate answering.

1.2 Aims of this research

The aims of the study were:

1. To contextualise the Census and GHS water and sanitation questions within the framework of strategic decision-making in the water sector – how are they related to other data sets and how are they used in decision-making.
2. To test the way in which respondents interpret and answer selected water and sanitation questions in the National Census and the GHS with the aim of lowering the risk of inappropriate answering.
3. To make recommendations as to how these questions could be improved to generate data that is a more accurate reflection of respondents' reality.

1.3 Study method

The sub-sections below describe the methodology that was used to address the research aims.

1.3.1 Aim 1: Stakeholder consultation and literature review

To achieve Aim 1, the following study methods were used:

1. Consultations with key stakeholders in DWS and Statistics South Africa (StatsSA) to inform them of the project and to ask for their input and cooperation.
2. Discussions with key stakeholders in DWS to determine how the Census and GHS water and sanitation questions relate to other data sets and how they are used in decision-making.
3. A literature review of:
    a. Local and global actions to establish universal access to basic water and sanitation (Part 1), and
    b. The theory and methods of Cognitive Action Research, as well as a framework of analysis and its relevance for this research (Part 2).
4. A desktop analysis of the Census and GHS water and sanitation questions, based on the findings of previous Cognitive Action Research, to identify potential comprehension and task issues that respondents might have.
5. The selection of a sample of water and sanitation questions from Census 2011 and GHS 2018 to test with Cognitive Action Research.

See Chapters 2 and 3 for the details.

1.3.2 Aim 2: Qualitative research

Qualitative research was done to achieve Aim 2. The qualitative research comprised the following study methods:

1. Selecting a purposeful sample of research areas were finalized in collaboration with DWS, StatsSA and the project manager, with input from the Reference Group.
2. Developing a discussion guide that included the probing questions was developed.
3. Testing, analysing and revising the selected questions in four rounds of Cognitive Action Research.

See Chapters 4 and 5 for the details of the fieldwork methodology and the research findings.

1.3.3 Aim 3: Conclusions and recommendations

To achieve Aim 3, the findings of the Cognitive Action Research were further analysed and synthesised into a set of recommendations and final questionnaires.

The WRC will host a stakeholder dialogue, in partnership with DWS and StatsSA, on 26 May 2021 to discuss the findings of the study. Stakeholder input from the final Reference Group meeting on 5 May 2021, and the dialogue, will be integrated into the final report.

See Chapters 6 and 7 for the conclusions and recommendations.

Chapter 2: Stakeholder engagement

2.1 Overview

It was this research project's objective to achieve water and sanitation questions that give government accurate information on the indicators of safe and reliable water and sanitation services from the consumer's perspective. Stakeholder consultations were therefore integral to the project.

The representatives of DWS and StatsSA were regarded as part of the research team. They were continuously consulted. Issues were debated, sometimes in online meetings and sometimes in emails. Their support and input were invaluable.

This chapter summarises briefly the main consultations.

2.2 First meeting

On 20 January 2020, the research team met with Allestair Wensley and Dennis Behrmann of DWS to discuss revisions to the project proposal that would meet the needs of DWS.

2.3 Project kick-off meeting

On 13 June 2020, the research team met virtually with key stakeholders in DWS, StatsSA and other organisations to inform them of the project and to ask for their input and cooperation.

The meeting was attended by:

Table 1: Meeting attendees – 13 June 2020

Attendees	Organisations
Allestair Wensley	DWS
Dennis Behrmann	DWS
Iris Mathye	DWS
Jay Bhagwan	WRC
Jim Gibson	Maluti Water
John Hillocks	DWS
Lebogang Mlangeni	StatsSA
Mark Bannister	DWS
Monde Maluleka	DPME
Nadia Algera	ASSAF
Nadja Green	BHI32 (Research team)
Niel Roux	StatsSA
Norma Lerobane	DWS
Robert Parry	StatsSA
Sarah Slabbert	BHI32 (Research team)
Viv Naidoo	DWS

The following agenda was followed during the meeting:

1. Rationale and aims of the project
2. Deliverables and time frame
3. Overview of the water and sanitation questions
4. Stakeholder input needed
    a. What are the objectives of the water and sanitation questions on the Census and GHS?
    b. How is the data used?
    c. What are your expectations of the research?
    d. Specifics (for future input):
        i. Selection of questions
        ii. Selection of research areas.

2.4 Follow-up meeting

On 3 July 2020, the research team hosted a follow-up meeting with the following representatives from DWS and StatsSA:

- Allestair Wensley (DWS)
- Dennis Behrmann (DWS)
- Iris Mathye (DWS)
- Niel Roux (StatsSA).

The aim of the meeting was to:

- discuss the relationship between the Census and GHS water and sanitation questions
- discuss the SDGs and South African targets for water and sanitation, the definitions and indicators of basic water and sanitation services and facilities, and
- determine how the Census and GHS water and sanitation questions relate to other data sets and how they are used in decision-making.

Key discussion points were the following:

1. What are the norms and standards that DWS uses?
    a. As published (DWS, 2017)
    b. As set out in the Strategic Framework for Water Services (2003).
    c. Ms Mathye noted that the research team should treat the sanitation norms as a draft.
2. Purpose of the Census and GHS questions
    a. Monitor and evaluate progress in terms of targets
    b. Which targets?
        i. Mid-Term Strategic Framework
        ii. SDGs 6.1 and 6.2
    c. Track progress and the quality of service against the data of the rollout of infrastructure; identify gaps that need to be addressed or resolved. The HSRC did a study to test the quality of service; they got negative responses about the quality of service – this study was stopped.
3. Why are the StatsSA data so important for DWS?
    a. Internal data no longer adequate
    b. It is CoGTA's responsibility to unpack the non-financial data (i.e. how many toilets/pipes are DWS putting in etc.), but there are challenges with this.
    c. The WSDP is designed to be a key source of information that would identify the state of affairs in every single municipality. Unfortunately, many municipalities are not updating their WSDPs, hence the information is unreliable.
4. How is the Census and household surveys aligned?
    a. Community survey: Mid-term survey, in-between the Census

b. The household surveys and other similar surveys happen continuously. StatsSA is the custodian. The sample size is about 30 000.
c. 99% of the Census questions are aligned to the household surveys, but the two types of surveys are unfortunately not really comparable. The household surveys have the benefit that more questions can be asked.

5. Basic water and sanitation indicators were discussed in depth.

2.5 Continuous consultations

Before and during the fieldwork period, there were continuous consultations with the research manager, DWS and StatsSA. Topics included:

- The research instruments
- The findings of Round 1
- The first revised questionnaire
- Additional questions required, and
- Further revisions.

The consultations were extremely helpful to ensure that the revised questionnaire remained aligned with the objective to track performance and improvement on the national and international water and sanitation indicators.

It was agreed that:

From the perspective of government, the Census and GHS questionnaires must:

- Reflect the reporting requirements of government (SDG 6.1, 6.2 and backlogs)
- Generate data that is reliable, analysable (including trends), timeous, and
- Generate data that is an accurate reflection of current and future water and sanitation status.

The implication was that the Census and GHS should have the same core questions.

From the perspective of the respondent, the questionnaires must be:

- Easy to understand
- Resonate with the respondent's water and sanitation realities (i.e. it must be relevant for the respondent), and
- Easy to answer appropriately (Refer to 0).

From the fieldwork perspective of StatsSA:

- The fieldworker must be able to read out the questionnaire without explanation
- The fieldworker must be able to capture responses on a tablet
- No additional fieldworker material should be necessary, and
- The length of the Census questionnaire should not be increased.

2.6 Position paper

The project manager, Mr Jay Bhagwan, suggested that the research team draft a position paper on the research. The paper was written in close cooperation with the stakeholder team. They gave detailed comments and made suggestions in track changes.

Chapter 3:
Literature review and desktop analysis

3.1 Literature review: Part 1 Universal access to basic services

3.1.1 International Institutional framework

The Millennium Development Goals (MDGs) was an initiative of the United Nations that started in 2000 as a global effort to address poverty. The MDGs established measurable targets for 2015 to reduce extreme poverty and hunger and the effects of deadly diseases, and to expand access to water and sanitation, among other development priorities.

The Sustainable Development Goals (SDGs), which were initiated at the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012, are a set of universal goals that replaced the MDGs with a new target date of 2030. The SDGs address the most pressing environmental, political and economic issues that the world is currently facing. The SDGs also aim to put the world on a more sustainable path.

The SDGs are monitored at a global and national level. At a global level, three organisations are involved in the monitoring of SDG6 (Water and Sanitation):

- the Joint Monitoring Programme (JMP) for Water Supply and Sanitation comprising the WHO and UNICEF
- the Integrated Monitoring initiative (GEMI), and
- the UN-Water Global Analysis and Assessment for Sanitation and Drinking-Water (GLAAS).

The responsibility for monitoring SDG6 is divided between the three organisations as follows (Wilkinson et al., 2019):

Figure 1: Monitoring responsibilities (Wilkinson et al., 2019)

3.1.2 South African institutional framework

When apartheid came to an end in 1994, a significant percentage of South Africans did not have access to basic water and sanitation services. According to the Strategic Framework for Water Services (2003), 5 million (11%) of the 44.8 million people living in South Africa in 2001 had no access to safe water supply. A further 6.5 million (15%) did not have access to the defined basic services. 18.1 million people (41%) did not have adequate sanitation services (2001 Census).

Drastic action was required to address these backlogs.

In 2002, DWS initiated the Water Services programme and established the Department Water Services Database (now referred to as WSKS). Under the umbrella of the Build, Operate, Train and Transfer programme (BOTT), infrastructure was constructed and later transferred to municipalities (Behrmann, 2020).

The Water Supply and Sanitation Policy White Paper of 1994 sets out an enabling policy framework for a new national water services function that could deliver basic water and sanitation services rapidly to people living primarily in rural areas (DWS, 2003).

Behrmann (2020) notes though that water and sanitation legislation and policy in South Africa is as much driven by water scarcity and the imminent water deficiency as by the need to rectify historical inequities and promote justice and equality in the availability and use of water resources.

The Constitution of the Republic of South Africa of 1996 declared access to water and a healthy environment as basic human rights. In terms of the Bill of Rights (Sections 27 (1)(b) and Section 24 (a)) everyone has the right to have access to sufficient food and water and the right to an environment that is not harmful to their health or well-being.

The National Water Act 36 of 1998 and the National Water Services Act 108 of 1997 legislate roles and responsibilities to achieve the sustainable use of water for the benefit of all. In terms of these two Acts, it is the responsibility of DWS to develop water policies and strategies such as the Strategic Framework for Water Services (DWS, 2003) and the National Water & Sanitation Master Plan (NW&SMP) (DWS, 2018a). DWS is also the national regulator.

Several other sectors involve the use of water, for example mining, energy, environmental management and health. The legislation governing these sectors makes it clear that any activities in these sectors that involve water resources and water use are also governed by the two water Acts. The National Health Act, for example, sets out the role of municipal health services and includes the monitoring of water quality, all of which are subject to the norms and standard set by DWS, the regulator.

In terms of the Constitution, local government is responsible for the delivery of water and sanitation services. The provision of water and sanitation services and associated tariffs at local government level is governed by the Municipal Systems Act 32 of 2000 and the Municipal Finance Management Act 56 of 2003. Water Services Authorities are responsible for developing bylaws that, amongst others, enable regulation of water services provision and use within its area of jurisdiction (DWS, 2018a).

The South African Bureau of Standards plays a complementary regulatory role. It has set several water quality standards for the water sector, including the drinking water standard (SANS 241).

Three organisations are responsible for monitoring access to water and sanitation services in South Africa:

- The Department of Water and Sanitation derives its mandate from the National Water Services Act 108 of 1997. Section 27 of the Act also mandates every Water Services Authority (WSA) to monitor the performance of Water services providers and water services intermediaries within its area of jurisdiction (Wilkinson et al., 2019)
- The Department of Planning, Monitoring and Evaluation (DPME) bases its mandate on Section 85(2) of the Constitution of the Republic of South Africa (Wilkinson et al., 2019). The DPME was established in 2010 with the responsibility to implement Constitutional monitoring and evaluation.
- Statistics South Africa is the country's official statistics agency. It is mandated by the Statistics Act, Act No. 6 of 1999 to produce national statistics. StatsSA is accountable to the Minister in the Presidency responsible for National Planning, Monitoring and Evaluation, Youth and Statistics South Africa (Wilkinson et al., 2019).

Post 2015, the water sector of South Africa is monitoring at a national level (Wilkinson et al., 2019):

1. the SDG water and sanitation targets and indicators
2. the relevant international GLAAS targets and indicators
3. the regional AMCOW targets and indicators, which are aligned to the SDGs, and
4. the targets and indicators of the National Development Plan, the Medium-Term Strategic Framework, the National Benchmarking Initiative, the Regulatory Performance Measurement System (RPMS), and any other norms and standards set by the DWS, such as the Blue, Green and No Drops.

3.1.3 Vision, goals and targets

3.1.3.1 Introduction

As the Census and GHS are household surveys, this study is limited to the vision, goals, targets and indicators for access to water and sanitation services at household level.

As discussed above, the drive for universal access to basic human rights and basic services is captured in the United Nations' Millennium Development Goals, and later the Sustainable Development Goals (SDGs) for 2030. In parallel to the SDGs, each country has developed its own sustainable development goals that it has set for its people.

Each goal is underpinned by a definition of the basic rights or services that all people should have access to. The country-specific definitions are usually aligned with the SDG definitions, but there are also differences, as the South African examples will demonstrate.

The achievement of the SDGs and associated country-specific goals is furthermore marked by a set of indicators. Surveys that measure progress on the SDGs and country-specific goals translate the indicators into questions.

Wilkinson et al. (2019) conducted a WRC study to review national and international water supply and sanitation monitoring and reporting requirements. The purpose of the research was to align the water and sanitation sector monitoring and reporting function with South African (National Development Plan [NDP], National Water Resource Strategy 2 [NWRS2], NW&SMP) and international water and sanitation goals, targets and indicators. The outcome of the study was a monitoring and reporting framework for the water sector.

The insights of this study were applied in this section (3.1.3), which maps the international and national goals for water and sanitation, the definitions and indicators of these goals, and the translated survey questions of the South African Census and the GHS to show how they are aligned.

3.1.3.2 Goals

The global vision for universal access to basic water and sanitation services are captured in the Millennium Development Goals, which were set for 2015 and the subsequent Sustainable Development Goals for 2030. A vision and end goal for South Africa were set in the Strategic Framework for Water Services (2003). The table below summarises these goals.

Table 2: Global and local goals for access to basic water and sanitation

Strategic Framework for Water Services (2003)	Vision: All people living in South Africa have access to adequate, safe, appropriate and affordable water and sanitation services, use water wisely and practise safe sanitation. It sets the following goals for water services (DWS, 2003: 5) but does not give a time frame: 1. All people living in South Africa have access to an appropriate, acceptable, safe and affordable basic water supply and sanitation service. 2. All people living in South Africa are educated in healthy living practices (specifically with respect to the use of water and sanitation services) and the wise use of water.
Millennium Development Goals for 2015	Goal 7: Ensure environmental sustainability: 1. By 2015, halve the proportion of people without sustainable access to safe drinking water. 2. By 2015, halve the proportion of people without basic sanitation.
Sustainable Development Goals for 2030	SDG 6.1 By 2030 achieve universal and equitable access to safe and affordable drinking water for all. SDG 6.2 By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

Wilkinson et al. (2019) compares the MDGs and the SDGs in the following table:

Table 3: A comparison of the MDGs and SDGs (Wilkinson et al., 2019)

Millennium Development Goals (MDGs)	Sustainable Development Goals (SDGs)
MDGs were extracted from the Millennium Declaration by UN experts and formally adopted by UN Member States in 2005	The SDGs were negotiated by UN Member States, informed by UN-led global conversation involving 10 million (experts, leaders, people from all walks of life, including marginalized communities)
Year 2000 to 2015= 15 years	Year 2016 to 2030= 15 years
Goals phrased as to "reduce the backlog" in other words partial achievement	Much more ambitious as to achieve benefit for all or universal access
8 goals, 21 targets and 60 indicators, focusing on poverty reduction	17 goals and 169 indicators focusing on sustainable development
Primarily relevant to low income countries	Relevant to all countries
Water fell under MDG 7 on *environmental sustainability*	Specific SDG for water
2 core indicators on drinking-water and sanitation	8 core indicators for water and sanitation (including wastewater and water resources)
Focus only on access to an "improved service" for drinking water	Focus expand to include water quality (safe water) and other service aspects such as reliability of service
Focus only on access to an "improved service" for sanitation	Focus extend to wastewater treatment, faecal sludge management
No hygiene indicators	Hand washing with soap
No clear agreement on follow-up, review process or accountability	Obligates "robust, effective, inclusive, transparent follow up and review at all levels" based on shared principles; defined global, regional follow up mechanisms
Monitoring focus only on households	Monitoring to expand to include WASH in schools and health care facilities
Global monitoring through household surveys and use census data	Monitoring by national authorities, feeding into regional and global reporting
Limited use of regulatory data	Greater scope for regulatory data to be used in global reporting. Regulation of water supplies will be emphasized as an able and appropriate regulatory authority can ensure compliance with this target.

It is noted in Wilkinson et al. (2019) that monitoring of global development goals shifted from global monitoring to "monitoring by national authorities, feeding into regional and global reporting''.

3.1.3.3 Targets

The global goals are linked to a time frame; hence they are both a goal and a target.

The South African targets that were set for water and sanitation services at household level were aligned with, firstly, the Millennium Development Goals for 2015, and later the Sustainable Development Goals for 2030. Whereas the goal of the MDGs was to halve backlogs, the SDGs aim for universal access by 2030.

The Medium-Term Strategic Framework (MTSF) (The Presidency, 2014) sets out the actions that government will take and targets to be achieved in view of remaining backlogs and the uneven quality of services. In addition to ensuring universal access, the MTSF addresses the quality and consistency of services, and the improvements that are necessary in the performance of the public service, municipalities and service providers.

The South African targets are also aligned to the targets that have been set by the African Ministers Council of Water (AMCOW), which in turn are the same as the global targets (DHI, 2016).

The table below summarises the targets and the progress that was made over the years in South Africa.

Table 4: Water and sanitation services in South Africa: targets and progress

Who set the target and when?	Target	Progress
SFWS (2003)	• All people in South Africa have access to a functioning basic water supply facility by 2008 • All people in South Africa have access to a functioning basic sanitation facility by 2010 • All bucket toilets are eradicated by 2006 • 70% of households with access to at least a basic sanitation facility know how to practise safe sanitation by 2005 (and 100% by 2010)	According to the Census of 2011: 22% of people in the Eastern Cape did not have access to piped water. For the provinces of KwaZulu-Natal and Limpopo the figure is 14%. 5.2% have no access to toilets. 2.1% of South African still use the bucket system. DPME (2019) reports that, in 2018, 89% of households had access to piped or tap water in their dwellings and 83% of households had access to improved sanitation facilities. 70% have access to a reliable water service (Information based on GHS 2016 results)
The Medium-Term Strategic Framework (2014-2019) (MTSF)	Increase the percentage of households with access to a functional water service from 85% in 2013 to 90% by 2019. Increase the percentage of households with access to a functional sanitation service from 84% in 2013 to 90% by 2019; eliminate bucket sanitation in the formal areas.	
MTSF (2019-2024)	95% of households have a reliable water service. 90% of households have adequate sanitation and hygiene (DPME, 2019).	
Development Indicators (2016)	Ensure that all South Africans have access to clean running water in their homes (National Development Plan 2030) 90% of households in South Africa to have access to sanitation facilities by 2019 with no household in formal areas using a bucket system (A basic acceptable sanitation facility is defined as a ventilated improved pit latrine)	

Who set the target and when?	Target	Progress
National Development Plan for 2030 (DPME, 2016)	Before 2030, all South Africans will have affordable, reliable access to sufficient safe water and hygienic sanitation	

The table shows that, although there has been significant progress in the provision of water and sanitation services since 1994, South Africa is still struggling to meet its targets and achieve universal access.

This was confirmed in the UNICEF and WHO report (2015) on South Africa's progress on sanitation as the figure below illustrates:

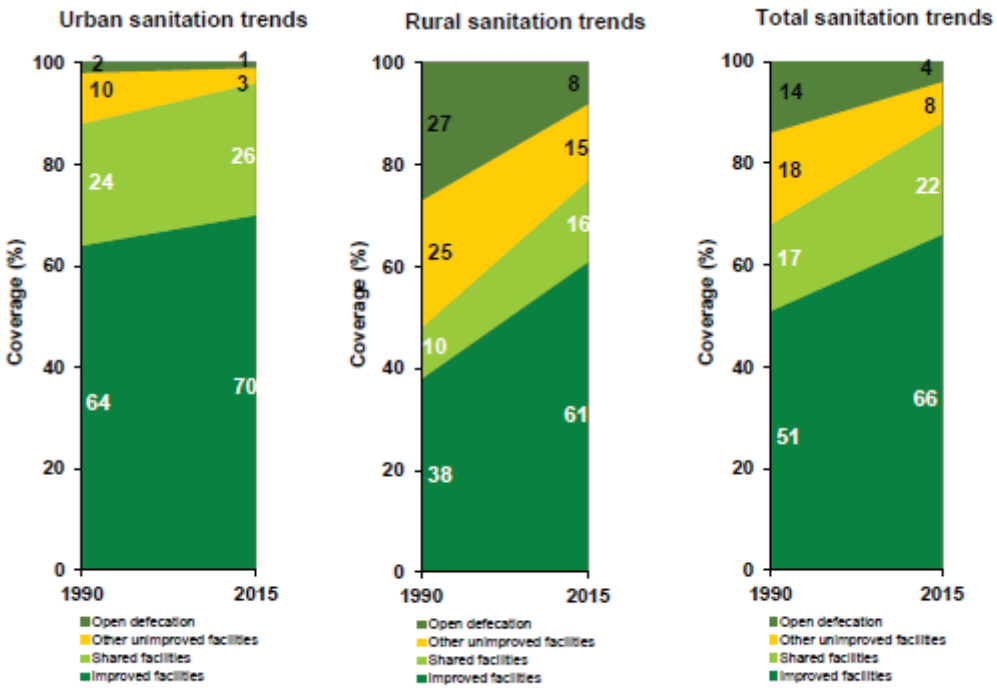


Figure 2: South Africa's progress on the MDG targets for 2015 (UNICEF & WHO, 2015)

3.1.4 Definitions and indicators

What does it mean for a household to have access to safe drinking water and safe sanitation and hygiene? This section discusses the definitions that appear in the SDGs and South African policy documents, and the associated indicators.

As the literature will show, the definitions are similar, but not the same. And so are the indicators.

Wilkinson et al. (2019:85) distinguishes between different types of indicators:

*a) **Input indicators**: Measure inputs of resources (usually human and financial) to a particular intervention. For example budget allocation to provision of WASH services;*

*b) **Process indicators**: Measure the manner in which interventions services and goods are provided. For example, incident management plan in place; maintenance plan in place.*

*c) **Output indicators**: Measure the short-term quantity of goods and services produced and the efficiency of production of the intervention. For example number of job opportunities per Rand spend; number of people trained in hygiene; number of toilets and water outlets constructed;*

*d) **Outcome indicators**: Measure the broader, medium-term results achieved by an intervention. For example, number of people with access to a safely management drinking water service; number of people with access to adequate sanitation services; and*

*e) **Impact indicators**: Measure the long-term desired impact which an intervention wishes to achieve. For example, decrease in incidence of diarrhoea.*

The Census and GHS water and sanitation questions measure outcome indicators, which are therefore also the focus of this study.

Wilkinson et al. (2019: 89) notes that the current South African water and sanitation indicators do not all meet the criteria for SMART indicators: Specific, Measurable, Assignable, Relevant and Time-based.

In the context of surveys as instruments to measure progress in meeting water and sanitation targets, indicators that are not specific or measurable are difficult to translate into survey questions that produce appropriate and accurate responses.

3.1.5 Water

In the subsections below the international and local definitions and indicators for water services to the public are summarised.

3.1.5.1 SDG 6.1 definitions and indicators

SDG 6.1: By 2030, everyone uses safely managed drinking water services[2]

Safe drinking water

Definition: Indicator 6.1.1 is the Proportion of population using safely managed drinking water services.

A safely managed drinking water service is defined as one located on premises, available when needed and free from contamination.

Goal: By 2030 achieve universal and equitable access to safe and affordable drinking water for all.

Note: Premises is not defined.

Figure 3: SDG 6.1 – safe drinking water

The definition of safe drinking water and its indicators are unpacked in the diagram of the water ladder below (Johnston 2017; WHO & UNICEF, 2017).

[2] https://sdg-tracker.org/water-and-sanitation

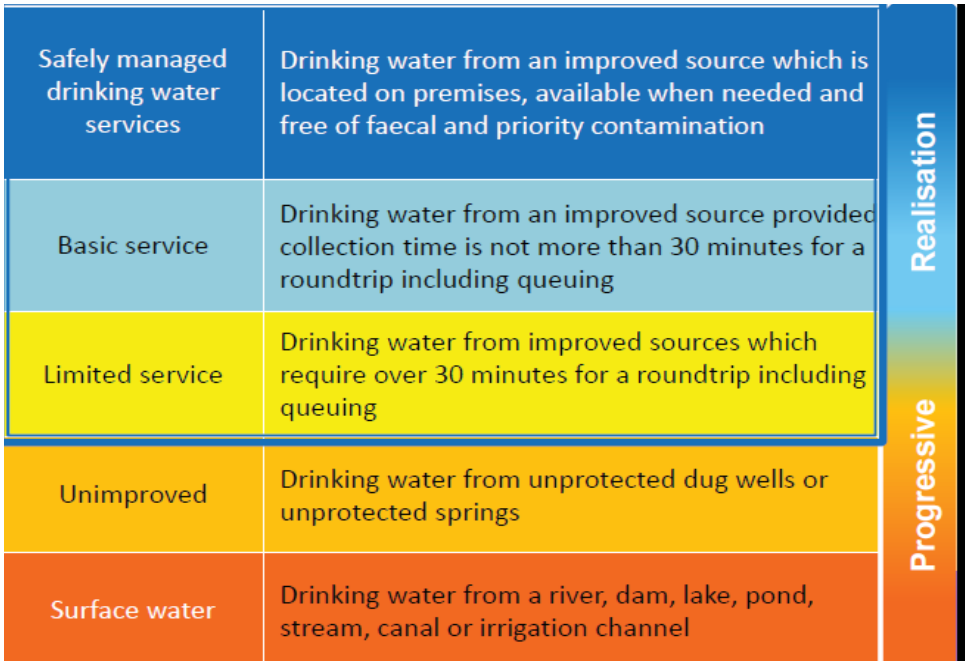


Figure 4: The water ladder

UN-Water (2017) gives the following normative interpretation of the SDG 6.1 indicators:

Target text	Normative interpretation
By 2030, achieve universal	Implies all exposures and settings including households, schools, health-care facilities and the workplace
and equitable	Implies progressive reduction and elimination of inequalities among population subgroups
access	Implies that sufficient water to meet domestic needs is reliably available close to home
to safe	Safe drinking water is free from pathogens and elevated levels of toxic chemicals at all times
and affordable	Implies payment for services does not present a barrier to access or prevent people from meeting basic human needs
drinking water	Water used for drinking, cooking, food preparation and personal hygiene
for all	Suitable for use by men, women, girls and boys of all ages, including people with disabilities

Figure 5: UN-Water's normative interpretation of the indicators of SDG 6.1

According to Johnston (2017) and the WHO and UNICEF (2017), the following water sources qualify as ''an improved water source'':
a) piped water,
b) boreholes or tubewells,
c) protected dug wells,
d) protected springs, and
e) rainwater.

UN-Water (2017) includes ''public taps or standpipes located on the premises'' in their definition of an improved drinking water source. They define an improved drinking water source as "piped water into dwellings, yards or plots; public taps or standpipes; boreholes or tube wells; protected dug wells; protected springs; rainwater; packaged or delivered water, that is located on the premises and available when needed, and free of faecal and priority chemical contamination''.

Wilkinson et al. (2019) reports that, although the WHO and UNICEF (2017) recognise bottled water and tanker truck water as potentially at the top of the ladder, it could also be positioned on the basic or limited rung due to challenges with accessibility, availability and quality.

3.1.5.2 South African definitions and indicators

South Africa follows the goal of SDG 6.1, but the norms and standards that it sets for the facility and service that indicate access to a basic right and service are slightly different.

As expressed in its vision statement, the Strategic Framework for Water Services (2003) sees it as a government priority that all South Africans should at least have access to basic water and sanitation. The two concepts are defined in terms of a facility and a service as set out below:

Basic water supply facility*: The infrastructure necessary to supply 25 litres of potable water per person per day within 200 metres of a household and with a minimum flow of 10 litres per minute (in the case of communal water points) or 6 000 litres of potable water supplied per formal connection per month (in the case of yard or house connections).*

Basic water supply service*: The provision of a basic water supply facility, the sustainable operation of the facility (available for at least 350 days per year and not interrupted for more than 48 consecutive hours per incident) and the communication of good water use, hygiene and related practices* (DWS, 2003; DWS, 2018b).

The definitions in the draft Water and Sanitation Compulsory Norms and Standards (DWS, 2018b) are similar.

It should be noted that ''basic'' in terms of the SDGs and ''basic'' in terms of the SFWS and the draft Water and Sanitation Compulsory Norms and Standards do not mean exactly the same. For the SFWS, ''basic'' is the minimum acceptable service level, for the SDGs, "basic'' is a level below safely managed drinking water or sanitation services.

The South African indicators have been met have been further unpacked into measurable units in the discussions with DWS officials and StatsSA (mentioned in Chapter 2). The table below shows how the DWS/StatsSA indicators are aligned with the SDG and SFWS definitions and indicators.

Table 5: Comparison of DWS (DWS, 2017; DWS, 2018b), SDG and SFWS indicators for drinking water

DWS/StatsSA indicators	SDG 6.1 indicators	SFWS indicators
Access		
• Yard/dwelling connection • Quantity – At least 25 litres per person per day • Flow – At least 10 litres per minute (Flow is an example of an indicator that is difficult to measure with a survey).	Located on the premises Equitable Affordable	• Quantity: 25 litres potable water per person per day • Flow: minimum 10 litres per minute (community tap/water point); yard/house connection: (6000 litres of potable water per connection per month)
Availability		
At least 350 days per year, interruption not more than 2 consecutive days	Available when needed	Available 350 days per year Interruption not more than 2 consecutive days

DWS/StatsSA indicators	SDG 6.1 indicators	SFWS indicators
Quality		
Comply with SANS241 Tap/piped water assumed to be safe Water carried no further than 200 m to yard	Free from contamination (Basic level = less than 30 minutes away, for a round trip, including queuing)	Within 200 m of a household
Education		
No mention	No mention	Communication of good water use, and related hygiene practice received.

DWS assumes that water coming out of a tap is safe. It is therefore important that monitoring questions include the term “tap water” (Dennis Behrmann, DWS, personal communication).

The distance to tap water is also important for reporting on water quality in terms of the SDGs. If the tap is located less than 100 m from dwelling, it is assumed to be safe from contamination. If the tap is more than 100 m from the dwelling, the possibility of contamination is assumed (Dennis Behrmann, DWS, personal communication).

Tap water from a municipal source (piped, borehole, water tanker), a private borehole or a rainwater tank is considered safe if it is available within the required distance.

Contrary to UN-Water’s interpretation of an improved drinking water source, a **communal standpipe or tap is not considered safe**. In terms of the water ladder, a communal standpipe within 200 m from the dwelling is regarded as an interim service (WHO & UNICEF, 2017). The term ‘’interim’’ service is not used in South Africa (Dennis Behrmann, personal communication).

It should be noted that equity and affordability, which are part of SDG 6.1, are not specifically mentioned in the DWS/StatsSA indicators. South Africa has a policy of Free Basic Water for poor people.

Other requirements mentioned in the Draft Norms and Standards (2018) refer to WSA responsibilities, for example:

- All connections metered and tariffed; metered but free for indigents (included in GHS questions)
- Emergency water service – more than 24-hour interruption – alternative water supply made available.

3.1.6 Sanitation

In the subsections below the international and local indicators for sanitation services to the public are summarised.

3.1.6.1 SDG 6.2 definitions and indicators

SDG 6.2: By 2030, everyone uses safely managed sanitation services[3]

Safe sanitation and hygiene

Definition: Indicator 6.2.1 is the Proportion of population using (a) safely managed sanitation services and (b) a hand-washing facility with soap and water.

This is measured as the share of the population using safely managed sanitation facilities and at least basic handwashing facilities.

A safely managed sanitation facility is one where excreta is safely disposed of in situ or treated off-site. A basic handwashing facility is defined by a device to contain, transport or regulate the flow of water to facilitate handwashing with soap and water in the household.

Goal: By 2030 achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.

Figure 6: SDG 6.2 – safe sanitation and hygiene

The definition is unpacked as follows (WHO, 2017):

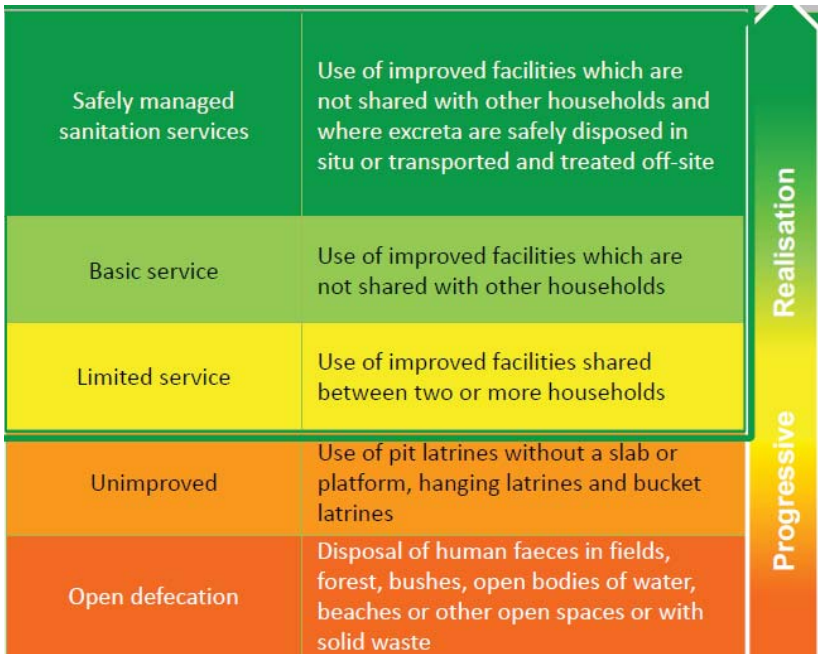


Figure 7: The sanitation ladder

[3] https://sdg-tracker.org/water-and-sanitation

UN-Water (2017) gives the following normative interpretation of the SDG 6.2 indicators:

Target text	Normative interpretation
By 2030, achieve access	Implies facilities close to home that can be easily reached and used when needed
to adequate	Implies a system that hygienically separates excreta from human contact as well as safe reuse/ treatment of excreta in situ, or safe transport and treatment off site
and equitable	Implies progressive reduction and elimination of inequalities among population subgroups
sanitation	The provision of facilities and services for safe management and disposal of human urine and faeces
and hygiene	The conditions and practices that help maintain health and prevent spread of disease including handwashing, menstrual hygiene management and food hygiene
for all	Suitable for use by men, women, girls and boys of all ages, including people with disabilities
and end open defecation	Excreta of adults or children are: deposited (directly or after being covered by a layer of earth) in the bush, a field, on a beach or in any other open area; discharged directly into a drainage channel, river, sea or any other water body; or wrapped in temporary material and discarded
paying special attention to the needs of women and girls	Implies reducing the burden of water collection and enabling women and girls to manage sanitation and hygiene needs with dignity. Special attention should be given to the needs of women and girls in high-use settings such as schools and the workplace, and high-risk settings such as health-care facilities and detention centres
and those in vulnerable situations	Implies paying attention to specific drinking water, sanitation and hygiene (WASH) needs found in special cases including refugee camps, detention centres, mass gatherings and pilgrimages

Figure 8: UN-Water's normative interpretation of the indicators of SDG 6.2

WHO and UNICEF (2017) deconstructed safe excreta disposal further as one of the following options:

- treated and disposed of in situ
- stored temporarily and then emptied, transported and treated offsite, or
- transported through a sewer with wastewater and then treated offsite.

According to the JMP ladder, an improved sanitation facility includes (WHO and UNICEF, 2017):

- wet sanitation technologies:
  - flush and pour flush toilets connecting to sewers, septic tanks or pit latrines
- dry sanitation technologies:
  - ventilated improved pit (VIP) latrines
  - pit latrines with slabs
  - composting toilets[4].

A handwashing facility must be on the premises, it could either be fixed or mobile, and could consist of (WHO & UNICEF, 2017):

- a sink with tap water
- a water tap or pipe (devices that contain, transport or regulate the flow of water)
- buckets with taps
- tippy-taps, or
- a portable basin.

It is interesting that the last bullet point (a portable basin) is not in line with the Covid-19 guidelines for handwashing, which insist on running water.

[4] We assume that this includes all types of eco-sanitation.

WHO and UNICEF (2017) classify the following as soap:

- bar of soap
- liquid soap
- powder detergent, and
- soapy water (the same comment about Covid-19 guidelines applies here).

3.1.6.2 South African definitions and indicators

South Africa follows the goal of SDG 6.2, but the norms and standards that it sets for the sanitation facility and service that indicate access to a basic right and service are more comprehensive and complex.

***Basic sanitation facility**: The infrastructure necessary to provide a sanitation facility that is safe, reliable, private, protected from the weather and ventilated; keeps smells to a minimum; is easy to keep clean; minimises the spread of sanitation-related diseases by facilitating appropriate control of disease carrying flies and pests; and enables safe and appropriate treatment and/or removal of human waste and wastewater in an environmentally sound manner.*

***Basic sanitation service**: The provision of a basic sanitation facility that is easily accessible to a household; the sustainable operation of the facility, including the safe removal of human waste and wastewater from the premises where this is appropriate and necessary; and the communication of good sanitation, hygiene and related practices* (DWS, 2003; DWS, 2018b).

The definitions in the draft Water and Sanitation Compulsory Norms and Standards (DWS, 2018b) are similar.

The indicators have been further unpacked into measurable units in the discussions with DWS officials and StatsSA (mentioned in Chapter 2). The table below shows how the DWS/StatsSA indicators align with the SDG and SFWS definitions and indicators.

Table 6: Comparison of DWS (DWS, 2017; DWS, 2018b), SDG and SFWS indicators for sanitation

DWS/StatsSA indicators	SDG 6.2 indicators	SFWS indicators
Facility		
Toilet: In yard Safe (has different meanings: safe structure, safe to go to, safe to use) Reliable – 24 hours a day Environmentally sound Easy to keep clean Provides privacy Provides protection against weather Well ventilated Keep smells to minimum Prevents entry and exit of flies and other disease carrying pests Excreta safely contained Lighting With functional hand washing facility	End open defecation Adequate Not shared by another household Equitable Basic handwashing facility (defined as ‘’a device to	• Safe • Reliable • Private • Protected from the weather • Ventilated • Keep smells to a minimum • Easy to clean • Minimises the spread of infectious diseases

DWS/StatsSA indicators	SDG 6.2 indicators	SFWS indicators
	contain, transport or regulate the flow of water to facilitate handwashing with soap and water in the household'')	
Ensure that menstruation needs of women and girls are considered Persons with disability must have a special toilet (according to SANS 10400-S)	Paying special attention to the needs of women and girls and those in other vulnerable situations	
Service		
Safe excreta disposal on-site or off-site Shared or communal toilets are regarded as a temporary solution.	Safe excreta disposal in-situ or treated off-site	Easily accessible Can be sustainable operated Safe and appropriate removal/treatment of human waste and wastewater in an environmentally sound manner
Education		
Supported with knowledge and relevant resources (hygiene promotion); health and hygiene education (WSA responsibility)	No mention	Communication of good sanitation, hygiene and related practices

It should be noted that equity and adequacy, which are part of SDG 6.2, are not included in the DWS/StatsSA indicators. According to the WRC (Jay Bhagwan – personal communication) the South African minimum standard for a sanitation facility translates to a ventilated pit latrine or a pour flush toilet.

Other requirements mentioned in the Draft Norms and Standards (2018) refer to WSA responsibilities, for example emergency sanitation, but the availability of emergency sanitation is not regarded as an indicator of a basic sanitation service.

Notes:

- Lighting: it was not clear if lighting referred to a window or a light or both.
- According to DWS (2018b), the household or owner of the sanitation facility is fully responsible for all operation, maintenance and refurbishment actions and costs pertaining to on-site sanitation, unless it is provided as a free basic sanitation service in which case the local institution is responsible for these actions and costs.

3.1.7 Measuring progress

In South Africa, the National Census, and surveys like the General Household Survey, conducted by StatsSA, are important tools to quantify the country's progress on the mentioned international and national water and sanitation targets from the perspective of the consumer.

3.1.7.1 The Census water and sanitation questions

Because it has to cover a wide range of socioeconomic indicators, the Census questionnaire has theme restrictions. A detailed history of the Census water and sanitation questions can be found in Appendix 4 of Wilkinson et al. (2019). The Census 2011[5] questionnaire included six water and sanitation questions:

Table 7: Census 2011: water and sanitation questions

H-07 ACCESS TO PIPED WATER

In which way does this household mainly get piped water for household use?	
1	Piped (tap) water inside the dwelling
2	Piped (tap) water inside the yard
3	Piped (tap) water on community stand: distance less than 200 m from dwelling
4	Piped (tap) water on community stand: distance between 200 m and 500 m from dwelling
5	Piped (tap) water on community stand: distance between 500 m and 1000 m (1 km) from dwelling
6	Piped (tap) water on community stand: distance greater than 1000 m (1 km) from dwelling
7	No access to piped water

H-08 SOURCE OF WATER

What is this household's MAIN source of WATER for household use	
1	Regional/local water scheme (operated by municipality or other water services provider)
2	Borehole
3	Spring
4	Rain water tank
5	Dam/pool/stagnant water
6	River/stream
7	Water vendor
8	Water tanker
9	Other

If 2-9, go to H-10

[5] At the time of the research, the Census 2021 questionnaire was not finalized. Census 2021 was postponed to 2022 due to the Covid-19 pandemic.

H-09 RELIABILITY OF WATER SUPPLY

In the last 12 months, has this household had any interruptions in piped water supply?	
1	Yes
2	No

If 2, go to H-10

H-09a RELIABILITY OF WATER SUPPLY

Did any specific interruption(s) of piped water supply last longer than two days?	
1	Yes
2	No

If 2, go to H-10

H-09b RELIABILITY OF WATER SUPPLY

What alternative water source did the household use during water supply interruption?	
1	Borehole
2	Spring
3	Rain water tank
4	Dam/pool/stagnant water
5	River/stream
6	Water vendor
7	Water tanker
8	Other
0	None

H-10 TOILET FACILITIES

What is the MAIN type of TOILET facility used by this household?	
1	Flush toilet (connected to sewerage system)
2	Flush toilet (with septic tank)
3	Chemical toilet
4	Pit toilet with ventilation (VIP)
5	Pit toilet without ventilation
6	Bucket toilet
7	Other
0	None

3.1.7.2 General Household Survey (GHS) water and sanitation questions

As the national Census is only undertaken every 10 years, the GHS is designed to fill the data gap that arises in the years between the Census counts. The GHS has been conducted since 2002 by StatsSA and was specifically designed to measure the many facets of the living conditions of South African households. It covers six broad areas, namely education, health and social development, housing, household access to services and facilities, food security, and agriculture.

The GHS has a sample of about 33 000 households.

According to the DWS officials and StatsSA, the following revisions were included in the GHS 2018 questionnaire after discussions between DWS and StatsSA:

- Water vendor was added as a source option (5.12)
- The question about alternative water source during a water interruption was added (5.21a)
- None (toilet facility) was changed to Open defecation (5.22)
- No privacy was added as a problem with sanitation (5.26b), and
- Question about handwashing behaviour was added (5.26e).

A detailed history of the GHS water and sanitation questions can be found in Appendix 3 of Wilkinson et al. (2019).

3.1.7.3 GHS 2018 questionnaire

The 25 water and sanitation questions comprised a variation of the Census questions plus questions that ask indicators that the Census does not ask and other aspects that are relevant for planning in the water sector:

Table 8: GHS 2018[6]: water and sanitation questions

Ask all households		
5.12	What is the household's main source of drinking water?	
	01 = Piped (tap) water in dwelling/house	Go to Q5.14
	02 = Piped (tap) water in yard	Go to Q5.14
	03 = Borehole in yard	Go to Q5.14
	04 = Rainwater tank in yard	Go to Q5.14
	05 = Neighbour's tap	
	06 = Public/communal tap	
	07 = Water carrier/tanker	
	08 = Water vendor	
	09 = Borehole outside yard	
	10 = Flowing water/stream/river	
	11 = Stagnant water/dam/pool	
	12 = Well	
	13 = Spring	
	14 = Other (specify)	
Ask if water is not in dwelling or in yard		
5.13a	How are far is the water source from the dwelling or yard (200 m is equal to the length of two football/soccer fields)?	
	1 = Less than 200 metres	
	2 = 201-500 metres	
	3 = 501 metres-1 kilometre	
	4 = More than 1 kilometre	
	5 = Do not know	

[6] GHS 2020 was not available when this part of the research was done.

Ask if water is not from a pipe or a tap. Otherwise go to Q5.14

5.13b Did you use piped or tap water at any time in the past while living in this community, but have stopped as a result of the system breaking down?
1 = Yes
2 = No

Ask all households

5.14 Is the water from the main source of drinking water before any household treatment?
Read all the options (yes/no for each)
1 = Safe to drink?
2 = Clear (has no colour/free of mud)?
3 = Good in taste?
4 = Free from bad smells?

5.15 Do household members treat the water used for drinking?
This may include boiling, adding chlorine or other chemicals, filtering.
1 = Yes, always
2 = Yes, sometimes
3 = No, never

5.16 Is your main source of drinking water supplied by a municipality?
1 = Yes
2 = No — Go to Q5.22
3 = Do not know — Go to Q5.22

Ask if "Yes" in 5.16

5.17 How do you rate the municipal water services you receive?
1 = Good
2 = Average
3 = Poor

5.18a Does your household have a water meter?
1 = Yes
2 = No

5.18b Does the household pay for municipal water? *If cost of water is included in a levy/rent paid to a housing complex/owner/landlord, the response should be "No"*
1 = Yes — Go to Q5.19a
2 = No

Ask if "No" in Q5.18b

5.18c What is the main reason why the household does not pay for water?
01 = Use own source of water
02 = Use a free source of water
03 = Pay directly to landlord as part of rent
04 = Payment included in a levy
05 = Permission from municipality not to pay
06 = Do not have a water meter
07 = Water meter not working/broken
08 = Do not receive water bill
09 = Community decision not to pay
10 = Cannot afford to pay
11 = Water supply irregular
12 = Water supply has been stopped
13 = Other (specify)

5.19a Has your municipal water supply been interrupted at any time during the last 12 months?
1 = Yes
2 = No — Go to Q5.22

Ask if "Yes" in Q5.19a

5.19b If yes, what was the main reason for the interruption?
1 = General maintenance
2 = Water only delivered at fixed times
3 = Non-payment for services (cut off)

4 = Pump not working
5 = Construction
6 = Vandalism
7 = Do not know
8 = Other (specify)

5.20 Thinking about the interruptions in your municipal water supply over the last 12 months, was any specific interruption longer than two days?
1 = Yes
2 = No — Go to Q5.21b
3 = Do not know — Go to Q5.21b

5.21a If the municipal water supply interruption was or longer than two days over the last 12 months, what alternative drinking water source did the household use during the interruption?
01 = Borehole
02 = Spring
03 = Well
04 = Rainwater tank
05 = Dam/pool/stagnant water
06 = River/stream
07 = Water vendor
08 = Water tanker
09 = None
10 = Do not know
11 = Other (specify)

5.21b If you add all the days that your municipal water supply was interrupted over the last 12 months, was it more than 15 days in total?
1 = Yes
2 = No

Ask all households

5.22 What type of toilet facility is used by this household?
01 = Flush toilet connected to a public sewerage system
02 = Flush toilet connected to a septic tank or conservancy tank
03 = Pour flush toilet connected to a septic tank (or septage pit)
04 = Chemical toilet
05 = Pit latrine/toilet with ventilation pipe
06 = Pit latrine/toilet without ventilation pipe
07 = Bucket toilet (collected by municipality)
08 = Bucket toilet (emptied by household)
09 = Ecological Sanitation Systems (e.g. urine diversion) — Go to Q5.24
10 = Open defecation (e.g. no facilities, field, bush) — Go to Q5.27a
11 = Other (specify) — Go to Q5.24

Ask if flush toilet connected to public sewerage system (option 1) in Q5.22

5.23 Does this household pay for the sewerage system?
1 = Yes
2 = No
3 = Do not know

5.24 Is the toilet facility shared with other households?
1 = Yes
2 = No

5.25a Is the toilet facility in the dwelling, in the yard or outside the yard?
1 = In dwelling — Go to Q5.26a
2 = In yard — Go to Q5.26a
3 = Outside yard

Ask if toilet is outside the yard. Otherwise go to Q5.26a

5.25b How far is the nearest toilet facility to which the household has access (200 m is equal to the length of two football/soccer fields)?
1 = Less than 50 m

2 = 51-100 m 3 = 101-200 m 4 = 201-500 m 5 = More than 500 m
5.26a During the past 6 months, has your household experienced any of the following problems with regards to the toilet facility usually used by this household? *Read all the options.* *Yes/No/Not applicable for each.* 01 = No water to flush the toilet 02 = Toilet blocked up 03 = Toilet pit or chamber full 04 = Toilets not well maintained and broken 05 = Poor lighting 06 = Toilet not enclosed well or structure damaged 07 = Broken pipes or blockages in the municipal system (sewerage flowing in the street) 08 = Problem reported but not repaired within 5 working days 09 = Toilet system overflowing in yard 10 = Toilet system not working properly causing odours and insects 11 = No tap or water point to wash hands after using the toilet 12 = Sewer problems being repaired that the municipality informed you about
5.26b During the past 6 months, have you experienced any of the following problems while using the toilet facility usually used by this household? *Read all the options.* *Yes/No/Not applicable for each.* 01 = Toilet unsafe to use, due to risk of assault 02 = Toilet unsafe to use, due to health risks 03 = Too many people, long waiting times 04 = Toilet not cleaned (if shared public toilet) 05 = Toilet does not provide privacy 06 = Unable to dispose of sanitary items (women and girls) *If all options in Q5.26b are ''no'' then go to Q5.26d*
5.26c Has the problem/s mentioned in 5.26b caused you to relieve yourself in the open/ practice open defecation? 01 = Yes 02 = No 03 = Do not know
5.26d Does your household have hand washing facilities (e.g. basin, bowl or functioning tippy tap) with soap and water? 01 = Yes 02 = No 03 = Do not know
5.26e After defecating, do household members wash their hands using soap? 01 = Yes 02 = No 03 = Do not know

3.1.8 Concerns

3.1.8.1 Differences between the Census and GHS data

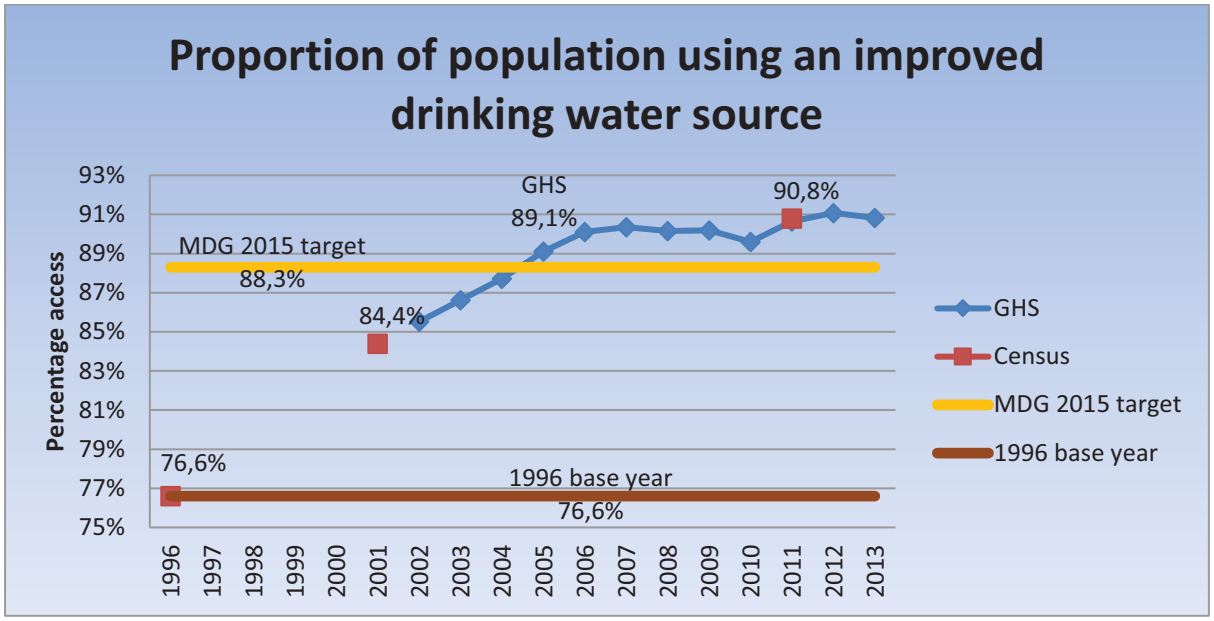
In the discussions with the DWS and StatsSA officials, they expressed their concern about the differences in the data from the GHS and the Census 2011. The data on access to water was similar, but there were significant differences in the sanitation data. This proved to be a challenge for DWS as they based their departmental database on Census data. It was important for them that StatsSA reconciled their data sets. Some reasons were explored. StatsSA mentioned that, for the Census, temporary fieldworkers are employed, whereas the GHS has a more permanent group of fieldworkers.

DWS commented that the United Nations used the GHS data to report on water and sanitation progress in terms of SDGs (and previously the MDGs), not the Census data.

3.1.8.2 Flat lining

In 2018, Allestair Wensley, the previous Chief Engineer of DWS, noted in an internal document called "Standards for the SDGs case studies'' that the ''flat lining'' of progress was a concern.

…service delivery progress was "flat lining" in South Africa even after significant financial spending (R3 billion, during 2006/7). It had become clear that simply spending money on infrastructure was not eradicating the water services backlogs. This trend was supported by service delivery statistics, based on water and sanitation questions placed by the Department of Water and Sanitation with the South African Statistical Services (StatsSA), specifically in relation to the MDG Target 7C – Indicator 7.8: "proportion of population using an improved drinking water source". See drinking water service delivery trend graph below:



To be able to address this trend, the Department reviewed their monitoring and evaluation process by distinguishing between water services ***facility*** implementation (the infrastructure provided) and "the ***sustainable operation*** of the facility (which is based on the stipulated basic service delivery supply standard of a minimum flow rate of 10 litres per minute and available when needed at 98% assurance of supply)" (Wensley, 2018).

The Department subsequently developed a new indicator, which was called ''stability of supply''. It was added to the GHS 2009 questionnaire as five questions (5.19a & b, 5.20, 5.21a & b) on water interruptions and was monitored in GHS 2018 as well.

According to Wensley (2018), the results from the GHS 2009 for ''stability of supply'' yielded the following results:

- *The percentage of households who had stable municipal water supply was 76.3% and access to a basic tap water supply (within 200 m of Household) was 83.8%.*

- *Based on the results, DWS developed a new composite indicator called "Reliability of Supply" with regards to access to basic water services provision. The method of computation was to multiply "Stability of Supply" (76.3%) by "Access to Basic Water Supply" (83.8%). The Reliability of Supply Indicator for South Africa was 64%.*
- *The "Access to Basic Water Supply" indicator correlates directly with the SDG definition of Access to Basic Water Supply (with a distance filter of 200 m, not 100 m).*
- *This implies that although 95% of the infrastructure for basic services had been provided, only 64% was operational. (It seemed that 10% of the schemes had become dysfunctional and most of the financial spend continued to be directed to new scheme implantation and not the rehabilitation and upkeep of existing schemes – which explained the flat lining trend in the graph).*
- *The latest Census (2011) yielded the following:*
    - *Access to basic water supply infrastructure = 85%*
    - *Access to Stable Water Supply = 76%*
    - *Access to Reliable Water Supply = 65%*
- *The results of the worrying service delivery trends were presented to Government, explaining the dynamics of why service delivery had slowed to virtually zero.*
- *In 2014, a national election took place and these results directly influenced government policy. The latest Government Medium Term Strategic Framework (2014 to 2019) has 12 key Outcomes, and Outcome 9, states that "90% of all Households must have access to a sustainable and reliable water supply by 2019".*

Wensley (2018) notes that ''going forward the challenge remains to obtain the (technical) causal effect between service delivery protest action and Reliability of Supply".

3.1.8.3 Buckets

According to the DWS officials, the use of bucket toilets was a highly politicised issue and posed a challenge for the department. It was therefore critical that the data on bucket toilets was reliable.

StatsSA commented that respondents do not have the same understanding of bucket toilets and stressed the importance of adequate training for fieldworkers. DWS and StatsSA agreed that the data on this variable was problematic and that they would work together with the goal of improving data on bucket toilets in the upcoming Census (Roux, 2019).

According to Dennis Behrmann, the Metros have always queried the results of the Community Survey and GHS, as the results did not tally with the expenditure to eradicate "buckets" (personal communication).

3.1.8.4 WASH information

This concern was raised in a meeting between StatsSA and DWS officials (20 Sep 2018). DWS colleagues indicated that the data from the GHS is adequate for most SDGs; however, access to an adequate handwashing facility was a new priority and DWS required accurate data for area-specific planning and information campaigns. The handwashing question was added to GHS 2018 and subsequent versions.

3.2 Literature review: Part 2 Cognitive Action Research

The methodology of Cognitive Action Research (CAR) combines insights from the following fields (Van den Berg, Slabbert and Green, 2019):

- Cognitive interviewing
- Action research
- Plain Language, and
- English as a foreign language (EFL).

The sections below discuss cognitive interviewing, action research, Plain Language and EFL, and how each field of study contributes to the methodology of CAR.

3.2.1 Cognitive interviewing

In the 1980s, psychologists and survey methodologists joined forces to create a new field of study, called CASM or Cognitive Aspects of Survey Methodology (Schwarz, 2007).

The CASM researchers developed models to identify and evaluate the psychology of response errors in survey questionnaires (Schwarz, 2007). In particular, the cognitive interviewing technique has been widely researched in cognitive laboratories at survey research centres or statistical agencies. The literature makes little reference to the in-field application of cognitive interviewing in a real setting and not a laboratory (Willis, 1999).

Willis (2004) describes cognitive interviewing as “techniques to study the manner in which target audiences understand, mentally process and respond to the materials represented with a special emphasis on potential breakdowns in this process”.

The cognitive interviewing methods used most frequently are:

- Verbal probing
- Think-aloud, and
- Vignettes.

The **verbal probing method** involves questions that unpack how the respondent got to their answers. There are different categories of probes, including comprehension/interpretation probes, paraphrasing, confidence judgement, recall probes, specific probes and general probes (Willis, 1999).

The **think-aloud method** refers to a very specific activity where respondents are explicitly asked to “think aloud” as they answer a question. While answering the question, the respondent should describe in detail how they have reached their answer. The interviewer should not interject or interrupt except to ask for more detail (Willis, 1999). Respondents are usually trained on how to perform the think-aloud method before the interview.

The **vignette method** comprises brief descriptions of hypothetical situations that are presented to respondents. Respondents are asked to base their answers to the survey questions on the vignette (Collins, 2003; Willis, 2004). When answering the questions, respondents are asked to explain their thinking out loud.

3.2.2 Framework of analysis

Table 9 below shows a framework of analysis for typical issues identified during the cognitive interviewing process. The framework of analysis is based on the coding frame of Presser and Blair (1994) (Blair & Brick, 2010) and insights from the research team's previous cognitive interviewing studies[7].

Table 9 Framework of analysis for survey questions and response categories

Structural or logic issues

- Flow or relation between questions
- Structure or organisation of information
- Amount of information

Semantic issues

- Ambiguity
- Semantic categories
- Weak verbs
- Insufficient knowledge:
    - Technical term is not understood
    - Common term is not understood
    - Abbreviations not understood
- Inability to analyse the relationship between clauses in a complex sentence
- Conceptual variability

Respondent task issues

- Recall
- Inappropriate response categories
- Response categories that do not talk to the question
- Overlapping response categories
- Response categories are insufficient
- Response categories making too fine a distinction
- Too many response categories
- Sensitivity
- Accuracy of responses to open questions:
    - Spelling
    - Incompleteness

How was cognitive interviewing used in this study?

The research team used verbal probing to identify and evaluate response errors and issues in the answering of the 15 selected water and sanitation questions.

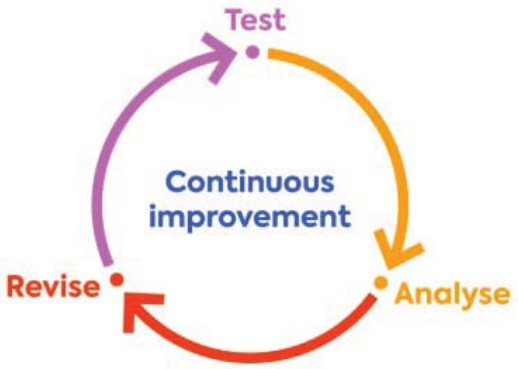
[7] Studies include testing an SMS survey for the i2i facility (FinMark Trust) (2018); testing a social housing questionnaire for Genesis (2018); testing concepts and survey questions for MultiChoice (2019); testing online surveys for Cenfri (2019-2020); testing the MuSSA self-assessment tool (WRC Project No. TT 816/20).

3.2.3 Action research

Kemmis et al. (2014:2) define action research as "an approach to research and change which is best represented as a self-reflective spiral of cycles of planning, acting and observing, reflecting and then re-planning in successive cycles of improvement". Participatory action research involves the subjects of the research as researchers of their own practice.

How was action research used in this study?

Action research has been applied in this study in four successive rounds (cycles). Each round comprised testing the questionnaire with respondents, analysis and revision. After each round the research team reflected critically on the findings and adjusted the questions to address semantic, structural, logic and respondent task issues that respondents experienced in that round. The revised questions were subsequently tested, analysed, and revised in the next round. This process was repeated four times.



3.2.4 Plain Language

In the literature (International Plain Language Federation, 2020; Article 22 of the National Consumer Act 68 of 2008) Plain Language is defined as an outcome and not as a 'language': Communication is in Plain Language if a member of the target audience with average literacy skills and minimal experience of the content can easily find what they need, understand what they find and use what they find. The definition implies that user testing is the only way to determine whether communication is indeed in Plain Language.

Research into barriers to understanding has led to a set of Plain Language tools or techniques that can be used to improve clarity and understanding (PLAIN, 2011). These tools cover all aspects of communication and range from structure, order and language to layout and design.

How was Plain Language used in this study?

In this study, user testing methods were integrated into the cognitive interviewing. Plain Language tools and techniques were used to analyse the issues that respondents had with certain questions and to improve their clarity for respondents.

3.2.5 English as a foreign language (EFL)

In the field of EFL, there have been many studies on the cognitive strategies that foreign language speakers employ to make sense of a written message (such as Mohd et al., 2010; Knight et al., 1985). For example, EFL speakers typically "latch" onto familiar words and structures, and they deduce the meaning of the rest based on what is familiar.

How was EFL reading-processing strategies used in this study?

Even though the fieldworkers read out the questions, knowledge of these strategies assisted the research team to:

- analyse response behaviour, and
- improve questions so that it was easier for respondents to process the meaning of the questions.

3.3 Desktop analysis of Census and GHS questions

3.3.1 Differences between the Census and the GHS water and sanitation questions

This analysis was only done for indicators that are asked in both questionnaires. Sometimes a single Census question corresponds with more than one GHS question.

Table 10: Differences between Census 2011 and GHS 2018 water and sanitation questions

Census questions	Corresponding GHS questions	Differences
Water		
H-07 ACCESS TO PIPED WATER In which way does this household mainly get piped water for household use? 1. Piped (tap) water inside the dwelling 2. Piped (tap) water inside the yard 3. Piped (tap) water on community stand: distance less than 200 m from dwelling 4. Piped (tap) water on community stand: distance between 200 m and 500 m from dwelling 5. Piped (tap) water on community stand: distance between 500 m and 1000 m (1 km) from dwelling 6. Piped (tap) water on community stand: distance greater than 1000 m (1 km) from dwelling 7. No access to piped water	5.12 What is the household's main source of drinking water? 01 = Piped (tap) water in dwelling/house 02 = Piped (tap) water in yard 03 = Borehole in yard 04 = Rainwater tank in yard 05 = Neighbour's tap 06 = Public/communal tap 07 = Water carrier/tanker 08 = Water vendor 09 = Borehole outside yard 10 = Flowing water/stream/river 11 = Stagnant water/dam/pool 12 = Well 13 = Spring 14 = Other (specify)	Census: • Ask about water for household use • Separate question on access to piped versus not piped water (H-07). Sources are asked in H-08. • Distance is included in the question (H-07) GHS: • Ask about drinking water • Distance is a separate question (5.13a)

Census questions	Corresponding GHS questions	Differences
	Ask if water is not in dwelling or in yard 5.13a How are far is the water source from the dwelling or yard (200 m is equal to the length of two football/soccer fields)? 1 = Less than 200 metres 2 = 201-500 metres 3 = 501 metres-1 kilometre 4 = More than 1 kilometre 5 = Do not know	Census: • Distances only apply to water on a community stand GHS: • Distances apply to all sources outside the yard
H-08 SOURCE OF WATER What is this household's MAIN source of WATER for household use 1. Regional/local water scheme (operated by municipality or other water services provider) 2. Borehole 3. Spring 4. Rainwater tank 5. Dam/pool/stagnant water 6. River/stream 7. Water vendor 8. Water tanker 9. Other *If 2-9, go to H-10*	5.16 Is your main source of drinking water supplied by a municipality? 1 = Yes 2 = No 3 = Do not know	Census: • Does not have "well" as an option • The options mix up the supplier and the source. GHS has a separate question to determine municipal supply.
H-09 RELIABILITY OF WATER SUPPLY In the last 12 months, has this household had any interruptions in piped water supply? 1. Yes 2. No *If 2, go to H-10*	*Ask only if main source supplied by municipality* 5.19a Has your municipal water supply been interrupted at any time during the last 12 months? 1 = Yes 2 = No	Census: • Interruption in piped water supply • Includes piped borehole water – self supply or other GHS: • Interruption in municipal water supply • Accuracy of response relies heavily on whether respondent knows the origin of their water source.
H-09a RELIABILITY OF WATER SUPPLY Did any specific interruption(s) of piped water supply last longer than two days? 1. Yes 2. No *If 2, go to H-10*	5.20 Thinking about the interruptions in your municipal water supply over the last 12 months, was any specific interruption longer than two days? 1 = Yes 2 = No 3 = Do not know	See above.

Census questions	Corresponding GHS questions	Differences
	5.21b If you add all the days that your municipal water supply was interrupted over the last 12 months, was it more than 15 days in total? 1 = Yes 2 = No	Not asked in Census
H-09b RELIABILITY OF WATER SUPPLY What alternative water source did the household use during water supply interruption? 1. Borehole 2. Spring 3. Rainwater tank 4. Dam/pool/stagnant water 5. River/stream 6. Water vendor 7. Water tanker 8. Other 0. None	5.21a If the municipal water supply interruption was or longer than two days over the last 12 months, what alternative drinking water source did the household use during the interruption? 01 = Borehole 02 = Spring 03 = Well 04 = Rainwater tank 05 = Dam/pool/stagnant water 06 = River/stream 07 = Water vendor 08 = Water tanker 09 = None 10 = Do not know 11 = Other (specify)	Census: • "Well" is not an option • No 'do not know' option • No opportunity to specify Other Note: options mix up source and supplier. If the respondent buys water from a neighbour with a borehole, what is the alternative source: Borehole or Water vendor?
Sanitation		
H-10 TOILET FACILITIES What is the MAIN type of TOILET facility used by this household? 1. Flush toilet (connected to sewerage system) 2. Flush toilet (with septic tank) 3. Chemical toilet 4. Pit toilet with ventilation (VIP) 5. Pit toilet without ventilation 6. Bucket toilet 7. Other 0. None	*Ask all households* 5.22 What type of toilet facility is used by this household? 01 = Flush toilet connected to a public sewerage system 02 = Flush toilet connected to a septic tank or conservancy tank 03 = Pour flush toilet connected to a septic tank (or septage pit) 04 = Chemical toilet 05 = Pit latrine/toilet with ventilation pipe 06 = Pit latrine/toilet without ventilation pipe 07 = Bucket toilet (collected by municipality) 08 = Bucket toilet (emptied by household) 09 = Ecological Sanitation Systems (e.g. urine diversion) 10 = Open defecation (e.g. no facilities, field, bush) 11 = Other (specify)	• GHS has more options than Census • Examples: pour flush, two types of buckets, Ecosan • GHS mentions a conservancy tank • None is specified as open defecation in the GHS • GHS has opportunity to specify Other

3.3.2 Applying the CAR framework of analysis

An initial analysis of the Census and GHS questions indicated that respondents in particularly rural areas and informal settlements might not understand and process these questions as intended, even if translated. Below are examples of potential issues:

3.3.2.1 Semantic issues

- Do respondents distinguish between household water and drinking water?
- How do respondents interpret piped water (tap water)? Do they include a tap from a borehole, for example?
- What is respondents' interpretation of distance, and how do they express it? In walking time; in travel time, in kilometres, in soccer fields?
- How do they understand "regional/ local water scheme (operated by a municipality or operated by another water services provider")?
- Do respondents know what ''stagnant water'' is and which sources of water would they call ''stagnant''?
- How do they understand the term ''water vendor'? If they buy water from a neighbour with a borehole, would they choose this option? Or would they choose the ‘’borehole’’ option?
- What is their understanding of ''an interruption of piped water supply''?
- How do respondents understand ''alternative water source''?
- How do respondents understand ''sewerage system''?
- How do they understand the difference between a pit toilet with, and without ventilation?

3.3.2.2 Respondent task issues

- Do respondents know if their toilet is connected to a sewerage system or a septic tank?
- Some questions have a long list of response options. If there is no showcard, respondents are likely to forget some of the options.

3.3.3 The hierarchy of water supply and sanitation facilities

The Census and GHS questionnaires have theme limitations as a result water supplier, water source and end user point get mixed up in the response options. However, from the respondent’s perspective, it becomes complicated to select an option. For example, which option does a respondent select if both the municipality and a water tanker are options and the respondent gets water from a municipal tanker?

The two figures below attempt to show the complexities of these hierarchies. The green blocks depict basic (in terms of the South African definition) and higher supply levels, in other words, meeting DWS’ interpretation of the requirement of safe drinking water or improved sanitation. Red blocks depict drinking water that is not safe and unimproved sanitation. Orange blocks depict interim measures or self-supply (we are not sure if these are considered as safe drinking water or improved sanitation).

3.3.4 The hierarchy of water supply

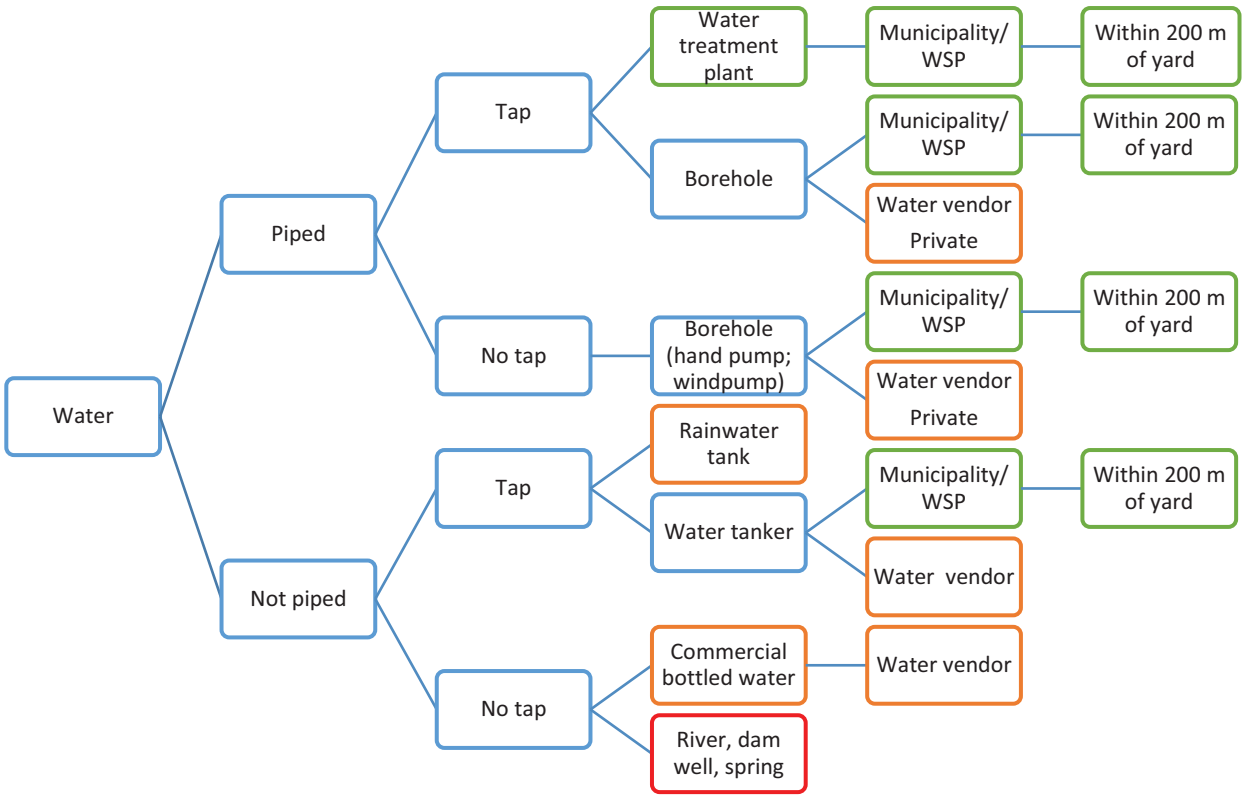


Figure 9: Hierarchy of water supply

3.3.5 The hierarchy of sanitation facilities

The equivalent sanitation hierarchy is less complex from a respondent's perspective because the supplier is not asked.

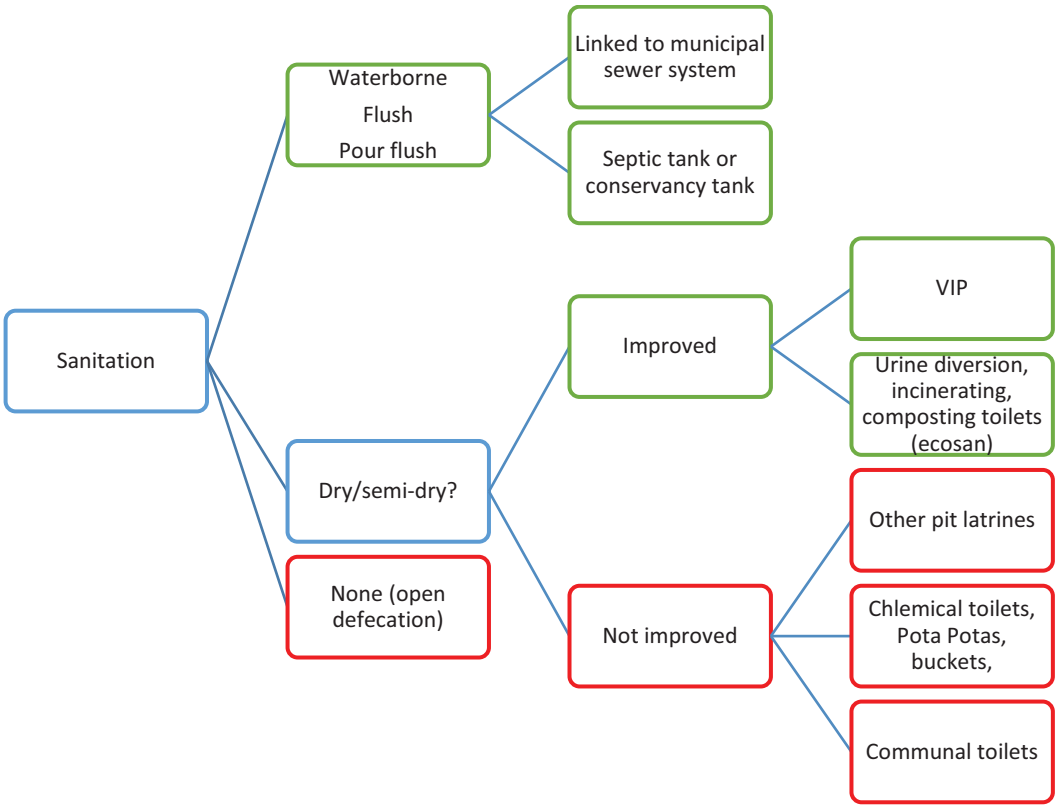


Figure 10: Hierarchy of sanitation facilities

3.3.6 Different water and sanitation economies

The Census and GHS questions are framed in terms of government's water and sanitation policy, implementation planning and budgets. However, the SERI report (Royston, 2019) indicated that in areas where municipal water and sanitation services are absent or dysfunctional, an alternative water and sanitation economy is emerging as the short summaries of the three case studies in informal settlements attest:

Ratanang in Klerksdorp, North West

The at least 1, 800 residents of Ratanang did not have access to any municipally-provided services in 2016 and 2017, when the field research took place…. The availability and management of water, sanitation and solid waste was entirely community-organised, with the exception of the sporadic arrival of a water tanker from the municipality… Local residents stepped into the vacuum, and local artisans undertook hand-pump repairs, dug and re-dug unimproved pit latrines when they filled up, ran solid waste recycling operations and collected water or firewood for other residents for a small fee.

Marikana in Phillipi in the City of Cape Town

In Marikana, municipal service provision was limited to "temporary services" comprised of 371 chemical toilets and between 50 and 100 communal taps, many not functional, for 60 000 people. Toilets were emptied by a municipal service provider four times a week. Many of the chemical toilets were reportedly and observably frequently full, unpleasant and unsafe to use.

In an effort to reduce vandalism and eradicate bucket toilets which residents used overnight, the City of Cape Town provided portable flush toilets or "porta-portas", which were collected, emptied and cleaned, and delivered by truck to depot points such as the open space adjacent to the settlement three times a week. Households were not assigned their own porta-portas and residents said that receiving a different toilet each time made them feel anonymous.

Some households had made their own water connections, saying that the walk to one of the roads where the tap stands had been erected was too onerous. These connections were managed in similar ways to electricity connections: households paid for pipes, connections and labour, and connected either to main lines on the periphery of the settlement, or to infrastructure installed by the municipality but subsequently discontinued. Residents reported waiting in long queues to collect water for drinking, laundry and other household needs.

Siyanda in Kwa-Mashu, eThekwini

In Siyanda in eThekwini, the municipality had also provided interim water and sanitation services through communal ablution blocks (CABs). Twenty-two of these facilities had been installed in Siyanda in eleven pairs, one for males and another for females. The facilities had two showers, each with a door for privacy, two flush toilets with doors, two hand basins and an additional two fitted urinals in the male containers. Attached to the outside of each container were four basins used for washing clothes and an additional stand-alone tap. At the time of research, approximately 1,000 people were living in the settlement, which meant that each container served about 45 households, approximately 200 metres from each household.

The women interviewed stated clearly that they did not feel it was safe to walk to communal toilets at night, regardless of whether they could access the keys from the caretaker. Many residents had dug pit latrines in their yards in order to mitigate distances, topography and night-time accessibility and safety issues.

This raises the question as to how respondents in these areas would answer the Census and GHS questions, and how the monitoring agencies would interpret these responses in view of the mentioned alternative water and sanitation economies.

3.3.7 Water for different uses

The current Census and GHS questions do not distinguish between different water uses, for example water for flushing toilets, water for washing clothes and water for drinking and cooking. The research will explore how these practices are reflected in responses.

Chapter 4: Fieldwork methodology

4.1 Questions tested in Round 1

The following criteria were drawn up for the questions to be tested in Round 1:

- Maximum 15 questions (This is the maximum number of questions that can be tested with a respondent. If the questionnaire is longer, fatigue sets in, which has a negative impact on the quality of the interview)
- Include all the Census questions
- Include questions that test indicators of basic water and sanitation facility and service
- Include questions that test indicators of SDG 6.1 and 6.2, if not already included, and
- Exclude perception questions.

Since the corresponding GHS questions are not exactly the same as the Census questions, it was important to test the Census and the GHS version. However, to test all the basic indicators of the SDGs and the DWS indicators, meant that there were more than 15 questions. Therefore, in Round 1, the research team tested two questionnaires with two groups of respondents. The two questionnaires appear in Annexure 1.

4.2 Sampling

The research team initially proposed that the Cognitive Action Research take place in three rounds. It was however decided to extend the research to four rounds of testing to test the water questions with a bigger sample of non-municipal consumers.

The first three rounds of Cognitive Action Research were conducted in October-November 2020. The final round (Round 4) took place in March 2021.

The table below sets out the study sample.

Table 11: Sample

Round 1	**Gauteng:** • Formal (9 respondents): various areas including 3 from Langaville suburbs • Informal (7): Langaville and Bramfisherville • Rural (6): Hammanskraal **Limpopo: Polokwane LM** • Formal (2): various areas • Informal (6): Mankweng, Seshego, Freedom Park, Greenside • Rural (7): Makgofe **Total: 37**
Round 2a	**Gauteng:** • Informal (10): Langaville and Bramfisherville **Other provinces (4 – working in Johannesburg)** • Free State (formal), North West (informal), Mpumalanga (informal), Eastern Cape (formal) **Total: 14**

Round 2b	**Gauteng:** • Rural (6): Hammanskraal **Limpopo: Polokwane LM** • Formal (7): Mankweng, Seshego • Informal (6): Blood River • Rural (5): Makgofe **Total: 24**
Round 3	**Gauteng:** • Informal (7): Langaville • Rural (6): Northern Farm **Total: 13**
Round 4	**North West:** • Rural (7): Phukeng (near Rustenburg) • Informal (5): Mmakau **Western Cape** • Rural (1): Breede Valley LM **Northern Cape** • Rural (1): Ga-Segonyana LM **Total: 16**
Total	**102 qualitative interviews/respondents**

Note: only respondents with a basic conversational proficiency in English were interviewed.

According to DWS, the split between municipal and non-municipal consumers is about 80:20. Twenty (20) of the 102 interviews were conducted with non-municipal consumers.

4.3 Cognitive action research

Each round of Cognitive Action Research comprised three steps: interview, analysis and revision:

1. Interview
    a. To start off the interview, the interviewer had an **informal chat** with the respondent to gain trust and insight into their lives. These insights were used in the cognitive interview to make the probing questions more specific and more personal.
    b. The interviewer **asked the respondent the Census/GHS questions** and recorded their answers. Interviewers did not assist respondents when they asked for clarification but took note of their questions and referred to it during probing.
    c. Before the cognitive interview, the interviewer **explained to the respondent** that their input was required on how the questionnaire could be made easier for people to answer. The importance of their role and input was emphasised.
    d. The interviewer then conducted the **cognitive interview**. For each round, there was a discussion guide (see Annexure 2 for an example of such a discussion guide). Each question was discussed separately. General probing questions to determine the strategies or frames of reference that respondents used to answer the question were asked first. The general probes were followed by specific probes relevant to each question. For example, specific probes referring to the terminology used in a question. If a response did not correspond with the contextual information obtained during the

informal chat, interviewers probed further to understand why the respondent had given a different answer.

2. Analysis
    a. As a first stage of the analysis, interviewers **recorded the verbal and non-verbal responses** to each survey and probing question on a summary sheet of the interview.
    b. After all interviews in the round were conducted, the interviewers participated in a **debrief session** with the research team. The responses to each survey question and its associated probes were discussed, and the reasoning behind answers were unpacked in detail. Inappropriate responses were tracked in an Excel spreadsheet. There were two types of inappropriate responses:
        i. Responses that resulted from total or partial incomprehension
        ii. Responses that resulted from a mismatch between the respondent's interpretation of the questions and the interpretation intended by the questionnaire designers.
    c. Lastly, the research team **analysed the questions and interpreted the responses** in terms of the insights from all the mentioned fields of knowledge. The issues were then mapped onto the framework of analysis.
3. Revision
    a. At the end of each round of interviews, the **questionnaire was revised** for the next round. Plain Language tools and techniques were used to address the issues that the analysis identified.
    b. Before the next round, the research team had **discussions with DWS and StatsSA** to ensure that the revised questionnaire remained on track in terms of its objectives.

4.4 Appropriate answering

The term ''appropriate answering'' refers to respondents selecting a response option that is an accurate reflection of their water and sanitation reality. The term is not relevant for questions that ask perception or opinion. The term was also not applied in this research when the fieldworkers were unable to verify the respondent's response either by observation or with probing. For these reasons, the term ''appropriate answering'' was not applied to the water treatment question, the sanitation problems questions and the question asking about handwashing behaviour.

A large percentage of inappropriate responses would indicate that the data integrity is compromised.

The reasons for inappropriate answering were explored with probing questions in in-depth, individual qualitative interviews. The interviewing method clearly revealed whether an answer was appropriate, inappropriate or if the respondent did not understand the question at all. The analysis of the responses and the answers to the probing questions furthermore revealed the underlying problem with the question or its response options. A single inappropriate answer was often sufficient to identify an underlying internal logic issue, structural issue, or an ambiguity issue.

Once an issue was identified, the question was revised, and the revision was tested in the next round.

In this research, as in our previous research in this field, there were one or two idiosyncrasies and outliers. The implication is that 100% appropriateness is almost impossible to achieve. For example, a respondent might refer to an event that had a major impact even though it happened outside the timeframe of the question (two years ago instead of the past 12 months).

Chapter 5: Analysis and findings

5.1 Findings of the first three rounds of research

This section reports on the findings of the first three rounds of testing.

5.1.1 Overview of Rounds 1-3

Figure 11: Overview of Rounds 1-3

5.1.2 Overview of indicators tested

It was important to align the revised questions with the latest indicators. The table below maps the testing against the latest version of the Water and Sanitation indicators (National Treasury, 2020).

Table 12: Summary of indicators tested

Indicator (as captured in PowerPoint of Joint W&S draft indicators for 2021)	Census/GHS question	Tested	Notes
Water			
Drinking water	Census (household water) GHS (drinking water)	Tested both in Round 1	Rounds 2 and 3 tested drinking water only.
Access to piped water - In house - In yard - Outside yard (less than 30 minutes to fetch from communal tap)	Census/GHS Distance expressed as metres	Yes	From Round 2, distance was expressed as less/more than 30 minutes to fetch.
Volume of water supplied by water tankers	Census/GHS Volume not asked; asked if consumer gets water from a water tanker	Yes	Respondents confused tanker and tank. Tested ''water truck'' for municipal consumers in Rounds 2 and 3.
Interruptions - Mains - Unplanned interruptions - Callouts within 24 hours	Census/GHS No distinction between planned and unplanned from consumer perspective Callouts not asked	Yes	Response options expanded in Rounds 2 and 3 to capture different types of interruptions (once off vs regular, tap vs water truck/tank).
Water quality	GHS Treatment question	Yes	The original question worked well. It was only slightly simplified for Round 2.
New water connections	Not asked	No	
Water meters	GHS	No	
Water re-use	Not asked	No	
Sanitation			
Improved facility: Number of flush toilets Number of pour flush (not mentioned) Number of VIPs	Census/GHS	Yes (terminology and sketches)	Names of toilet types simplified to increase appropriate answering.
Number of chemical toilets	Census/GHS	Yes	Respondents found the term confusing because chemicals are added to a range of toilet types. Tested alternative term, ''mobile''.
Flush toilets connected to municipal sewer system	Census/GHS	Yes	Asked in follow-up question.
Flush toilets connected to septic tank	Census/GHS	Yes	Asked in follow-up question.
Sewer blockages	GHS (not a separate question; included in list of problems)	Yes	Became a separate question in Rounds 2 & 3.

Indicator (as captured in PowerPoint of Joint W&S draft indicators for 2021)	Census/GHS question	Tested	Notes
Callouts within 24 hours	GHS (included in list of problems; no repair within 5 working days)	Yes (in Round 1)	Captured in new question on sewer blockages.
New sewer connections - To households - To communal toilets	Not asked	No	
Faecal sludge management is not listed in the 2021 indicator documents but is an important SDG indicator.	Not asked	Yes	New question in Round 2. Revised for Round 3.
Paying special attention to the needs of women and girls is not listed in the 2021 indicator documents but is an important SDG indicator.	GHS (included in list of problems)	Yes	Captured in new question.
Water and sanitation hygiene (WASH) is not listed in the 2021 indicator documents but is an important SDG indicator.	GHS	Yes	The term "handwashing facility" was a problem in the first question and overreporting in the second question. For the first question, the focus was shifted to access to soap. In the second question, the option "Not always" was added to encourage respondents to report actual behaviour.
Customer satisfaction	GHS (2018)	No	

Annexure 3 shows how the questions were changed across the first three rounds.

5.1.3 Appropriate answering

5.1.3.1 Introduction

The pie charts below show how appropriate answering improved from Round 1 to Round 3. The improvement is illustrated with reference to two water questions and one sanitation question. These questions are fundamental to reporting on the achievement of Sustainable Development Goals 6.1 and 6.2.

The legend is as follows:

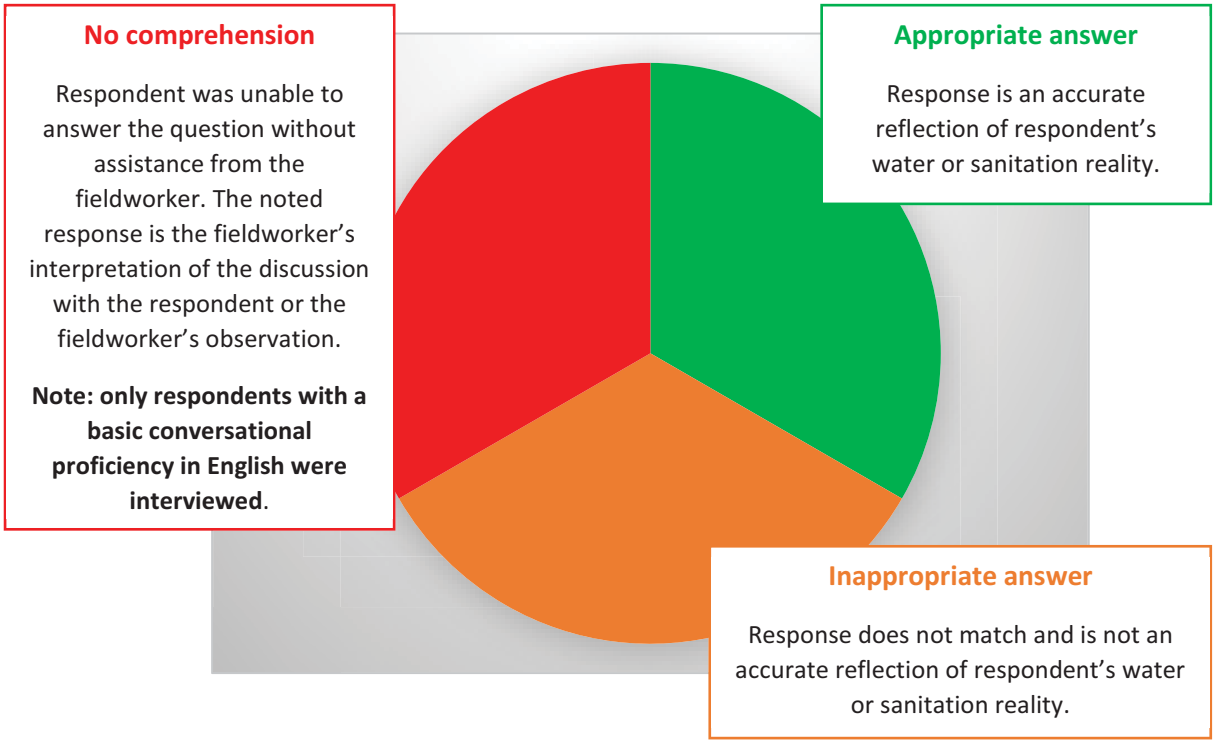


Figure 12: Legend for charts that depict appropriate answering

Although this was qualitative research, percentages of the above three categories (appropriate, no comprehension, inappropriate) are given for the first two water questions and the main sanitation question.

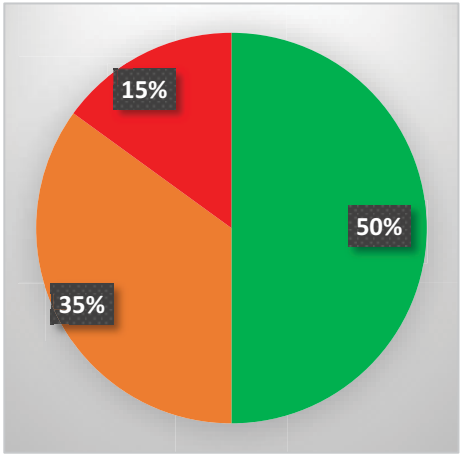
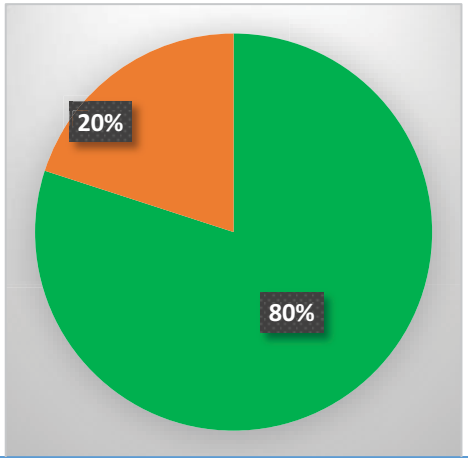
5.1.3.2 Appropriateness of responses to two water questions across the three rounds

The two questions measure progress on SDG 6.1, Access to safely managed drinking water services.

Round 1

The first two water questions on the Census 2011 questionnaire got the following results.

Table 13: Census 2011, first two water questions – Appropriate answering

Census 2011 (first two water questions)	Appropriate answering
Question 1 (Census 2011) In which way does this household mainly get piped water for household use? 1 Piped (tap) water inside the dwelling 2 Piped (tap) water inside the yard 3 Piped (tap) water on community stand: distance less than 200 m from dwelling 4 Piped (tap) water on community stand: distance between 200 m and 500 m from dwelling 5 Piped (tap) water on community stand: distance between 500 m and 1000 m (1 km) from dwelling 6 Piped (tap) water on community stand: distance greater than 1000 m (1 km) from dwelling 7 No access to piped water	
Question 2 (Census 2011) What is this household's MAIN source of WATER for household use? 1 Regional/local water scheme (operated by municipality or other water services provider) 2 Borehole 3 Spring 4 Rainwater tank 5 Dam/pool/stagnant water 6 River/stream 7 Water vendor 8 Water tanker 9 Other	

The reasons for inappropriate answering were the following:

Census 2011, Question 1:

- Terminology – *household, piped water, household use, dwelling, community stand, no access to piped water*
- Distance in metres and kilometres
- Long, composite options
- Too many response options.

Three (3) out of the 20 respondents could not answer the question without the help of the fieldwork (= no comprehension).[8]

[8] In Round 1, 20 respondents answered questionnaire 1 (Census water questions) and 17 respondents answered questionnaire 2 (GHS water questions).

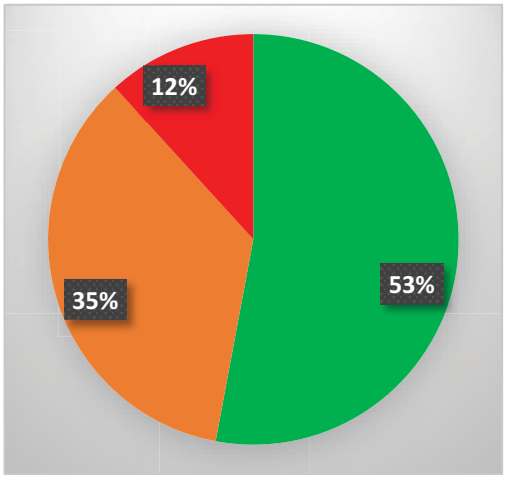
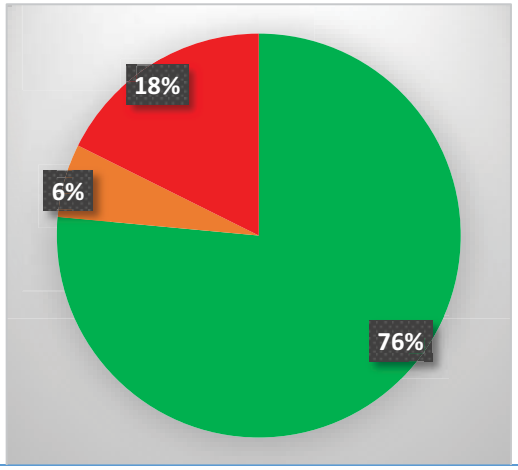
Census 2011, Question 2:

- Terminology – *household, main source, household use, regional/local water scheme, spring, tanks vs tanker, stagnant water, water vendor*
- Too many response options
- Overlapping response categories
- Composite options.

Note: Respondents latched onto the first word that they recognised in option 1, namely "municipality". As the municipality was the supplier for most of the respondents, this question had more appropriate answers than the comprehension results suggest (16 out of 20 respondents answered appropriately).

The first two water questions on the GHS 2018/2020 questionnaire got the following results.

Table 14: GHS 2018/2020, first two water questions – Appropriate answering

GHS 2018/2020 (first two water questions)	Appropriate answering
Question 1 (GHS 2020) What is the household's main source of drinking water? 1 Piped (tap) water in dwelling/house 2 Piped (tap) water in yard 3 Borehole in yard 4 Rain-water tank in yard 5 Neighbour's tap 6 Public/communal tap 7 Water-carrier/tanker 8 Water vendor (charge involved) 9 Borehole outside yard 10 Flowing water/stream/river 11 Stagnant water/dam/pool 12 Well 13 Spring 14 Other	
Question 2 (GHS 2020) Is the household main source of drinking water supplied by a municipality? 1 Yes 2 No 3 Do not know	

The reasons for inappropriate answering were the following:

GHS 2018/2020, Question 1:

- Terminology – *household, main source, piped water, tanks vs tanker, flowing water, stagnant water, water vendor, well, spring*
- Too many response options

- Composite options
- Respondents missed “drinking water” and therefore answered for the water that they use for bathing and washing.

Two (2) out of the 17 respondents could not answer the question at all.

GHS 2018/2020, Question 2:

- Terminology – *household, main source*
- Respondents missed “drinking water” and therefore answered for the water that they use for bathing and washing.

Three (3) out of the 17 respondents could not answer the question at all.

Note: The question is deceptively simple. Most of the respondents did not understand “main source” and there was no other familiar word (except “municipality”) to help them understand what is being asked. When “main source” and “household” were removed and replaced with a simplified question, the appropriate answer shot up to a 100% (see below).

Round 2a and b

In the consultations, DWS and StatsSA agreed that the Census questions and GHS questions should be the same although the GHS would ask addition information. To be aligned with SDG 6.1, it was also decided that water questions should ask drinking water and not household water.

For Round 2, DWS and StatsSA requested the research team to test two approaches to determine access to piped water:

- Approach 1 determines supplier first (municipal vs non-municipal). DWS indicated their preference for this approach. The follow-up question for municipal consumers gave end user point options. The follow-up question for non-municipal consumers unfortunately mixed source, supplier and end user point, due to the limitation of the number of questions in the Census.
- Approach 2 determines source and end user point for municipal and non-municipal consumers. The follow-up question determines supplier.

Note: The only difference between the access to piped water questions in Round 2a and 2b was ‘’handpump”, which was added after consultation with DWS.

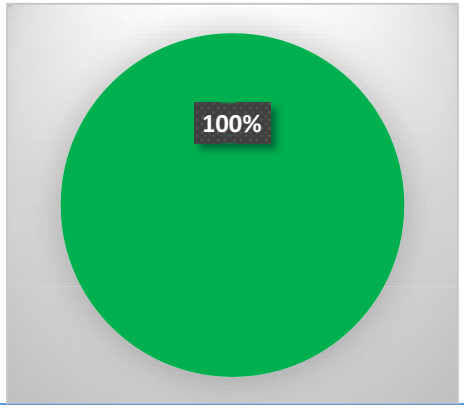
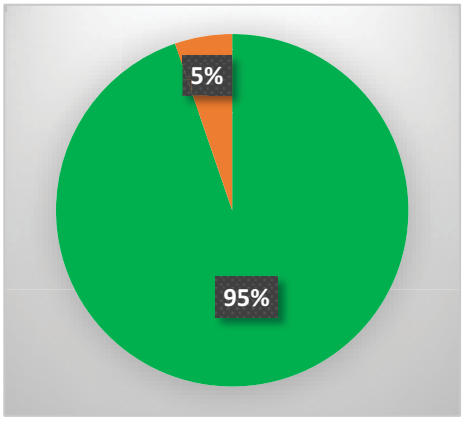
The research team also:

- Rephrased the questions to avoid all terminology that respondents did not understand
- Shortened and simplified the questions where possible
- Took out piped water completely; it was argued that access to piped water could be deducted from access to a tap
- Deconstructed the composite options; distance became a separate question
- Addressed overlapping response categories, and
- Reduced the number of options.

The findings of Round 2 are depicted in the tables below.

Questionnaire 1

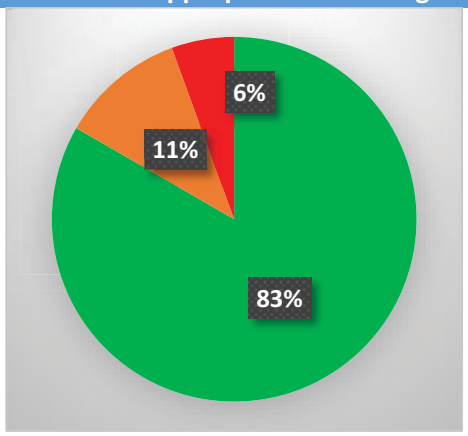
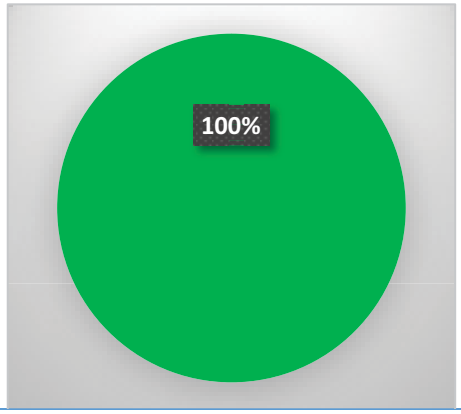
Table 15: Appropriate answering in Round 2 (Questionnaire 1)

Questionnaire 1	Appropriate answering
Question 1 (supplier) Do you get your drinking water from the municipality? 1 Yes 2 No 3 Do not know	
Question 2a (municipal end user point) Do you get this drinking water from: 1 A tap inside your [house/room]? 2 A tap inside your yard? 3 A tap outside your yard? 4 A hand pump? 5 A water truck? 6 A water tank (JoJo)? 7 Not one of these **Question 2b (non-municipal supplier, source and end user point)** You said you don't get your drinking water from a municipality. Do you get it: 1 From a shop or a person who sells water? 2 From your own borehole? 3 From your own rainwater tank or system? 4 From a dam, river or canal? 5 Not one of these? Do you get it: 6 From a tap inside your home? 7 From a tap inside your yard? 8 From a tap outside your yard?	The pie chart below depicts the combined results of Question 2a and 2b. 

- Question 1 was answered appropriately by all respondents.
- Question 2a had one inappropriate answer. The respondent picked the wrong option. Respondent uses multiple end user points: a JoJo tank and a communal tap. The respondent picked option 6 (water tank), but this is not the primary end user point.
- Question 2b was answered by two non-municipal respondents. They answered appropriately. This question was further tested with more non-municipal consumers in Round 3.

Questionnaire 2

Table 16: Water questions – Appropriate answering in Round 2 (Questionnaire 2)

Questionnaire 2	Appropriate answering
Question 1 (mix of end user point and source) Do you get your drinking water: 1 From your own borehole? 2 From your own rainwater tank or system 3 From a dam, river or canal? 4 From a water truck? 5 From a water tank (JoJo) outside your yard? 6 From a hand pump 7 From a tap inside your [house/room]? 8 Fr om a tap inside your yard? 9 From a tap outside your yard? 10 From a shop or a person who sells water? 11 From somewhere else (specify):	
Question 2 (supplier) Do you get your drinking water from the municipality? 1 Yes 2 No 3 Do not know	

As expected, the mixing of source and end user point in Question 1 created some problems. Several respondents selected multiple options: some applicable for a municipal supplier; others for a non-municipal supplier. This necessitated a follow-up question to determine the primary end user point/source. Unfortunately, the Census does not allow for this type of follow-up question.

The long list of response options also contributed to inappropriate answering for Question 1.

For these reasons, it was decided not to test this approach further in Round 3.

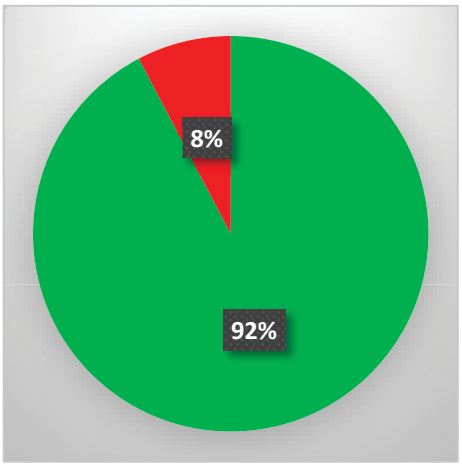
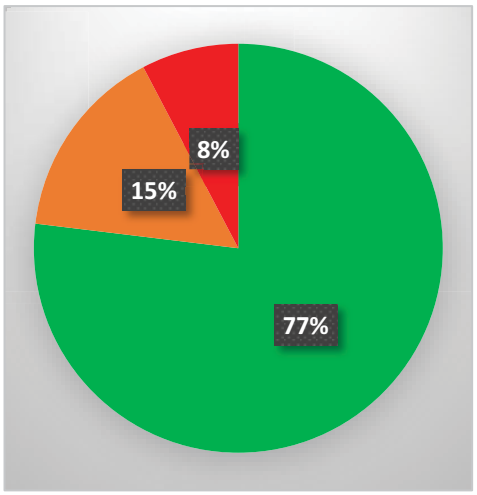
Round 3

To ensure that respondents do not miss “drinking water”:

- an introductory sentence was added,
- drinking water was repeated in the follow-up questions, and
- the term was underlined for emphasis.

The approach to the follow-up question for non-municipal consumers (2b) was revised in Round 3 to accommodate the Census format.

Table 17: Water questions – Appropriate answering in Round 3

Questionnaire	Appropriate answering
Question 1 (source) I am now going to ask you about the water you use for drinking. Do you get the water that you use for drinking from the municipality? 1 Yes 2 No 3 Do not know	
Question 2a (municipal end user point) The drinking water that you get from the municipality, do you get it from: 1 A tap inside your [house/room]? 2 A tap inside your yard? 3 A tap outside your yard? 4 A hand pump? 5 A water truck? 6 A water tank (JoJo)? 7 Not one of these (specify): **Question 2b (non-municipal source and end user point)** You said you do not get the water that you use for drinking from a municipality. Do you get it from: 1 A shop or a person who sells water? 2 Your own borehole? 3 Your own rainwater tank or system? 4 A dam, river or canal? 5 A tap inside your home? 6 A tap inside your yard? 7 A tap outside your yard?	Pie chart for all responses to Question 2 (a+b) 

Seven (7) of the 13 respondents in Round 3 were municipal consumers. These respondents answered both Question 1 and Question 2a appropriately.

The inappropriate answering (orange and red) in the above two charts for Round 3 came from the six non-municipal consumers. The reasons for inappropriate answering were as follows:

- One respondent could not answer Question 1 or 2b because his proficiency in English was inadequate. The respondent gets drinking water from a borehole on a neighbouring farm.
- Question 2b was inappropriately answered by two more respondents. The respondents picked the option “your own borehole” when in fact the borehole belonged to their employer.

Question 2b was subsequently revisited in correspondence between the research team, DWS and StatsSA. The revised version that was agreed upon was tested in Round 4. See section 0 below.

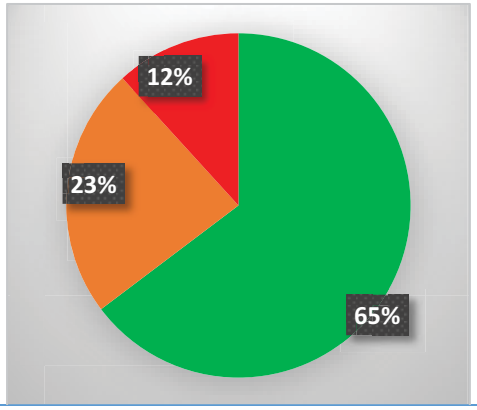
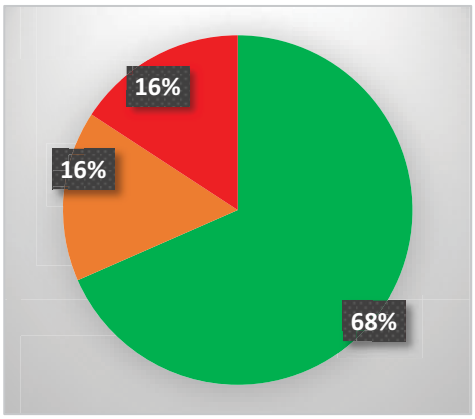
5.1.3.3 Appropriateness of responses to the main sanitation question across three rounds

The question measures progress on SDG 6.2: Access to safely managed sanitation services.

Round 1

The main sanitation question on the Census 2011 and GHS 2018/2020 questionnaires got the following results.

Table 18: Census 2011 and GHS 2018 main sanitation question – Appropriate answering

Questionnaire	Appropriate answering
Census (type of toilet facility) What is the MAIN type of TOILET facility used by this household? 1 Flush toilet (connected to sewerage system) 2 Flush toilet (with septic tank) 3 Chemical toilet 4 Pit toilet with ventilation (VIP) 5 Pit toilet without ventilation 6 Bucket toilet 7 Other 8 None	
GHS (type of toilet facility) What type of toilet facility is used by this household? 1 Flush toilet connected to a public sewerage system 2 Flush toilet connected to a septic or conservancy tank 3 Pour bucket/flush toilet connected to a septic tank (or seepage pit) 4 Chemical toilet 5 Pit latrine/toilet with ventilation pipe 6 Pit latrine/toilet without ventilation pipe 7 Bucket toilet 8 Portable flush toilet 9 Composting toilet 10 Urine diversion dry toilet 11 Open defecation (e.g. no facilities, field, bush) 12 Other	

The reasons for inappropriate answering were the following:

- Respondents were not familiar with the terminology
- Composite response options: The flush toilet options comprised two aspects: the type of facility and the faecal management (sewerage system vs septic tank).
- Too many response options (especially the GHS question).
- Too few response options: pour flush is not an option in the Census question.
- Question does not allow for multiple mention. For example, a respondent in Hammanskraal has a new flush toilet in their yard. They also have a pit toilet as a back-up for when there is no water to flush.
- The bucket toilet option does not distinguish between a bucket toilet that the municipality comes to clean and the night bucket that most people use when their toilet is outside the house. In later

versions of the Census and GHS questionnaires a distinction is made between buckets collected by municipality and emptied by household.

- Some of the newer types of toilets could fall under more than one option. For example, the Bramfisherville residents have a type of pit toilet, called Khusela dry sanitation, which has a lever that opens the opening to the pit. The residents use it like a bucket flush toilet. For them, the lever ''flushes'' the toilet. See the pictures below.

Figure 13: Khusela dry sanitation in Bramfisherville, Soweto

- The reverse happened with "chemical toilet". In the probing, any toilet that the municipality cleans using chemicals was called a "chemical toilet". In addition, respondents add chemicals themselves to their pit toilets. Some therefore called a "pit toilet" also a "chemical toilet."

Round 2a and 2b

After discussions with DWS and StatsSA it was decided to use sketches with labels for the sanitation facilities. The sketches that were developed for the WHO, the JMP and UNICEF (Shaw, 2005) were used for the two pit toilet options. The research team got the sketches for the flush toilets from the internet. The sketches for the chemical and bucket toilets were hand drawn. In the course of the testing, the research team also experimented with open- and closed-door toilets and hand drawn pit toilets.

The research team revised the questionnaire as follows:

- Rephrased the question to avoid all terminology that respondents did not understand
- Shortened and simplified the question
- Deconstructed the composite options; flush toilet connections became a separate question
- Addressed overlapping response categories, and
- Reduced the number of options by removing the options that the respondents did not know at all. For example, in Limpopo there was a composting toilet that even the users could not identify. They called it the Shoprite toilet. It was therefore argued that these options only add to respondent fatigue.

  It is recommended that when StatsSA would be ready to add sketches to the GHS, a second group of sketches can be added to accommodate the less common types.

In Round 2a, the revised questionnaires were tested in Langaville with residents with bucket toilets.

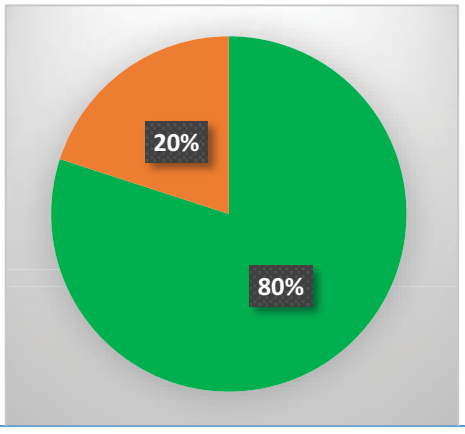
These bucket toilets look from the outside, and even the inside, exactly like chemical toilets that are also supplied by the municipality in the area. The buckets are only visible from the back. (See pictures below)

Figure 14: Bucket toilets in Langaville

The bucket toilets are cleaned by the municipality in the same way as the chemical toilets are cleaned.

The findings of Round 2a are depicted in the table below.

Table 19: Sanitation – Appropriate answering, Round 2a

Questionnaire	Appropriate answering
Round 2a [SHOW PICTURES. READ THE LABELS.] MULTIPLE MENTION What type of toilet (or sanitation) do you use where you live? IF MULTIPLE MENTION, ASK: What do you use most often?	

There was an improvement from Round 1, but some inappropriate answering remained.

Some of the respondents knew that their toilet had a removable bucket, and they selected the sketch with a bucket toilet. Others did not know this and therefore selected the sketch of the chemical toilet. For this type of bucket toilets, the sketches did not improve inappropriate answering.

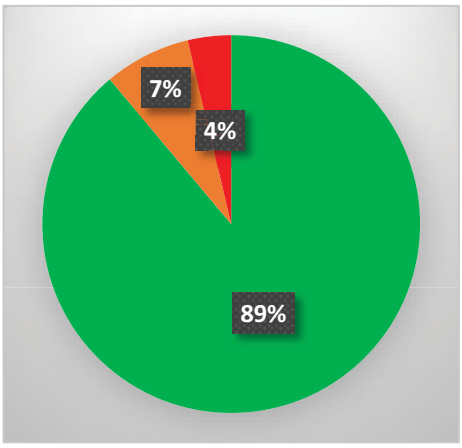
The sketches were also tested in Bramfisherville where residents use a variety of toilet types. All answered appropriately. One respondent uses their old pit toilet because the Khusela one is broken. The fact that the respondent answered appropriately for their current use indicated that the question was working well.

When it became clear that sketches would not be possible for Census 2021 and that it could also be an issue potentially for future GHS surveys, it was decided to test both the listed options and the sketches in Round 2b in Hammanskraal and Polokwane (formal, informal and rural).

Since 2b went back to a list of options, the term "chemical toilet" (which was no longer supported by a sketch) had to be replaced by an alternative term. The probing guided the research team towards using the term "mobile toilet" with ''like the one used at events'' in brackets. The use of the generic term "events" instead of a specific term like "funeral" was deliberate.

The improvement in appropriate answering in comparison with the findings of Round 1 was substantial as the chart below illustrates.

Table 20: Sanitation – Appropriate answering, Round 2b

Questionnaire	Appropriate answering
Round 2b READ THE OPTIONS. MULTIPLE MENTION] What type of toilet do you use where you live? 1. There is no toilet 2. Flush toilet 3. Pour or bucket flush toilet 4. Pit toilet with a pipe for ventilation 5. Pit toilet without a pipe 6. Mobile toilet (like the one used at events) 7. Bucket toilet (cleaned by the municipality) 8. Something else (specify): IF MULTIPLE MENTION, ASK: What do you use most often? [SHOW PICTURES. READ THE LABELS.] MULTIPLE MENTION What type of toilet (or sanitation) do you use where you live? IF MULTIPLE MENTION, ASK: What do you use most often?	

The reasons for the remaining inappropriate answering were the following:

- One respondent could not select an option from the list when read out. The respondent was however able to select the correct option from the sketches

- Two respondents missed key words or detail on the sketches:
    - One respondent selected “flush” instead of “pour flush”
    - One respondent selected the wrong pit option.

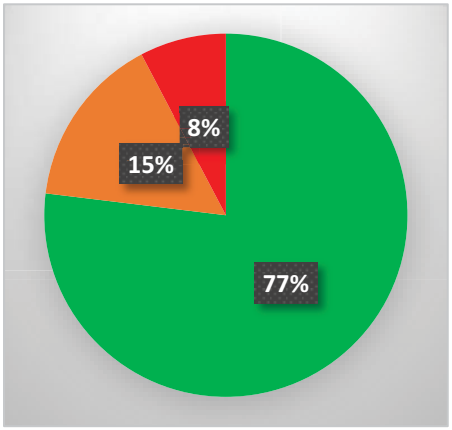
The probing in Rounds 2a and 2b revealed that the option, “there is no toilet”, was problematic. One of the respondents, for example, did not have his own toilet. The respondent used his neighbour’s toilet. Not having a toilet does therefore not mean that you practice open defaecation.

Round 3

The first option, “there is no toilet”, was revised to specifically refer to open defaecation: *use a plastic bag or the bush*. It was decided that “plastic bag” would be relevant for respondents living in informal areas and “bush” relevant for rural respondents. None of the respondents practiced open defaecation but they understood *use a plastic bag or the bush* as referring to open defaecation.

“Cleaned by the municipality” was added to the bucket toilet option to be in line with the latest versions of the Census and the GHS. “Bucket toilet (emptied by the household)” was not added because respondents told the fieldworkers that most households with an outside toilet use a bucket at night. It is not the “main type of toilet”.

Table 21: Sanitation – Appropriate answering, Round 3

Questionnaire	Appropriate answering
READ THE OPTIONS. MULTIPLE MENTION What type of toilet do you use where you live? 1. Use a plastic bag or the bush 2. Flush toilet 3. Pour or bucket flush toilet 4. Pit toilet with a pipe for ventilation 5. Pit toilet without a pipe 6. Mobile toilet (like the one used at events) 7. Bucket toilet (cleaned by the municipality) 8. Something else (specify): IF MULTIPLE MENTION, ASK: What do you use most often? [SHOW PICTURES. READ THE LABELS.] MULTIPLE MENTION What type of toilet do you use where you live? IF MULTIPLE MENTION, ASK: What do you use most often?	

The results for Round 3 were similar to those of Rounds 2a: an improvement from Round 1 but still some inappropriate answering:

- One respondent could not answer the question because his proficiency in English was inadequate. He could also not select an option from the sketches.
- Two inappropriate answers were given by respondents in Langaville. The reason for the inappropriate answer was the same as in Round 2a, i.e. they called their bucket toilets a “mobile” toilet because they look similar.

5.1.4 Barriers to appropriateness

5.1.4.1 Comprehension

Understanding of terminology

The cognitive interviews revealed that terminology was a major barrier to appropriateness in Round 1. Even though respondents could conduct a basic conversation in English, many of them struggled to understand the terminology used in the questions and response options. A number of them asked the fieldworkers to explain the terms or translate it into their home language.

In some instances, respondents were completely lost and unable to give an answer.

When respondents were probed on the meaning of specific terms (see the discussion guide in Annexure 2 for examples), several said that they "forgot" or that they were "not sure".

Non-verbal responses

The respondents' non-verbal responses were another indication that the terminology was difficult to understand. In Round 1 respondents:

- had blank looks on their faces
- paused for a long time
- pointed and gestured instead of giving verbal answers, and
- moved closer trying to peep at the questionnaire, hoping it will help them.

In Rounds 2 and 3, the non-verbal responses were a testimony that respondents were much more comfortable with the questionnaire:

- They listened intently to the question and response options
- They answered much quicker, and
- They were comfortable to keep their distance and did not try to peep at the questionnaire.

As a result, the interviewing time was much shorter in Rounds 2 and 3 and the interview flow was smooth without the respondents interrupting the fieldworker to ask them to clarify or repeat.

Examples

Below are a few examples of terminology that respondents found difficult to understand in Round 1.

Census 2011 – First water question

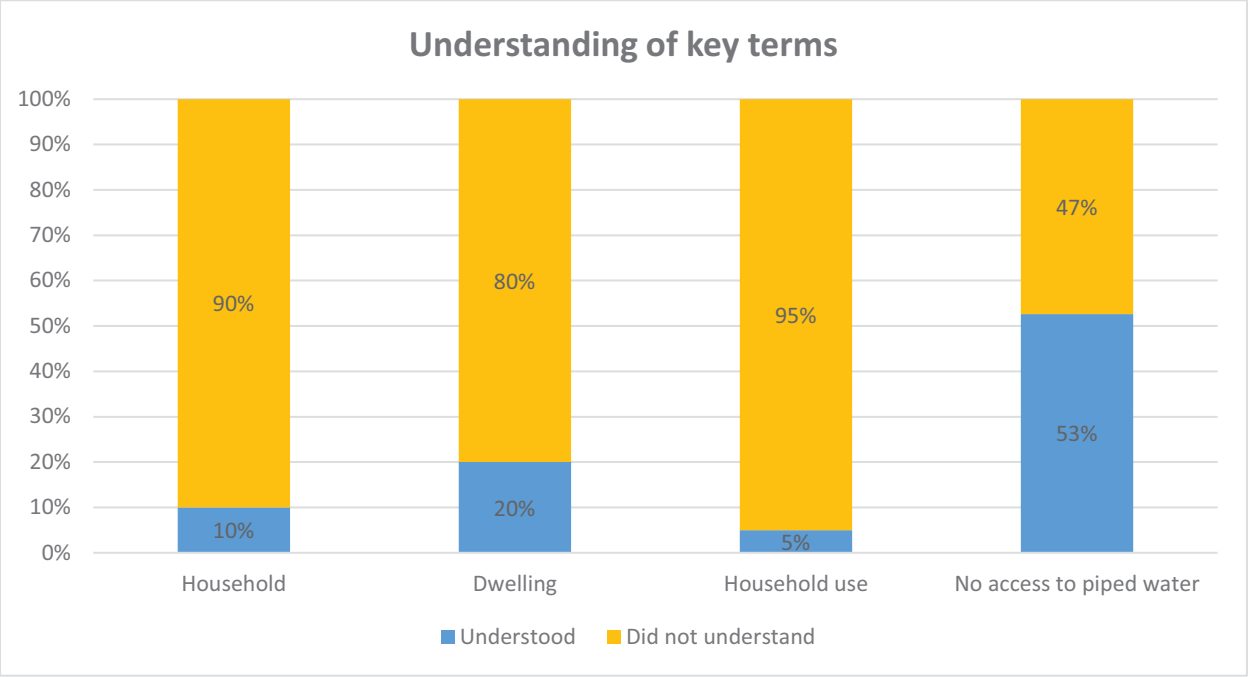


Figure 15: Census access to piped water question – understanding of key terms

Household

Only 10% of the respondents who answered this question (i.e., 2 out of 20 respondents[9]) gave the correct explanation for the term "household" during probing. Below are a few incorrect explanations that respondents gave for the term, indicating that they did not understand:

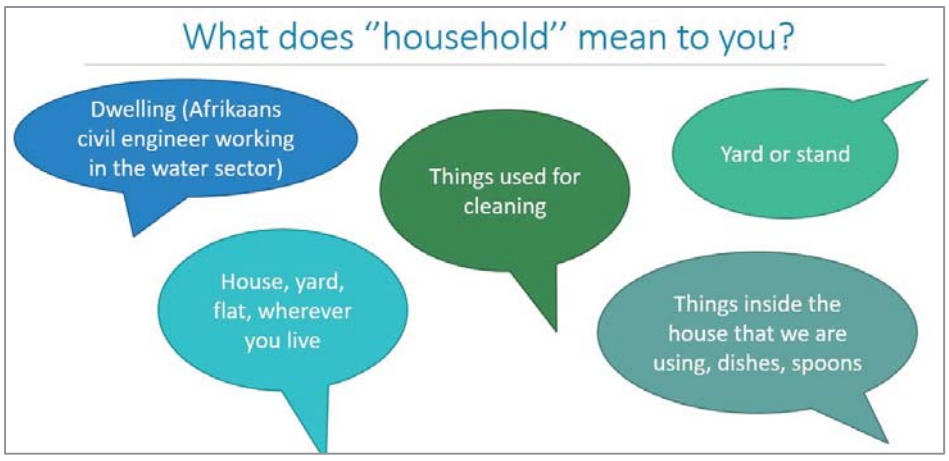


Figure 16: Examples of how respondents understand "household"

[9] In Round 1, 20 respondents answered questionnaire 1 (Census water questions) and 17 respondents answered questionnaire 2 (GHS water questions).

Dwelling

Four (4) out of the 20 respondents understood the term “dwelling”. Below are incorrect explanations for the term.

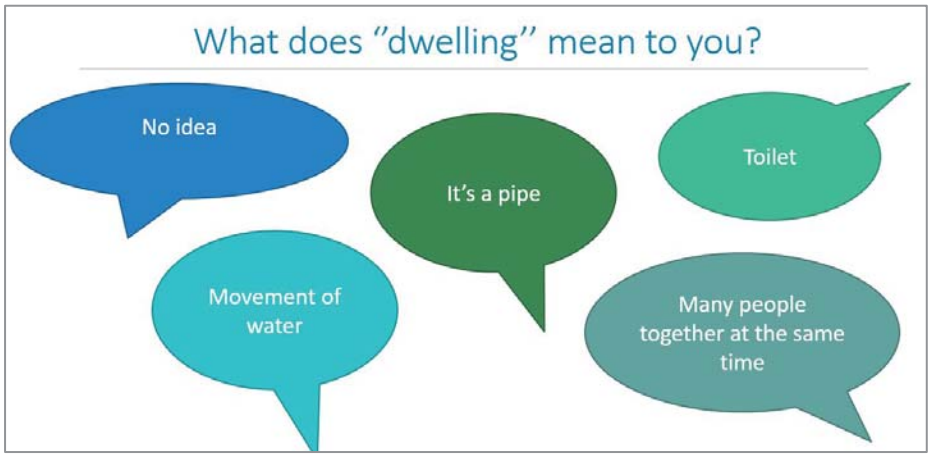


Figure 17: Examples of how respondents understand ''dwelling''

Household use

Only one respondent could give the correct explanation for the term “household use”. Below are a few examples of incorrect explanations:

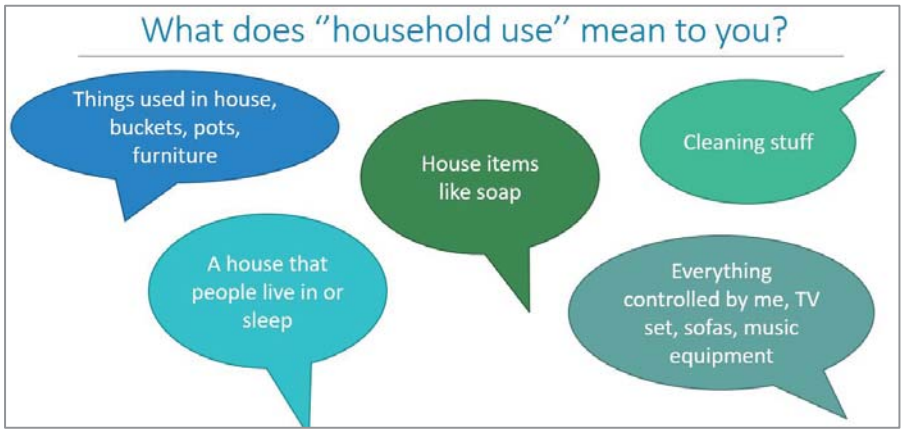


Figure 18: Examples of how respondents understand ''household use''

No access to piped water

Even though the phrase “No access to piped water” was better understood than the terms discussed above, it was still only understood by 53% of the respondents.

Other terminology

- With the term “piped (tap) water”, respondents ignored the word “piped” and only considered the word “tap”, which is a familiar word for them.
- The term “community stand” was confusing for many of the respondents. Below are a few examples of respondents’ explanations of the term:

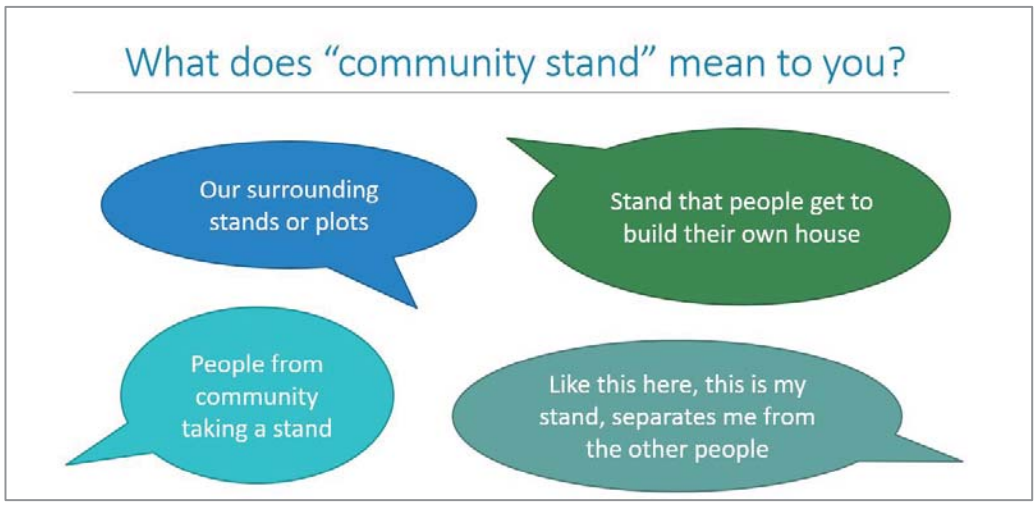


Figure 19: Examples of how respondents understand ''community stand''

Census 2011 – Second water question

Below are three key terms that respondents found difficult to understand. These were however not the only problematic terminology in the question – see the examples below.

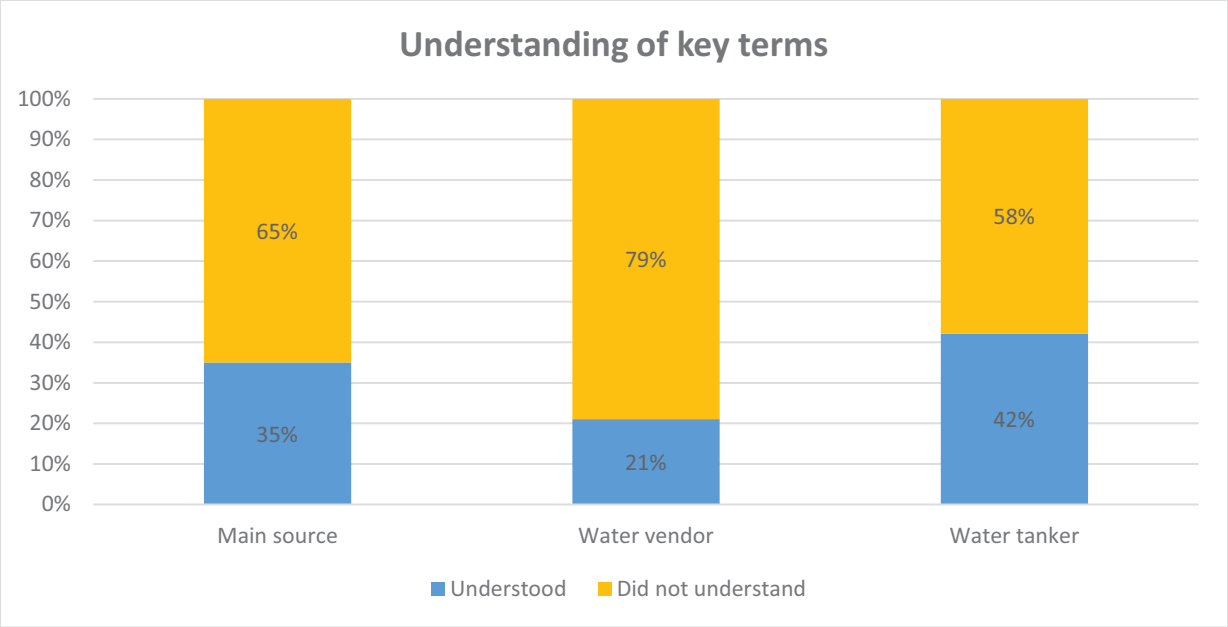


Figure 20: Census, source of household water – understanding of key terms

Main source

Seven (7) out of the 20 respondents (35%) gave correct explanations for the term "main source". Five (5) respondents could not give an explanation; eight (8) respondents gave incorrect explanations. One respondent, for example, thought that main source meant where their water originally came from, in other words the river.

Water vendor

The term "water vendor" completely stumped the respondents. 74% (14 respondents) could not explain the term.

Water tanker

42% of the respondents gave correct explanations for the term water tanker. The main reason for the incorrect answers were the respondents' confusion between "tanker" and "tank". Many respondents thought that a water tanker is the same as a JoJo tank or a rainwater tank.

Other terminology issues

- In the first response option respondents totally disregarded the phrase "regional/local water scheme*"* and only latched onto the word that is familiar to them, namely "municipality".
- The same happened with the fifth response option: respondents ignored "stagnant water*".*
- Many respondents did not understand the word "spring". "To run fast" or "a coil" were among the explanations.

GHS 2018/2020 – First two water questions

The first water question on GHS 2018/2020 is similar to the second water question on Census 2011. The findings were therefore almost the same: many respondents did not understand the key terms *household, main source, water carrier/tanker, stagnant water, water vendor (charged involved),* and *spring.*

Other terminology issues

- Respondents ignored the term "flowing water" in response option 10.
- Many respondents did not understand option 12, "well". One respondent said that it meant "to be sharp, to be okay".

Census 2011 and GHS 2018/2020 – Main sanitation question

The probing revealed that respondents were not familiar with the names of the different types of toilets. Below are a few explanations that were given for the term "chemical toilet".

Table 22: Respondents' interpretations of the option ''chemical toilet''

Modern toilets
Municipality comes with chemicals to clean
Like bucket toilets
Toilets where you dig a hole into the ground
Camping toilets and porta potties
Shared toilet; cleaned by truck
Ceremony toilet
A toilet used at functions or occasions
Same as a pit toilet (pour chemicals into it)
Mobile toilet
Toilet that cleans germs

The technical terms for newer toilet types used in the GHS 2018/2020 question (*composting toilet, urine diversion dry toilet*) were not understood by any of the respondents.

Respondents got even confused with toilet types that have been around for a long time like a pit toilet. Adding another term, ''latrine'', did not improve comprehension. The charts below show respondents' understanding of the term ''pit toilet'' (used in the Census 2011 question) and ''pit toilet/latrine'' (used in the GHS 2018/2020 question) and whether respondents knew the difference between a pit with ventilation and one without.

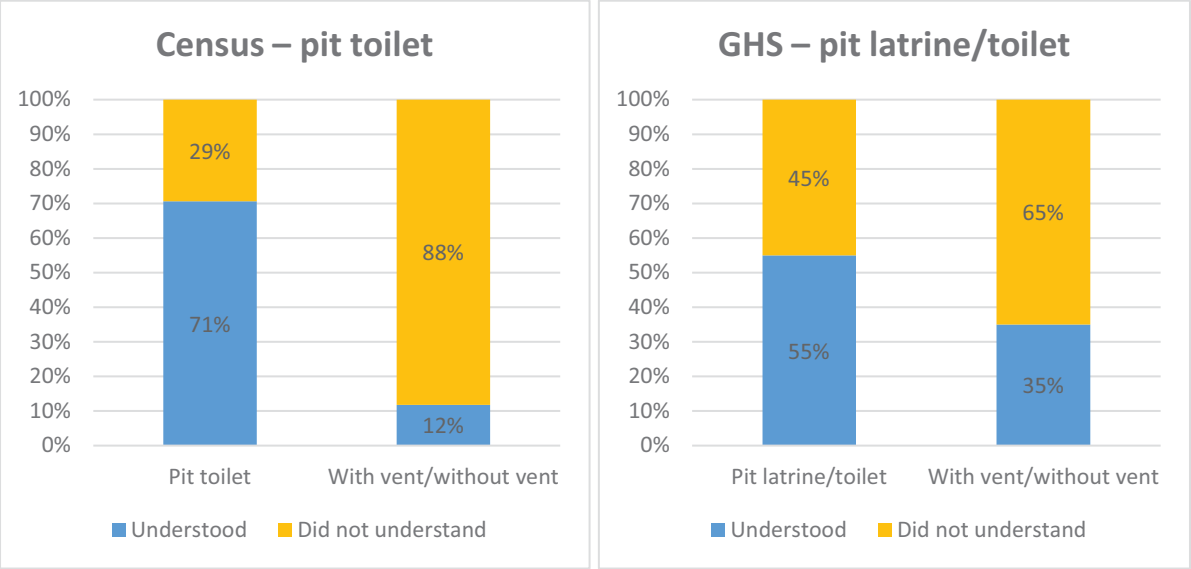


Figure 21: Comparison of appropriate answering for using a pit toilet/latrine

In Rounds 2 and 3, the fieldworkers probed to find out what respondents who were using pit toilets call them. Two respondents said ''long drop''; one said ''mokgodi''. The more common answer: ''It is just my toilet'' was not helpful, but it is highly likely that most people simply refer to their toilets, irrespective of type, as ''my toilet''. For these reasons, the research team decided to keep the term ''pit toilet'' (without latrine).

Terminology that respondents understood

After the analysis of Round 1, the research team compiled a list of nouns, verbs, and adjectives that respondents struggled with. These words were avoided in Rounds 2 and 3. The probing gave clues as to which words most respondents understood. Below is a list of key terms that were used in the revised questionnaires for Rounds 2 and 3.

Table 23: List of key terms that most respondents understood

Water questions	Sanitation questions
Tap	Toilet
Water	Flush toilet
Municipality	Pour flush or bucket flush
Drink (drinking and cooking)	Pipe (not ''piped water'')
Yard	Pit toilet with/without a pipe
Tap that is dry (without water)	Bucket toilet (that municipality cleans)
Borehole	Bush
River	Plastic bag
Dam	Community (not ''community stand'')
Canal	Families
Water truck	Sewage
Water tank (JoJo)	Contractor

Water questions	Sanitation questions
Rainwater Shop Canal Minutes Fetch Clean (treat)	Human waste Empty Rubbish dump Dispose Sanitary pads Nappies Bin Burn; bury; dig a hole Soap Hands Wash

Respondents struggled to understand ''connected to a public sewerage system'' in Round 1. The phrase was simplified to ''connected to a municipal sewer pipe'', which tested well in Rounds 2 and 3. Comprehension of ''septic tank'' was also poor, but since there is no simpler synonym, it was argued that respondents with a septic tank would know that they have one. This was confirmed in the findings of Round 3.

5.1.4.2 Structural issues

The sentence structure of questions and response options was a second barrier to appropriate answering.

The structural aspects that are discussed below make it difficult for respondents to comprehend the question or the response options, and hence to answer appropriately.

Long and composite questions or response options

Normally, the researcher wants the respondent to consider the full question or the full response option before they answer. If the question or response option is composite, that is, made up of more than one topic, or very long, respondents tend to focus only on the part that they understand best or can best relate to and ignore the rest.

The GHS question about problems with toilets is an example of a very long question: ''During the past 6 months, has your household experienced any of the following problems with regards to the toilet facility usually used by this household?'' Respondents latch onto the familiar words, ''problems'' and ''toilet'' and the rest of the information is largely ignored.

The first three response options of the GHS 2018/2020 question that asks the type of toilet that the respondent use at home are both long and composite:

What type of toilet facility is used by this household?

1. Flush toilet connected to a public sewerage system
2. Flush toilet connected to a septic or conservancy tank
3. Pour bucket/flush toilet connected to a septic tank (or seepage pit)

For example, most of the respondent did not know what a ''public sewer system'' or ''septic or conservancy tank'' was. As a result, they ignored these terms and only focused on ''flush toilet'' and randomly selected option 1 or 2.

Random selection also happened when respondents had to select one of the pit toilet options and did not know what ''ventilation'' meant.

Double negatives

Some respondents found the double negative in scenarios 1 and 11 of the first sanitation problems question confusing.

> During the past 6 months, has your household experienced any of the following problems with regards to the toilet facility usually used by this household?
> *Yes/No/Not applicable for each.*
> 1. No water to flush the toilet
> …
> 11. No tap or water point to wash hands after using the toilet

The respondent had to decide Yes, there is a problem of no water to flush the toilet, or No, there is not a problem of no water to flush the toilet. Several respondents answered Yes to scenarios 1 and 11 to affirm that there is water to flush the toilet, or that there is a basin or water point to wash hands (GTHammJ2; LMPMankwB4; LMPMankwJ5).

Passives

It has been found in Plain Language research that it is more difficult for readers and hearers to process sentences in the passive voice in English than it is for them to process sentences in the active voice (subject verb object). Several of the questions in Census 2011 and GHS 2018/2020 have passive structures, but the research found that any processing difficulties that respondents might have had with the passives were overshadowed by terminology that they did not understand. In the examples below, the passive verb is underlined; the terminology that respondents struggled with is in bold:

*Has this **household** municipal water supply been **interrupted** at any time during the last 12 months?*
*What type of toilet **facility** is used by this **household**?*

''Other'' as a response option

Questions and response options are usually a syntactic unit. For example, the question asks about a class of nouns from which the respondent has to select the appropriate one.

What is your main source of drinking water?

What type of toilet do you use at home?

Or the question asks about an action and the respondent has to select the appropriate action.

How do you dispose of sanitary items or nappies?

Semantically, a response option ''Other'' does not fit in either type of question because "Other'' is not a noun nor is it a verb. Respondents picked up this incongruence intuitively and became unsure of the meaning of ''Other''.

''Not one of these'' for noun options and ''Do something else'' for verb options are semantically more fitting and hence easier for respondents to select.

5.1.4.3 Respondent task issues

Options that are not mutually exclusive

Response options that are not mutually exclusive are confusing for respondents, because more than one option could apply to them. Examples of this task issue occurred in the Census 2011 and GHS 2018/2020 water questions that mix up end user point, supplier, and source in the options.

Census
What is this household's MAIN source of WATER for household use?
1 Regional/local water scheme (operated by municipality or other water services provider)
2 Borehole
3 Spring
4 Rainwater tank
5 Dam/pool/stagnant water
6 River/stream
7 Water vendor
8 Water tanker
9 Other

GTLangaSubJ1, a municipal consumer who has a tap inside the yard, selected Option 2 of the Census question (*All the water come from underground and is piped from there).*

FSPhilI1 answered 6 (river/stream). She misunderstood ''source of water'', answered ''river'', *because that is where the municipality gets water from*.

GTBramfInJ2, another municipal consumer who gets water from a communal tap, selected Option 8, water tanker. (*Water tank at the corner is where we get water when there is problem with this water (taps); it is refilled by municipal people*.) She does not regard tap water, her primary source, as from the municipality. (The confusion between water tanker and water tank exacerbated her problem.)

GHS
What is the household's main source of drinking water?
1 Piped (tap) water in dwelling/house
2 Piped (tap) water in yard
3 Borehole in yard
4 Rain-water tank in yard
5 Neighbour's tap
6 Public/communal tap
7 Water-carrier/tanker
8 Water vendor (charge involved)
9 Borehole outside yard
10 Flowing water/stream/river
11 Stagnant water/dam/pool
12 Well
13 Spring
14 Other

GTHammM2 selected Option 5 of the GHS question. When the neighbour is not there, he goes to the communal tap (Option 6). The neighbour's tap is in the yard (Option 2).

Multiple answers

Several respondents answered that they get their drinking water from different sources or different end user points:

GTHammB1 selected Option 5. He gets drinking water from the neighbour's tap and a municipal water truck.

LMPMankwB4 selected Option 7. *I use the (tap) water to bath and drink, and also laundry. I buy water (for drinking and fill up my water tanker (his JoJo)).*

LMPB5 selected Options 2 and 4. When probed, the respondent said: *When we don't have water in the tap, we resort to the rainwater tank.*

The confusion that overlapping response options caused in the sanitation question that asked about the toilet facility that respondents use at home was discussed in section 5.1.3.3 above.

Too many response options

Long lists of ten or more response options created recall issues. Respondents could not remember all the options and had to ask the fieldworker to repeat.

Too few response options

The first interruption question in the GHS 2018/2020 asks:

> Has this household's municipal water supply been interrupted at any time during the last 12 months?
> 1. Yes
> 2. No

It was evident from the probing that respondents' lack of a reliable water supply was more complex than the two response options suggest. See the table below.

Table 24: Examples of types of interruptions

Respondent	Answer	Notes
GTLangaSubM1 and GTLangaSubM1	No	**Do not count scheduled interruptions:** *No, there has only been scheduled interruptions.* These respondents live in what they call ''the suburbs'' and regard themselves as privileged in comparison with residents from other areas of Langaville.
GTBramfInJ2	No	The water tank(er) is filled regularly. **The respondent did not recognise the water tank as an alternative for a piped water supply which is frequently interrupted.**
Several respondents	Yes	The water tanker did not turn up or did not fill the JoJo tank regularly. A JoJo tank is needed because the piped water supply is unreliable. **These respondents have an unreliable supply at more than one level.**

The corresponding Census 2011 question asked the same, but for piped water specifically.

> In the last 12 months, has this household had any interruptions in piped water supply?
> 1. Yes
> 2. No

Here as well, the probing indicated that interruptions are much more complex than the two response options suggest.

Table 25: More examples of types of interruptions

Respondent	Response	Notes
GTHammM2	No	The respondent uses the neighbour's tap and the communal tap. If the one is without water, the other usually has water. **A reliable alternative supply cancels the effect of an interruption from the respondent's perspective.**
LMPB5 LMPMankwJ5	Yes	**Interruption every week:** *On different days of the week, the water goes to different areas at a time, so the community shares the water with other communities. So, 3 times in a week, our community has water, and we are expected to fill up our tanks. Then the other days belong to another community*. The second respondent referred to this type of interruption as ''*like loadshedding*''. **In addition, the first respondent has experienced a once off interruption**: *two weeks ago there was a broken water pipe*.

The follow-up questions ask about the length of interruptions (Census 2011 and GHS 2018/2020: longer than two days; GHS: more than 15 days in total). These follow-up questions are not relevant for respondents dealing with water shedding every day or every week, or unreliable water trucks. As a result, these respondents would answer No, even though the total number of days without water in the past year by far exceeds 15 days in total.

Multiple mentions

The water questions in the Census 2011 and GHS 2018/2020 require a singular response. The probing revealed that some respondents have more than one main source of household water/drinking water. For example, in Round 1, one respondent used the communal tap, but also got water from the JoJo tank that is filled by the municipality. Another used the communal tap but sometimes bought water. A respondent from Limpopo gets their water from a tap inside the yard (piped borehole), but in the rainy season they get it from a rainwater tank in their yard.

Recall

Expecting respondents to remember exactly how many days they were without water in the past year is unrealistic.

> Respondents from the same household did not even all agree on the length of a single interruption. GTSunN1: The husband said the interruption was less than 2 days; the wife said it was 3 days.

Some respondents work elsewhere and are only at home during weekends, as a result, they do not know exactly how long interruptions lasted.

Ambiguous options

Ambiguity confuses respondents and often lead to inappropriate answering.

To give a few examples from the response options of the above-mentioned sanitation question:

Table 26: Examples of ambiguous response options

Response option	Ambiguity
2 Toilet blocked up	What is the difference between a blocked-up toilet and a full chamber that blocks up the toilet?
3 Toilet pit or chamber full	
5 Poor lighting	Respondents asked if this mean that there is no natural light, or that there is no electric light in the toilet. One respondent asked why there should be a light as they (as everyone else) do not use the outside toilet at night.
6 Toilet not enclosed well or structure damaged	Which structure? The structure of the toilet or the structure of the enclosure?

Options that are vague

Another sanitation problem listed in the response options is the following: ''Unable to dispose of sanitary items (women and girls)''. Respondents found the option vague and hence it was very difficult to answer Yes or No.

> GTWelN2 said: *You are not supposed to flush sanitary items down the toilet.* GTSowS2 could not answer *because we don't flush these items. There is no bin in the toilet, we use a yard bin because there are males.*

Irrelevant scenarios

Irrelevant scenarios are not a problem for respondents if they can answer ''not applicable''. However, if ''not applicable'' is a term that they do not understand, or if they miss it, they answer Yes or No, even though the scenario is irrelevant.

The two GHS 2018 questions that outline sanitation-related problems elicited serious inappropriate answering for this reason. For example:

- Respondents without flush toilets would answer Yes or No for problems with flush toilets.
- Respondents who never report any sanitation problem to the municipality would answer Yes or No to the scenario that the municipality has not responded within 5 days to a reported problem.

Reference

Respondents sometimes answered inappropriately because they select an inappropriate reference. For example, GTHammJ1 answered Yes, there have been water interruptions, because water interruptions are common in the area. However, he was not affected. He gets his water from a tanker.

LMPFreeJ1 saw the question on sanitation problems as an opportunity to distinguish between her own toilet and the ''government one''. She said Yes to all the problems when referring to the government's communal toilets; No to all the problems when referring to her own toilet.

> The respondent built her own pour flush toilet connected to a septic tank. The communal toilets were causing her infections. The area has 4 VIPs shared among 45 households. According to the respondent, the municipality only comes to clean after 4 months, sometimes after 6 months. As a result, most people built their own toilets in their yards. Most of these are pit toilets. The communal toilets are over 10 years old. They were told it was temporary and they would be moved. They are still waiting patiently.

The use of examples

Examples are typically used in survey questionnaires to assist respondents. In the water treatment question, the examples helped respondents to understand what ''treat'' means:

Do household members treat the water used for drinking? This may include filtering, boiling, adding chlorine or other chemicals.

Unfortunately, the use of examples also has some disadvantages. Some respondents regard examples as a full set. If their practice is not listed in the examples, they answer inappropriately.

Does your household have hand washing facilities (e.g. basin, bowl or functioning tippy tap)?

1. Yes
2. No
3. Do not know

LMPSeshB1 answered *No, we just use the tap.* LMPMakgM2 gave the same answer. In contrast, GTHammB1 (and several other respondents) said *Yes. The tap. There is no soap, just water.*

Do not know/Not sure/Not always

When a question asks about something the respondent might feel they are supposed to know, or desirable behaviour like handwashing, a ''Do not know'' or ''No'' response might be perceived as reflecting negatively on the respondent and therefore avoided. ''Not sure'' for a noun phrase or ''Not always'' makes it more acceptable for respondents to select.

Below are two examples:

Is the flush toilet connected to:

1. A municipal sewer pipe?
2. A septic tank?
3. A hole in the ground (pit)?
4. Not sure

Do you wash your hands after you have been to the toilet?

1. Yes, with water
2. Yes, with water and soap
3. Yes, clean hands with hand sanitizer or wet wipes
4. Not always

A or B

The research team has found in previous Cognitive Action Research that respondents whose home language is not English do not always know how they should answer a question like *Do you have A or B?* What must they answer if the answer is Yes for A but No for B?

In this research, the issue cropped up again. In Rounds 2 and 3, the first WASH question asked: *At the place where you live, is there soap or sanitizer to clean your hands?* One respondent answered No – they have soap, but not sanitizer. To avoid this type of inappropriate answering, it was therefore decided to take out sanitizer in Round 4. Sanitizer is an expensive item; many respondents said that they cannot always even afford soap. The use of sanitizer for cleaning hands is captured in the second WASH question that asks about handwashing behaviour.

The impact of a major event

Previous Cognitive Action Research has found that an event or experience that has had a major impact on the respondent could override the scope of question. For example, a respondent answering that she got the first cell phone in her life two months ago when she was simply excited about the new cell phone that she got two months ago.

In this research, a respondent answered inappropriately that he always treats his municipal drinking water, because he was excited about the treatment system that he had installed to treat rainwater when there is no municipal water.

5.1.5 Summary of user experience

The two pictures below are an attempt to depict the user experience of respondents who did not understand the terminology of the first two water questions in Round 1, exacerbated by the structural and task issues discussed above. (Blacked out words indicate no comprehension; grey highlighting indicates partial understanding).

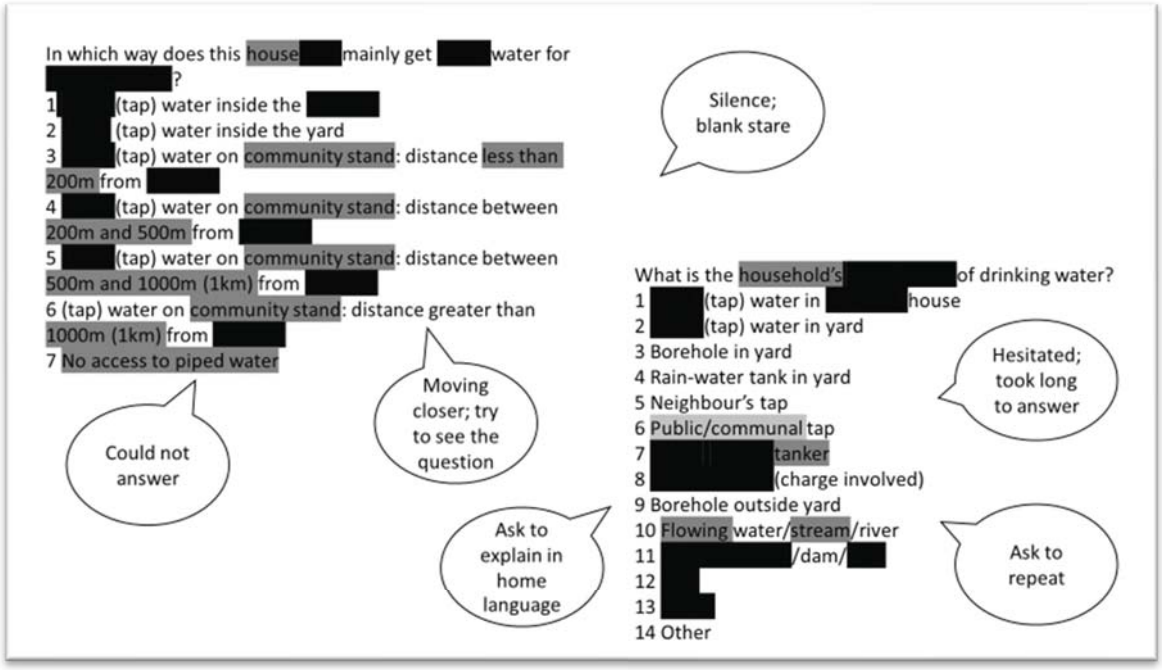


Figure 22: User experience with unfamiliar terminology

After the terminology and other issues were addressed, the user experience changed dramatically as depicted in the picture below.

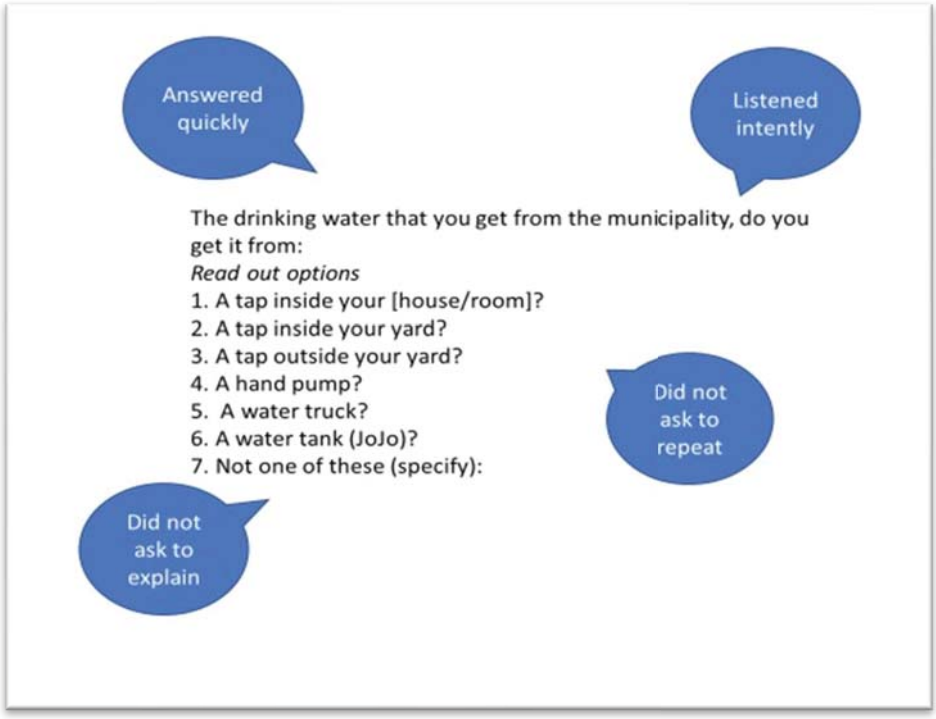


Figure 23: User experience if respondent understands all the terms

5.1.6 A closer look at the other water questions

5.1.6.1 Distance

In Census 2011, distance was included in the first question which determines access to piped water. The Strategic Framework for Water Services (2003) stipulates that household water should be accessible within 200 metres of the household to meet the requirements of a basic water supply facility.

In which way does this household mainly get piped water for household use?

1. Piped (tap) water inside the dwelling
2. Piped (tap) water inside the yard
3. Piped (tap) water on community stand: distance less than 200 m from dwelling
4. Piped (tap) water on community stand: distance between 200 m and 500 m from dwelling
5. Piped (tap) water on community stand: distance between 500 m and 1000 m (1 km) from dwelling
6. Piped (tap) water on community stand: distance greater than 1000 m (1 km) from dwelling
7. No access to piped water

In GHS 2018, distance is a separate question:

How far is the water source from the dwelling or yard (Note that 200 m is equal to the length of two football/soccer fields)?

1. Less than 200 metres
2. 201-500 metres
3. 501 metres-1 kilometre
4. More than 1 kilometre
5. Do not know

A previous Cognitive Action Research study that the research team conducted for Genesis Analytics (JHC social housing questionnaire) indicated that people do not necessarily express distance in terms of metres (or kilometres). The study found that expressing distance in terms of travelling or walking time was more common.

The probing in Round 1 revealed that distance in metres was a difficult concept for some respondents to comprehend. Below is an example.

LMPMakgB2 selected option 4:
Piped (tap) water on community stand: distance between 200 m and 500 m from dwelling

The answer was inappropriate at two levels: wrong source and distance. The respondent was referring to a JoJo tank at Spaza shop that community can use. (the JoJo has a tap and it is something that the community can use). When asked to explain the distance to a friend, the respondent said: plus-minus 10 metres. However, the fieldworker could not see Spaza shop from the respondent's house.

A further complexity was created by the fact that the municipal water truck does not necessarily stop at the same place every time, which makes distance in metres difficult to determine.

In Round 2, it was decided to test a time indicator instead of the distance indicator. See question below. According to SDG 6.1, a basic service comprises drinking water from an improved source less than 30 minutes away, for a round trip, including queuing.

How long does it usually take you to fetch water?
[READ OUT OPTIONS]

1. Less than 30 minutes
2. More than 30 minutes
3. It is not your task to fetch water

This question tested well. Respondents answered appropriately and considered waiting time and a round trip in their calculation.

The question was slightly adjusted for Round 3 to fit the Census question format:

Does it take you longer than 30 minutes to fetch your drinking water?
[READ OUT OPTIONS]

1. Yes
2. No
3. Do not fetch water

The question tested well.

5.1.6.2 Treatment

The water treatment question appears only in GHS 2018/2020. The original, which was tested in Round 1, reads as follows:

Do household members treat the water used for drinking?
This may include filtering, boiling, adding chlorine or other chemicals

1. Yes, always
2. Yes, sometimes
3. No, never

The probing showed that this question gives valuable information on consumers' perceptions of the safety of their drinking water.

Even though the question tested well, the probing showed that:

- Not all respondents understood the term "treat". Respondents however did understand the phrase "clean the water".
- The examples were too restrictive. If the respondent's treatment method, for example using Jik, was not mentioned in the examples, respondents did not say ''Yes".

Below is the final recommendation:

Do you clean (treat) your drinking water before you drink it?
[READ OUT OPTIONS]

1. Yes, always
2. Yes, sometimes
3. No, never

5.1.6.3 Interruption

The interruption questions in Census 2011 and GHS 2018/2020 read as follows:

Census 2011	**GHS 2018/2020**
In the last 12 months, has this household had any interruptions in piped water supply? 1. Yes 2. No Did any specific interruption(s) of piped water supply last longer than two days? 1. Yes 2. No	Has this household municipal water supply been interrupted at any time during the last 12 months? 1. Yes 2. No Thinking about the interruptions in your municipal water supply over the last 12 months, was any specific interruption longer than two days? 1. Yes 2. No If you add all the days that your municipal water supply was interrupted over the last 12 months, was it more than 15 days in total? 1. Yes 2. No

Please note that the Census questions focus only on interruptions of "piped water supply" while the GHS questions has a broader focus on "municipal water supply".

In 5.1.4.3, the complexity of water interruptions was discussed. In summary, the research found that consumers experience the following types of interruptions:

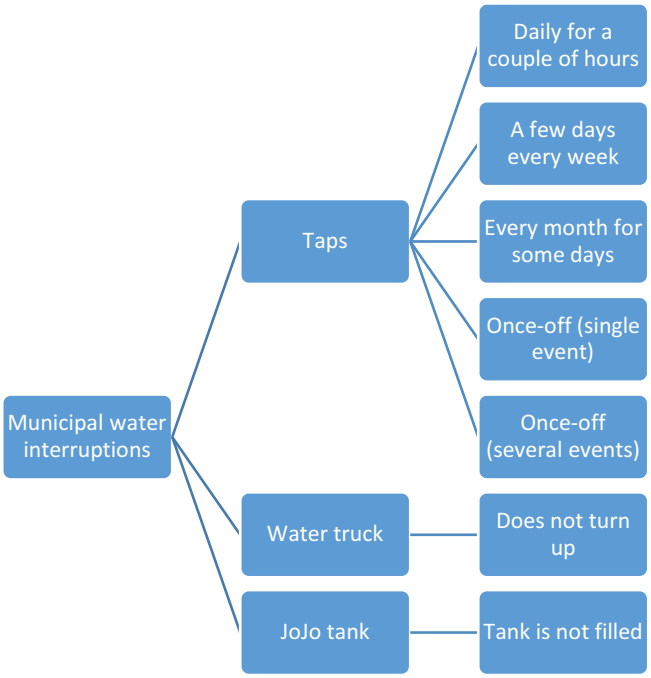


Figure 24: Types of water interruptions

The Census 2011 and GHS 2018/2020 question that ask about interruptions for **longer than two days** capture only once-off interruptions of piped water. **As a result, respondents with any of the other types of interruptions answer ''No'' and are routed away even though they have not received municipal water for more than 15 days in the past year.** The research team referred to this as 'the domino effect'.

In the questions about water interruptions, the domino effect was exacerbated by the fact that more than a third of the respondents did not understand the words ''interruptions'' (Census and GHS) and "interrupted" (GHS).

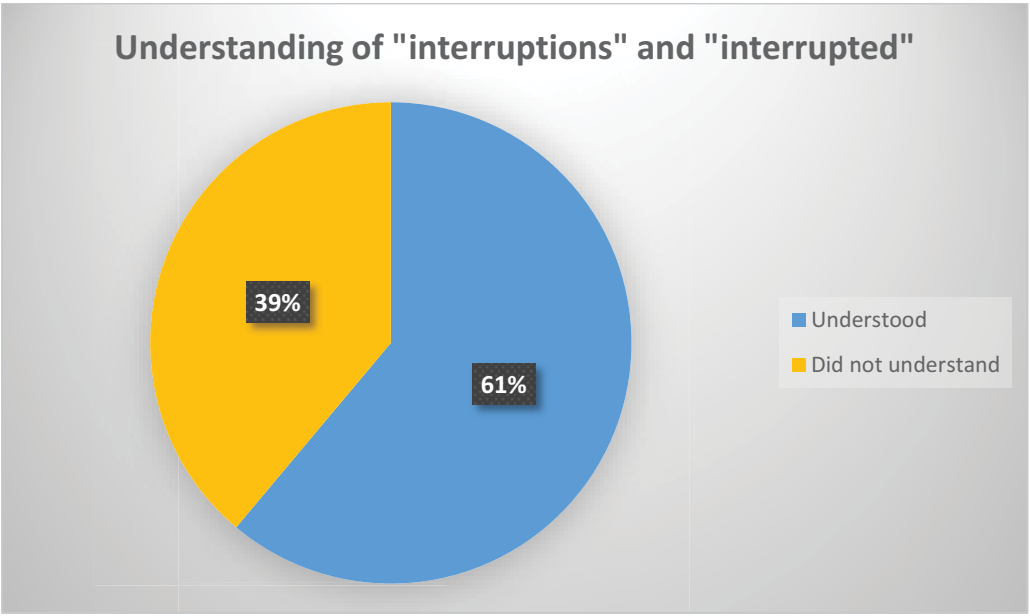


Figure 25: Understanding of interrupted and interruption

In an attempt to capture the spectrum of interruptions, separate questions were tested in Rounds 2 and 3 with the users of the three respective municipal end user points: tap users, water truck users and water tank (JoJo) users. To avoid the word ''interruptions'', the question for tap users refers to a ''dry tap'' with an alternative ''without water'' in brackets:

Taps:
Was the tap that you use for drinking water ever dry (without water) in the past 12 months?
READ OUT THE OPTIONS.

1. Yes, it was dry for longer than two days
2. Yes, it was dry but not for longer than two days
3. Yes, it is dry every day for a few hours
4. Yes, it is dry every week on some days
5. Yes, it is dry every other week
6. No, it was never dry in the past 12 months

Water truck:
In the past 12 months, was there any week or weeks when the water truck did not come?

1. Yes
2. No

Water tank:
In the past 12 months, was this water tank empty for more than two days in a row?

1. Yes
2. No

The questions tested well. It captured all types of interruptions, including scheduled interruptions.

5.1.6.4 Alternative source

The research found that the response options for the alternative source question led to inappropriate answering, because multiple mention was not allowed and because the options were too specific:

Census 2011	**GHS 2020**
What alternative water source did the household use during water supply interruption? 1 Borehole 2 Spring 3 Rainwater tank 4 Dam/pool/stagnant water 5 River/stream 6 Water vendor 7 Water tanker 8 Other 9 None	If a municipal water supply interruption over the last 12 months lasted for longer than two days, what alternative drinking water source did the household use during interruption? 1 Borehole 2 Spring 3 Well 4 Rainwater tank 5 Dam/pool/stagnant water 6 River/stream 7 Water vendor 8 Water tanker 9 Saved/stored water 10 None 11 Do not know 12 Other

For example, the research team found that:

- Respondents have more than one alternative source. One respondent, for example, had seasonal alternatives: they use a rainwater tank in the rainy months and buy water in the other months.
- Respondents have different alternatives for different uses: One respondent buys their drinking water from a shop but gets water from other vendors or the dam for other reasons.
- The list of alternative sources is insufficient. In addition to the listed options, respondents mentioned the following as alternative water source:
    - Another tap (neighbour, friend, or another area)
    - JoJo tank
    - Storing water in containers (this is an option in the GHS question)
    - Bringing water home from work.
- The option 'None' is ambiguous. Does it mean you do not have an alternative water source or that you did not have to use an alternative source during the interruption because you had stored water? Stored water was added as an option to GHS 2020.

Below is the recommended question for alternative water source. The question was asked to all municipal consumers and will allow for multiple mention by using a yes-no question format.

When there is no drinking water from the municipality, do you:
[READ OUT OPTIONS. MULTIPLE YES]

1. Get water from someone else?
2. Get water from another area?
3. Use rainwater or other water that you have stored?
4. Buy water?
5. Use your own borehole
6. Do something else

5.1.7 A closer look at the other sanitation questions

5.1.7.1 Location

SDG 6.2 refers to universal access to adequate and equitable sanitation. UN-Water's normative interpretation of access is ''close to home that can be easily reached and used when needed'' (2017). The DWS definition of a basic sanitation service (DWS, 2003) states that the facility must be ''easily accessible to a household''. In the GHS 2018 questionnaire, two questions measure accessibility: the first question asks where the facility is relative to the dwelling (with inside the yard as the minimum standard) and the second asks distance (with less than 200 m as the minimum standard).

Is the toilet facility in the dwelling, in the yard or outside the yard?	How far is the nearest toilet facility to which the household has access?
1. In dwelling 2. In yard 3. Outside yard	*Please note 200 m is equal to the length of two football/soccer fields* 1. Less than 50 m 2. 51-100 m 3. 101-200 m 4. 201-500 m 5. More than 500 m

After discussions with DWS and StatsSA, it was decided to remove the distance question. In terms of SDG 6.2, any toilet that is located outside the yard is considered to be unsafe and shared. The physical distance from the house does not matter.

However, from the cognitive interviews it became clear that a toilet located outside a respondent's yard is not necessarily a communal toilet. The toilet could be located in someone else's yard (i.e. sharing with a neighbour or someone close by).

The question was adjusted to make this distinction. Plus, it avoids using the term ''communal'', which was not well understood:

Is this toilet:
[READ OUT OPTIONS]
1. Inside your [house/room]?
2. Outside your [house/room] but inside your yard?
3. In somebody else's yard?
4. Outside the yard and used by the community?

5.1.7.2 Sharing

The GHS 2018/2020 ask specifically if the toilet is shared. The original question reads:

Is the toilet facility shared with other households?
1. Yes
2. No

In Round 1, 11 out of the 37 respondents answered this question inappropriately. Reasons for inappropriate answering:

- Terminology: Respondents understood "shared", but they did not understand "household"
- Respondent task issue: Respondents did not know who to include. Only households outside the yard or also those that stay inside their yard with them? What about tenants?

In Round 2, a more comprehensive question was tested, but it turned out to be too complicated for respondents. In Round 3, a simplified version was tested.

Round 2	**Round 3**
Do you share this toilet: *Ask Yes/No for each option. Repeat intro sentence for each option.* 1. With people renting here? 2. With neighbours? 3. With other people from the community?	Do you share this toilet with other families? 1. Yes 2. No

This simplified question tested well. When cross-tabulated with the location of the toilet, the type of sharing can be deducted. For example, a shared toilet inside the yard is usually shared by tenants. A shared toilet outside the yard and used by the community = a communal toilet.

5.1.7.3 Problems

The GHS 2018 questionnaire asks two questions about problems experienced with toilet facilities. The questions have the same Yes/No/Not applicable format.

During the past 6 months, has your household experienced any of the following problems with regards to the toilet facility usually used by this household? *Yes/No/Not applicable for each.* 1. No water to flush the toilet 2. Toilet blocked up 3. Toilet pit or chamber full 4. Toilets not well maintained and broken 5. Poor lighting 6. Toilet not enclosed well or structure damaged 7. Broken pipes or blockages in the municipal system (sewerage flowing in the street) 8. Problem reported but not repaired within 5 working days 9. Toilet system overflowing in yard 10. Toilet system not working properly causing odours and insects 11. No tap or water point to wash hands after using the toilet 12. Sewer problems being repaired that the municipality informed you about	During the past 6 months, have you experienced any of the following problems while using the toilet facility usually used by this household? *Yes/No/Not applicable for each.* 1. Toilet unsafe to use, due to risk of assault 2. Toilet unsafe to use, due to health risks 3. Too many people, long waiting times 4. Toilet not cleaned (if shared public toilet) 5. Toilet does not provide privacy 6. Unable to dispose of sanitary items (women and girls)

Respondents found the questions cumbersome, because they have to listen through long response options that are not applicable to them. Some of the options are vague or confusing, which led to a number of respondent task issues.

From the fieldworkers' experience in the rural and informal areas:

- Communal toilets were dirty, unsafe, not functional, and not used at night.
- The condition of shared toilets in the yard varied (but was better than communal toilets). These toilets are not used at night.
- Toilets that are not shared were in a good condition irrespective of type; owners took responsibility. If the toilet is outside the house, it is also not used at night.

Problems with toilet facilities can therefore be derived from where the toilet is located and whether it is shared by many households. The example below supports this statement.

> LMPFreeJ1 answered the questions for two toilets: the communal one (''the government one'') and the pour flush she built in the yard.
>
> She answered Yes for the ''government one'' and No for her own.

Problems can also be determined from the type of toilet. For example, a pit toilet without a ventilation pipe has odour problems.

Speaking to the respondents about their sanitation situation was quite an eye-opener for the fieldworkers (and later also for the research team). Many respondents have paid to improve the communal toilet facility; others have paid to move a communal toilet to their yard.

> For example, in Langaville, communal toilets are very dirty with worms and a bad smell. People in the community have collected money to pay a contractor to empty/clean the toilets. The municipality is responsible, but they do not regularly empty the toilets. Some people have paid a contractor to move a communal toilet into their yard. Even though the tenants share this toilet, and they cannot refuse passers-by from the street asking if they could use the toilet, respondents regard this toilet as superior to the communal toilet.

After discussions with DWS and StatsSA, it was decided to remove the two problematic problems questions. Two of the options were transformed into new questions.

5.1.7.4 WASH

Two WASH questions appear in the GHS 2018/2020 questionnaire. The original questions read as follows:

Does your household have hand washing facilities (e.g. basin, bowl or functioning tippy tap)?

1. Yes
2. No

After using the toilet, do household members clean their hands using one of the following methods?

1. Rinse hands with water
2. Wash hands with soap and water
3. Clean hands with hand sanitiser or wet wipes
4. Do not clean hands
5. Do not know

For the first question, the research found that the examples were too restrictive. For many respondents, a tap was their main handwashing facility, but it is not mentioned as an example. Some respondents

therefore answered 'Yes' if they use their tap; others answered 'No'. Furthermore, not one respondent knew what a "functioning tippy tap" was!

Respondents understood the second question. The question however tests desirable behaviour. It is therefore likely that respondents will overclaim their behaviour. The fieldworkers noted in several interviews that, in contradiction to the respondents' assurance that everyone wash their hands, they observed residents not washing their hands after using the toilet. In addition, it is very difficult, if not impossible, to answer this question for other members of your household.

The recommended questions tested well in Rounds 2 and 3. For the first question, the research team shifted the focus to access to soap. It was argued that, if someone has access to water, they have a handwashing facility, i.e., they can wash their hands if they want to. This could range from:

- washing your hands under a formal tap
- washing your hands under a self-constructed tap
- pouring water over your hands from a container, to
- washing your hands in a bucket or bowl of water.

The Covid-19 pandemic brought new questions about a safe handwashing facility. For example, is it safe for families without running water in their homes to share a handwashing bowl, or could they be spreading the disease? The pandemic also made the use of soap in handwashing practices more pertinent.

In the second question, the option "Not always" was added to encourage respondents to report non-desirable behaviour. In addition, the question now only focuses on the respondent's individual behaviour and not on the behaviour of the entire household.

Do you have soap to clean your hands here where you stay?
1. Yes
2. Sometimes
3. No

Do you wash your hands after you have been to the toilet? [READ OUT OPTIONS]
1. Yes, with water
2. Yes, with water and soap
3. Yes, clean hands with hand sanitizer or wet wipes?
4. Not always

5.1.7.5 New questions

Sewage running in the street

Although most of the problems with sanitation can be related to the household's type of toilet facility and its location, this does not give information about health problems caused by sewage running in the street. For this reason, a new question was added to assess the extent of this problem. The question is asked to all respondents.

Do you have a problem in your area with sewage running in the street?
1. Yes
2. No

The question tested well in Rounds 2 and 3. Respondents who live in areas without sewers answered No.

Women and girls

SDG 6.2 emphasises “paying special attention to the needs of women and girls and those in vulnerable situations” as an indicator of safe sanitation. In the original questionnaire, this indicator was integrated into the second list of problems (Unable to dispose of sanitary items).

For Rounds 2 and 3, the indicator was tested as a separate question. The word “nappies” was added to make the question more inclusive so that men could also answer it.

How do you dispose of sanitary items and nappies?
[READ OUT OPTIONS]

1. Put in a bin or plastic bag and the municipality or a private person collects it
2. Put in a plastic bag and take to a rubbish dump
3. Bury it.
4. Burn it
5. Throw it in the toilet
6. Do something else

The question tested well. Men were comfortable to answer.

Faecal sludge management

SDG 6.2 distinguishes between the following types of safe human excreta disposal:

- Treated and disposed of in-situ
- Stored temporarily and then emptied, transported and treated off-site, and
- Transported through a sewer with wastewater and then treated off-site.

Previously, the GHS only asked a question about the disposal of flush toilet waste. As mentioned in 5.1.3.3, flush toilet connections became a separate, follow-up question:

Is the flush toilet connected to:
[READ OUT OPTIONS]

1. A municipal sewer pipe?
2. A septic tank?
3. A hole in the ground (pit)?
4. Not sure

The question tested well.

On request of DWS, a new question on faecal sludge management was added as a GHS question. The question below was tested in Round 3.

What happens with the human waste when the toilet or septic tank is full and has to be emptied?
[READ OUT OPTIONS]

1. The municipality or its contractor takes it away
2. Pay someone to take it away
3. Bury it
4. Dig a new hole. The waste stays in the ground
5. Empty it on the rubbish dump
6. It has not been full

Small adjustments were made from Round 2 to Round 3. A private contractor was added to Option 1. ''Dig a hole'' was put first because respondents emphasised this action in the probing. Option 6 was added for respondents whose pits or tanks have not yet been full. Some of these respondents could not answer because, for them, it was a hypothetical question – they have never had a full pit.

The question tested well.

5.1.8 Small nuances

In previous Cognitive Action Research, the research team has found that even the smallest nuance or change to a word or a phrase can affect the way that respondents interpret survey questions.

Below are two examples:

Example 1:

When a questionnaire is read out, the respondent usually has only one opportunity to hear the question, comprehend it and select the relevant response option. It is natural for respondents to focus on familiar words and information that relates to them. In the process, they easily miss important information. Also, if the question gets long, respondents tend to stop listening and only focus on the first part of the question.

There are several strategies that a questionnaire designer can follow to prevent these misinterpretations:

- Moving important information to the front of the question: in the interruptions question, the time reference was moved to the end of the question to try and make sure that respondents focus on drinking water and a tap that is dry (without water).
  Was the tap that you use for drinking water ever dry (without water) in the past 12 months?
- Bold typeface or underlining guides the fieldworker to emphasise important words that you do not want the respondent to miss. For example, drinking water is underlined in all the questions.
- Adding an introductory sentence helps to set the scene for respondents. In the revised questionnaire, the research team wanted to make sure that respondents answer only for ''drinking water'' and not for general household water. An introductory sentence was added in Round 3 to this effect:
  I am now going to ask you about the water you use for drinking and cooking.

Example 2:

In Round 1, the fieldworkers were struck by the effect that the order of the options had on respondents. For respondents at the high end of the service scale, the option relevant to them was listed first. Respondents at the low end of the service scale heard their option last. In this way, the questionnaire affirmed social inequality.

The researchers tried to mix up the order of response options, but it was not always practical. The logic of the question and the routing also had to be considered.

5.2 Findings of the final round of research (Round 4)

5.2.1 Questions tested

This section reports on the findings of the fourth and final round of testing.

The table below shows the questions tested in Round 4 compared to those tested in Round 3.

Significant changes were made to Question 2b, which is asked to non-municipal consumers. A follow-up questions was also added (Question 2c). Question 10 is also new. The question aimed to capture self-supply. Minor changes were made to Questions 11 and 14.

Table 27: Questions tested in Round 4 vs Round 3

Question tested in Round 3	Question tested in Round 4
Question 1 I am now going to ask you about the water you use for drinking and cooking. Do you get the water that you use for drinking from the municipality? [READ OUT] 1. Yes 2. No 3. Do not know	Question 1 No change
Question 2a The drinking water that you get from the municipality, do you get it from: [READ OUT] 1. A tap inside your [house/room] 2. A tap inside your yard 3. A tap outside your yard 4. A hand pump 5. A water truck 6. A water tank (JoJo) 7. Not one of these (specify):	Question 2a No change
Question 2b You said you do not get the water that you use for drinking from a municipality. Do you get it from: [ASK YES/NO FOR EACH OPTION. MULTIPLE YES] 1. A shop or a person who sells water? 2. Your own borehole? 3. Your own rainwater tank or system? 4. A dam, river or canal? 5. A tap inside your home? 6. A tap inside your yard? 7. A tap outside your yard?	Question 2b You said you do not get the water that you use for drinking from a municipality. Do you: [READ OUT] 1. Buy your drinking water 2. Get your drinking water from someone (like an employer, a traditional leader, a mine or neighbour) 3. Fetch drinking water from a place like a dam or a river 4. Get drinking water from your own borehole 5. Get drinking water from your own rainwater tank or system
Not asked	Question 2c (New question) Does this drinking water come from: [READ OUT] 1. A tap inside your home 2. A tap inside your yard 3. A tap outside your yard 4. A handpump

Question tested in Round 3	Question tested in Round 4
Question 3 Does it take you longer than 30 minutes to fetch your drinking water? [READ OUT] 1. Yes 2. No 3. Do not fetch water	Question 3 No change
Question 4 Do you clean (treat) your drinking water before you drink it? [READ OUT] 1. Yes, always 2. Yes, sometimes 3. No, never	Question 4 No change
Question 5a Was the tap that you use for drinking water ever dry (without water) in the past 12 months? [READ OUT] 1. Yes, it was dry for longer than two days 2. Yes, it was dry but not for longer than two days 3. Yes, it is dry every day for a few hours 4. Yes, it is dry every week on some days 5. Yes, it is dry every other week 6. No, it was never dry in the past 12 months	Question 5a No change
Question 5b In the past 12 months, was there any week or weeks when the water truck did not come? 1. Yes 2. No	Question 5b No change
Question 5c In the past 12 months, was this water tank empty for more than two days in a row? 1. Yes 2. No	Question 5c No change
Question 6 When there is no drinking water from the municipality, do you: [READ OUT. MULTIPLE YES] 1. Get water from someone else? 2. Get water from another area? 3. Use rainwater or other water that you have stored? 4. Buy water? 5. Use your own borehole? 6. Do something else (Specify):	Question 6 No change

Question tested in Round 3	Question tested in Round 4
Question 7a What type of toilet do you use at the place where you stay? [READ OUT] 1. Use a plastic bag or the bush 2. Flush toilet 3. Pour flush or bucket flush toilet 4. Pit toilet with a pipe to let the smell out 5. Pit toilet without a pipe 6. Mobile toilet (like the one used at events) 7. Bucket toilet (that the municipality empties) 8. Not one of these (specify):	Question 7 No change
Question 7b [SHOW PICTURES. READ THE LABELS.] What type of toilet do you use at the place where you stay?	Question 7b No change
Question 7c Is the flush toilet connected to: [READ OUT] 1. A municipal sewer pipe 2. A septic tank 3. A hole in the ground (pit) 4. Not sure	Question 7c No change
Question 8 Is this toilet: [READ OUT] 1. Inside your [house/room/flat] 2. Outside your [house/room/flat] but inside your [yard/building] 3. In somebody else's yard 4. Outside the yard and used by the community	Question 8 No change
Question 9 Do you share this toilet with other families? 1. Yes 2. No	Question 9 No change
Not asked	Question 10 (New question) In this area where you live: [ASK YES/NO FOR EACH OPTION] 1. Do people in this area sometimes pay someone to clean the municipality toilets? 2. Do some people pay a person to move a municipality toilet into their yard? 3. Do some people dig a toilet in their yard because the municipality toilets are dirty?
Question 10 Do you have a problem in your area with sewage running in the street? 1. Yes 2. No	Question 11 Do you <u>often</u> have a problem in your area with sewage running in the street? 1. Yes 2. No

Question tested in Round 3	Question tested in Round 4
Question 11 What happens with the human waste when the [toilet/septic tank or pit] is full and has to be emptied? [READ OUT] 1. The municipality or its contractor takes it away 2. Pay someone to take it away 3. Bury it 4. Dig a new hole. The waste stays in the ground 5. Empty it on the rubbish dump 6. It has not been full	Question 12 No change
Question 12 How do you dispose of sanitary items and nappies? [READ OUT] 1. Put in a bin or plastic bag and the municipality or a private person collects it 2. Put in a plastic bag and take to a rubbish dump 3. Burn or bury it 4. Throw it in the toilet 5. Do something else:	Question 13 No change
Question 13 Do you have soap or sanitizer to clean your hands here where you stay? [READ OUT] 1. Yes 2. Sometimes 3. No	Question 14 Do you have soap to clean your hands here where you stay? [READ OUT] 1. Yes 2. Sometimes 3. No
Question 14 Do you wash your hands after you have been to the toilet? [READ OUT] 1. Yes, with water 2. Yes, with water and soap 3. Yes, clean hands with hand sanitizer or wet wipes 4. Not always	Question 15 No change

Annexure 3 shows how the questions were changed across all four rounds.

5.2.2 Issues and solutions

In general, the questions tested well. Respondents found the questions easy to understand and easy to answer appropriately, with some minor issues. The minor issues and their solutions are set out in the table below.

Table 28: Round 4: minor issues

Questions	Issues	Solution
Water		
Municipal vs non-municipal	Two inappropriate answers (both non-municipal). Confused the traditional authority with a municipality. Led to a domino effect.	The Bafokeng traditional authority offers the same services as a WSP. It is therefore understandable that some respondents would regard them as a 'municipality'.
Source and end user point	Municipal end user point One respondent did not know at first which option to pick. Their tap is broken. They get water from a hose pipe connected to the mains. Also gets water from a neighbour's JoJo tank and collect rainwater. Eventually selected 'tap inside the yard'. Non-municipal source One inappropriate answer. The respondent selected option 4 (own borehole) instead of option 2 (from someone else like a neighbour). They get their water from a neighbour's borehole. Respondents did not understand the word "employer". Non-municipal end user point One respondent did not have an option to pick. They get their water from a water truck supplied by the traditional authority.	Outlier Outlier Make the examples more specific: "like a traditional leader, a mine, a farm owner or neighbour)" Add water truck as an option.
Distance	No issues	
Treatment	No issues	
Interruption	No issues	
Alternative source	No issues	
Sanitation		
Toilet type	Half of the respondents were given the options in words (Question 7a). The other half were shown a showcard (see Annexure 4) with pictures (Question 7b). No issues and no difference in findings between the words and the pictures. One respondent selected option 1 (Use a plastic bag or the bush).	The changes to the wording of the question and response options, resolved the issues experienced in Rounds 1 and 2. The pictures once refined worked well but not necessarily better than the verbal questions.
Location	No issues	
Sharing	No issues	
Self-supply	Several issues	See discussion below.
Sewage problem	No issues	

Questions	Issues	Solution
Faecal sludge management	One inappropriate answer Respondent selected “Bury it” instead of “Dig a new hole. The waste stays in the ground” for a pit toilet.	Move “Bury it” to the second last option.
Women and girls	One respondent, an elderly male needed ‘not applicable’ as an option.	Take out the last option “Do something else”. Add an option: “No women or babies”.
WASH (two questions)	No issues	

5.2.3 Sanitation self-supply

Question 10 in Table 27 was a new question. The question aimed to test sanitation self-supply in circumstances where communal sanitation was unhygienic or inadequate. The three options were based on actual scenarios gathered from respondents in the previous rounds.

None of the respondents in Round 4 used communal sanitation. They tried to relate the options to their own circumstances. This did not work. For example, when confronted with option 2 (Do some people pay a person to move a municipality toilet into their yard?), a respondent said: “The RDP comes with a toilet, it is a package, no pay”.

As a solution, the research team proposes to route only respondents using communal toilets to this question.

5.2.4 Time reference

The Census 2011 and GHS 2018/2020 questionnaires both refer to “main” use (Census 2011 = get mainly; GHS 2018/2020 = main source). ‘’Main source’’ did not test well and was therefore taken out for municipal consumers in the subsequent rounds. It was argued that a single mention would force respondents unconsciously to select the one mainly used.

In the cognitive interviews, the researchers were struck by how often respondents used time references, such as now, most of the time, in the past, sometimes, in the meantime. Respondents will always use a time reference, and if it is not stated in the question, they will select the one most important or most relevant to them. To make the time reference the same for all respondents, the researchers propose to add “most of the time” as a time reference to Questions 2a (municipal end user point) and 2b (non-municipal source).

Chapter 6: Conclusions

6.1 Consumers struggled to understand

The study revealed that consumers struggle to understand the current Census and selected GHS water and sanitation questions and answer them appropriately. For example, only half of respondents could answer the first Census question appropriately. For the equivalent water question in the GHS 2020 questionnaire, the result was similar. The Census asks only one sanitation question. This question also did not test well.

Inappropriate answering was much higher among respondents in informal and rural areas. These are the people still underserviced with safe water and sanitation in terms of national and international goals and targets. Most of them are poor, they do not understand English well and they bear the brunt of poor municipal service delivery.

One could ask if the actual inappropriate answering in the Census 2011 and GHS 2018 was indeed as high as the research has indicated.

This is a difficult question to answer, because in this research, fieldworkers were instructed not to assist respondents when they asked for clarification. They were instructed to take down respondents' questions and refer to them during the cognitive interview that followed. DWS and StatsSA requested that the research tests the questions without fieldworker mediation.

In the actual field situation, however, Census and survey managers allow fieldworkers to translate, rephrase and explain questions, in an attempt to mitigate the risk of inappropriate answering.

Well-trained fieldworkers who understand the questions and their intent might significantly reduce inappropriate answering. On the other hand, allowing fieldworkers to explain questions could increase the risk of inappropriate answering. During the probing, one of the respondents mentioned that she was a fieldworker for Census 2011. She answered that the main source of her household water in a formal area was the river because ''that is where the municipality gets the water from''. She also thought that ''dwelling'' was a pipe!

It is dangerous to assume that all fieldworkers will interpret and explain the questions in the same way and as intended.

For a census, where large numbers of short-term interviewers are recruited and trained, the risk of fieldworkers misguiding respondents is substantial. For a survey like the GHS which has a full-time established fieldwork team, the risk might be less.

As discussed in detail in the preceding chapters, the reasons for inappropriate answering are a combination of not understanding the terminology and structural and task issues of the questions themselves.

The findings of Round 1 indicated that inappropriate answering is further compounded by the complexity of the South African population and its stratification in terms of income, diversity, language, and history.

Many consumers, especially consumers in those vulnerable groups who are the target of improved water and sanitation delivery, are disempowered to report on their situation, because they are unable to answer the current Census and GHS questions appropriately without the mediation of a fieldworker.

The negative experience of vulnerable consumers entrenches inequality; it does not eradicate it. These consumers could well ask: *Why does government not want to hear my voice?*

6.2 Towards a solution

In Rounds 2, 3 and 4, the methodology of Cognitive Action Research was used to revise the questions and test the revisions. The revisions were made in cooperation with DWS and StatsSA to ensure that the revised questionnaire remained on track in terms of its objectives.

The improvement in appropriate answering, and consequently data integrity, was substantial. This confirms that the methodology offers an effective solution.

Moreover, the way that respondents engaged with the fieldworker and the questions changed. In Rounds 2, 3 and 4, the non-verbal responses were a testimony that respondents were much more comfortable with the questionnaire:

- They listened intently to the question and response options
- They answered much quicker, and
- They were comfortable to keep their distance (important in Covid times!) and did not try to peep at the questionnaire.

It was no longer necessary for the fieldworkers to repeat the questions several times. As a result, the interviewing time was much shorter, and the interview flow was smooth without the respondents interrupting the fieldworker to ask them to clarify or repeat.

6.3 Remaining issues

There will always be outliers:

- Respondents whose circumstances are unusual: In Limpopo, two cousins were interviewed who are camping on a plot in the hope that it will secure an RDP house. Their responses to the water questions were a mix of their situation at home and this temporary situation.
- Respondents who simply did not listen to the question, for example a respondent in Limpopo who answered for the area and not for himself.

The confusion between different types of toilet facilities could not be completely resolved:

- Respondents with an unreliable water supply will continue to struggle to choose between a flush toilet and a bucket or pour flush toilet. If the respondent has water, it is a flush toilet; if the tap is without water, the toilet is a bucket or pour flush.
- Respondents with bucket toilets that look exactly like mobile (chemical) toilets will continue to struggle to choose between the mobile toilet and the bucket toilet option, as explained in section 5.1.3.3.

The research was mainly conducted in three provinces: Gauteng, Limpopo and North West. Although the research areas were selected to cover as wide a range of water and sanitation supply scenarios as possible, the research should ideally be conducted in all provinces.

Chapter 7: Recommendations

7.1 Recommended water and sanitation questions

7.1.1 Informed revisions

The research findings and consultations with DWS and StatsSA informed the final recommended water and sanitation questions as follows:

1. Align the Census and GHS questions
   The Census questions and GHS questions should be exactly the same although the GHS would ask additional information. The research has shown that every word has an effect on how respondents understand and answer questions. To be aligned with SDG 6.1, it was also decided that water questions should ask about drinking water and not household water.

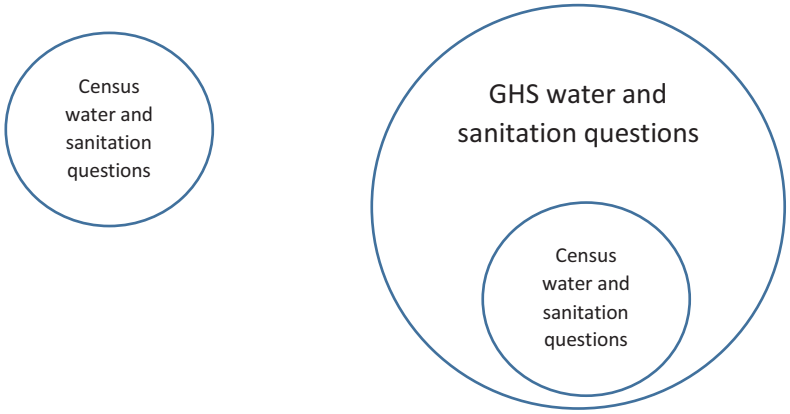


Figure 26: Relationship between Census and GHS water and sanitation questions

2. Avoid terminology that respondents in the research did not understand
   It is recommended that the Census and GHS questions only use terminology that tested well. For example, the cognitive interviews revealed that respondents in informal and rural areas were not familiar with the names of the different types of toilets, hence the inappropriate answering.

3. Avoid response options that are not mutually exclusive
   Mixing up supplier, source and end user point in the options confused respondents in the first two water questions of Census 2011. In the recommended questions, the first water question distinguishes between municipal and non-municipal supplier. The follow-up question for municipal consumers asks end user point (taps, handpump, water truck, water tank). The follow-up questions for non-municipal consumers ask supplier, source, and end user point. See the recommended questions below.

4. Ensure that the question matches the respondents' realities
   The gap between the reality that questions assume, and the actual realities of respondents, is well illustrated by the questions that test the reliability of water supply, as discussed in 5.1.6.3 .

   The research team recommends separate questions to capture the spectrum of interruptions. See below.

5. Use a frame of reference that respondents are familiar with
   The cognitive interviews revealed that respondents who fetch water from outside their yards are more familiar with a time reference than with a distance reference. The distance reference was therefore replaced by "longer than 30 minutes", which is aligned to SDG 6.1.

6. Sanitation: Closer alignment with SDG 6.2 and the needs of DWS
   In consultation with the DWS sanitation team, questions on the following aspects were added:
   a. Faecal sludge management
   b. Safe disposal of menstrual material and nappies, and
   c. Sewage running in the streets.

7. WASH: Soften non-desirable behaviour
   Respondents had little trouble to understand the original WASH questions, but there was evidence from the field that respondents were reluctant to admit that they do not always wash their hands with soap after they have been to the toilet. Questions were revised to give respondents the opportunity to say that they cannot always afford soap or that they do not always wash their hands with soap and water. The revised questions tested well.

8. Include self-supply as an option
   Self-supply of water and sanitation services is a growing trend (Royston, 2019) as municipal services deteriorate. This affects the affordability of services for poor people. The recommended questions added options that reflect self-supply, which will give government data on this trend.

7.1.2 Final recommended questions

Below are the final recommended questions for the Census and the GHS in the format of the respective instruments.

7.1.2.1 Census

H05	**WATER SUPPLIER** **I am now going to ask you about the water that you use for drinking and cooking.** **Do you get the water that you use for <u>drinking</u> from the municipality?** 1 = Yes 2 = No 3 = Do not know **If 1 or 3, go to H06a** **If 2, go to H06b**	☐
H06a	**ACCESS TO PIPED WATER** **Most of the time, do you get this <u>drinking water</u> from:** 1 = A tap inside your *(house/room/flat)* Choose the appropriate word. 2 = A tap inside your *(yard/building)* Choose the appropriate word. 3 = A tap outside your yard 4 = A hand pump 5 = A water truck 6 = A water tank (JoJo) **If 1-3, go to H07a** **If 4, go to H07d** **If 5, go to H07b** **If 6, go to H07c**	☐

H06b	**ACCESS TO PIPED WATER** **You said that you do <u>not</u> get the water that you use for <u>drinking</u> from the municipality. Most of the time, do you:** 1 = Buy your drinking water 2 = Fetch drinking water from a place like a dam or a river 3 = Get your drinking water from someone (like a traditional leader, a mine, a farm owner or neighbour) 4 = Get drinking water from your own borehole 5 = Get drinking water from your own rainwater tank or system **If 1-2, go to H08a** **If 3-5, go to H06c**	☐
H06c	**ACCESS TO PIPED WATER** **Does this <u>drinking water</u> come from:** 1 = A tap inside your home 2 = A tap inside your yard 3 = A tap outside your yard 4 = A handpump 5 = A water truck **If 1-2, go to H08a** **If 3-5, go to H07d**	☐
H07a	**RELIABILITY OF MUNICIPAL WATER SUPPLY** **Was the tap that you use for <u>drinking water</u> ever dry (without water) in the past 12 months?** 1 = Yes, it was dry for longer than two days 2 = Yes, it was dry, but not for longer than two days 3 = Yes, it is dry <u>every day</u> for a few hours 4 = Yes, it is dry <u>every week</u> on some days 5 = Yes, it is dry <u>every other week</u> 6 = No, it was never dry in the past 12 months **Go to H07d**	☐
H07b	**RELIABILITY OF MUNICIPAL WATER SUPPLY** **In the past 12 months, was there any week or weeks when the water truck did not come?** 1 = Yes 2 = No **Go to H07d**	☐
H07c	**RELIABILITY OF MUNICIPAL WATER SUPPLY** **In the past 12 months, was this water tank empty for more than two days in a row?** 1 = Yes 2 = No **Go to H07d**	☐
H07d	**RELIABILITY OF WATER SUPPLY** **Does it take you longer than 30 minutes to fetch your <u>drinking water</u>?** 1 = Yes 2 = No 3 = Do not fetch water **Go to H08a**	☐
H08a	**TOILET FACILITY**[10] **What type of toilet do you use at the place where you stay?** 1 = Flush toilet 2 = Pour flush or bucket flush toilet 3 = Pit toilet <u>with</u> a pipe to let the smell out 4 = Pit toilet <u>without</u> a pipe 5 = Mobile toilet (like the one used at events) 6 = Bucket toilet (that the municipality empties) 7 = Use a plastic bag or the bush 8 = Not one of these **If 1 or 2, go to H08b** **If 4-6 or 8, go to H09** **If 7, go to next section**	☐

[10] At the final Reference Group meeting, Mr Niel Roux requested that the option "Use a plastic bag or the bush" be moved from position 1 to position 7.

H08b	**TOILET FACILITY** **Is the flush toilet connected to:** 1 = A municipal sewer pipe 2 = A septic tank 3 = A hole in the ground (pit) 4 = Not sure	☐
H09	**SHARED TOILETS** **Do you share this toilet with other families?** 1 = Yes 2 = No	☐

7.1.2.2 GHS

Legend:

	Questions that appear in the Census and GHS questionnaires
	Questions that appear only in the GHS questionnaire
	Original GHS 2020 questions that we did not test

Water

WAT1: I am now going to ask you about the water you use for drinking and cooking. Do you get the water that you use for drinking from the municipality?	SINGLE SELECT WAT_MUN 1. Yes 2. No 3. Do not know
WAT2a: Most of the time, do you get this drinking water from: WAT_MUN == 1 or 3	SINGLE SELECT WAT_MUN_END 1. A tap inside your [house/room/flat] 2. A tap inside your [yard/building] 3. A tap outside your yard 4. A hand pump 5. A water truck 6. A water tank (JoJo)
WAT2b You said you do not get the water that you use for drinking from a municipality. Most of the time, do you: WAT_MUN = 2	SINGLE SELECT WAT_NON-MUN 1. Buy your drinking water 2. Fetch drinking water from a place like a dam or a river 3. Get your drinking water from someone (like a traditional leader, a mine, a farm owner or neighbour) 4. Get drinking water from your own borehole 5. Get drinking water from your own rainwater tank or system
WAT2c Does this drinking water come from: WAT_NONMUN == 2, 4 or 5	SINGLE SELECT WAT_NON-MUN_END 1. A tap inside your home 2. A tap inside your yard 3. A tap outside your yard 4. A handpump 5. A water truck
WAT3 Does it take you longer than 30 minutes to fetch your drinking water? WAT_MUN_END == 3, 4, 5 or 6 OR WAT_NON-MUN_END == 3, 4 or 5	SINGLE SELECT WAT_DIST 1. Yes 2. No 3. Do not fetch water
WAT4 Did this household use piped or tap water at any time in the past while living in this community, but have stopped as a result of the system breaking down?	SINGLE SELECT WAT_PIPE 1. Yes 2. No

WAT5 Do you clean (treat) your drinking water before you drink it?	SINGLE SELECT WAT_TREAT 1. Yes, always 2. Yes, sometimes 3. No, never
WAT 6 Does your household have a water meter? WAT_MUN == 1	SINGLE SELECT WAT_METER 1. Yes 2. No
WAT7 Does the household pay for municipal water? If cost of water is included in a levy/rent aid to a housing complex/owner/landlord, the response should be "No". WAT_MUN == 1	SINGLE SELECT WAT_PAY 1. Yes 2. No
WAT8 What is the main reason this household does not pay for water? WAT_MUNI == 1 && WAT_PAY == 2	SINGLE SELECT WAT_YNOTPAY 1. Use own source of water 2. Use a free water source 3. Pay directly to landlord as part of rent 4. Payment included in levy 5. Permission from municipality not to pay 6. Do not have water meter 7. Water meter not working/broken 8. Do not receive water bill 9. Community decision not to pay 10. Cannot afford to pay 11. Water supply irregular 12. Water supply has been stopped 13. Other
WAT9a Was the tap that you use for drinking water ever dry (without water) in the past 12 months? WAT_MUNI_END == 1, 2 or 3	SINGLE SELECT WAT_INT_TAP 1. Yes, it was dry for longer than two days 2. Yes, it was dry but not for longer than two days 3. Yes, it is dry every day for a few hours 4. Yes, it is dry every week on some days 5. Yes, it is dry every other week 6. No, it was never dry in the past 12 months
WAT9b In the past 12 months, was there any week or weeks when the water truck did not come? WAT_MUNI_END == 5	SINGLE SELECT WAT_INT_TRUCK 1. Yes 2. No
WAT9c In the past 12 months, was this water tank empty for more than two days in a row? WAT_MUNI_END == 6	SINGLE SELECT WAT_INT_TANK 1. Yes 2. No

WAT10 When there is no drinking water from the municipality, do you: WAT_INT_TAP == 1, 2, 3, 4 or 5 OR WAT_INT_TRUCK == 1 OR WAT_INT_TANK == 1	MULTI SELECT WAT_ALTSOURCE 1. Get water from someone else? 2. Get water from another area? 3. Use rainwater or other water that you have stored? 4. Buy water? 5. Use your own borehole?

Sanitation

SAN1a What type of toilet do you use at the place where you stay?	SINGLE SELECT SAN_TOILET 1. Flush toilet 2. Pour flush or bucket flush toilet 3. Pit toilet with a pipe to let the smell out 4. Pit toilet without a pipe 5. Mobile toilet (like the one used at events) 6. Bucket toilet (that the municipality empties) 7. Use a plastic bag or the bush 8. Not one of these (Specify:)
SAN1b Is the flush toilet connected to: SAN_TOILET == 1 or 2	SINGLE SELECT SAN_FLUSH 1. A municipal sewer pipe 2. A septic tank 3. A hole in the ground (pit) 4. Not sure
SAN2 Does this household pay for the sewerage system? SAN_FLUSH == 1	SINGLE SELECT SAN_PAY 1. Yes 2. No 3. Do not know
SAN3 Is this toilet: SAN_TOILET != 7	SINGLE SELECT SAN_LOCATION 1. Inside your [house/room/flat] 2. Outside your [house/room/flat] but inside your [yard/building] 3. In somebody else's yard 4. Outside the yard and used by the community
SAN4 Do you share this toilet with other families? SAN_TOILET != 7 && SAN_LOCATION != 3 or 4	SINGLE SELECT SAN_SHARE 1. Yes 2. No
SAN5 In this area where you live: SAN_LOCATION == 4	MULTI SELECT: YES/NO SAN_SELF-SUPPLY 1. Do people in this area sometimes pay someone to clean the municipality toilets? 2. Do some people pay a person to move a municipality toilet into their yard? 3. Do some people dig a toilet in their yard because the municipality toilets are dirty?

SAN6 Do you <u>often</u> have a problem in your area with sewage running in the street?	SINGLE SELECT SAN_SEWAGE 1. Yes 2. No
SAN7 What happens with the human waste when the [toilet/septic tank or pit] is full and has to be emptied? SAN_TOILET == 3, 4, 5, 6 or 8 OR SAN_FLUSH == 3 or 4	SINGLE SELECT SAN_FAECAL_SLUDGE 1. The municipality or its contractor takes it away 2. Pay someone to take it away 3. Dig a new hole. The waste stays in the ground 4. Empty it on the rubbish dump 5. Bury it 6. It has not been full 7. Not sure[11]
SAN8 How do you dispose of sanitary items and nappies?	SINGLE SELECT SAN_WOMEN 1. Put in a bin or plastic bag and the municipality or a private person collects it 2. Put in a plastic bag and take to a rubbish dump 3. Burn or bury it 4. Throw it in the toilet 5. No women or babies
SAN9 Do you have soap to clean your hands here where you stay?	SINGLE SELECT SAN_SOAP 1. Yes 2. Sometimes 3. No
SAN10 Do you wash your hands after you have been to the toilet?	SINGLE SELECT SAN_WASH 1. Yes, with water 2. Yes, with water and soap 3. Yes, clean hands with hand sanitizer or wet wipes 4. Not always

7.2 General recommendations

The study recommends that the risk of inappropriate answering in the Census and major surveys be mitigated as follows:

7.2.1 Test the questions

Cognitive Action Research provides a methodology to reduce inappropriate answering and ensure data integrity. It is recommended that this methodology be applied to test and adjust the Census and major survey questionnaires before they go into the field.

7.2.2 Translate the questions

The original Census and GHS questions, as well as the revised questions tested in this study, was <u>only</u> tested with respondents proficient in conversational English. The comprehension issues that respondents

[11] At the final Reference Group meeting, Mr Niel Roux requested that this option be added.

experienced and discussed in this report refer to these respondents. Furthermore, the adjustments made in the revised questions were tailored for these respondents.

The research team does not know how many respondents will still struggle to understand Census or GHS questions that are read out to them in English. Based on the field experience, it can be expected to be a significant percentage.

It is therefore recommended that the English questions, which are the product of this study, be translated into the official South African languages or the official provincial languages. Respondents can then indicate in which language they prefer the fieldworker to read out the questions. In computer-assisted interviewing, it should be simple to change the screen to the selected language.

Translations could introduce new comprehension issues and should also be tested. The research team has experience of testing translated questionnaires in Kinyarwanda and Swahili with Cognitive Action Research; testing is feasible.

7.2.3 If tracking outweighs appropriate answering

Data collected through a national census and large-scale surveys are used to track trends and measure progress on for example service delivery, goals and targets. Hence, it is understandable that organizations like StatsSA may want to keep questions as close as possible to previous questionnaires for tracking purposes.

It is possible to retain tracking and adjust questions to cover deviations stemming from inappropriate answering. For example, one could:

1. Include the recommended Census water and sanitation questions in one GHS survey, let's say 2023, to determine response differences, and adapt data accordingly until the next Census in 2031, or
2. Double the number of GHS respondents in one year, for example, 2022, and set up two matched samples. Include the current Census questions for the one sample, and the recommended Census questions with the other sample. Determine response differences and adapt future data accordingly. Repeat the exercise in 2029 and adapt as needed in time for Census 2031, or
3. Conduct a separate survey with the recommended water and sanitation questions with a smaller sample of 5 000-10 000. Determine response differences and adapt future data accordingly.

7.3 Potential impact of the study

Census and survey questions that are easy to understand and answer will increase appropriate answering and hence improve the integrity of data that is critical for the water sector. It also removes the risk of fieldworker intervention and mediation.

Accurate data will ensure that the money spent on water and sanitation infrastructure and services meet the actual needs of consumers in those areas where improvement will make the biggest impact.

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Annexure 1: Questions tested in Round 1

Questionnaire 1

Question 1

Ask all

In which way does this household mainly get piped water for household use?

1 Piped (tap) water inside the dwelling
2 Piped (tap) water inside the yard
3 Piped (tap) water on community stand: distance less than 200 m from dwelling
4 Piped (tap) water on community stand: distance between 200 m and 500 m from dwelling
5 Piped (tap) water on community stand: distance between 500 m and 1000 m (1 km) from dwelling
6 Piped (tap) water on community stand: distance greater than 1000 m (1 km) from dwelling
7 No access to piped water

Question 2

Ask all

What is this household's MAIN source of WATER for household use?

1 Regional/local water scheme (operated by municipality or other water services provider)
2 Borehole
3 Spring
4 Rainwater tank
5 Dam/pool/stagnant water
6 River/stream
7 Water vendor
8 Water tanker
9 Other

Question 3

Ask only if respondent answered that main water source is supplied by municipality (option 1 in Q2)

Has this household municipal water supply been interrupted at any time during the last 12 months?

1 Yes
2 No *Go to Q7*

Question 4

Ask if Yes in Q3 (had an interruption in the last 12 months)

Thinking about the interruptions in your municipal water supply over the last 12 months, was any specific interruption longer than two days?

1 Yes
2 No *Go to Q7*
3 Do not know *Go to Q7*

Question 5

Ask only for respondents that had interruption(s) for longer than two days (option 1 in Q4)

If you add all the days that your municipal water supply was interrupted over the last 12 months, was it more than 15 days in total?

1 Yes
2 No
3 Do not know

Question 6

Ask only for respondents that had interruption(s) for longer than two days (option 1 in Q4)

What alternative water source did the household use during water supply interruption?

1 Borehole
2 Spring
3 Rainwater tank
4 Dam/pool/stagnant water
5 River/stream
6 Water vendor
7 Water tanker
8 Other
9 None

Question 7

Ask all

Do household members treat the water used for drinking?

This may include filtering, boiling, adding chlorine or other chemicals

1. Yes, always
2. Yes, sometimes
3. No, never

Question 8

Ask all

What type of toilet facility is used by this household?

1 Flush toilet connected to a public sewerage system
2 Flush toilet connected to a septic or conservancy tank
3 Pour bucket/flush toilet connected to a septic tank (or seepage pit)
4 Chemical toilet
5 Pit latrine/toilet with ventilation pipe
6 Pit latrine/toilet without ventilation pipe
7 Bucket toilet
8 Portable flush toilet
9 Composting toilet
10 Urine diversion dry toilet
11 Open defecation (e.g. no facilities, field, bush)
12 Other

Question 9

Ask if 7 (bucket toilet) in Q8

Which type of bucket toilet does your household use?

1 Toilet that contains a black bucket that is provided and cleaned by the municipality or service provider
2 Night bucket used by household members at night, or sometimes during the day
3 Porta potti that is cleaned weekly, or more regularly, by the municipality or service provider
4 Chemical toilet that is provided and cleaned by the municipality or service provider

Question 10

Ask if 7 (bucket toilet) in Q8

Who cleans the bucket?

1 Cleaner provided by municipality or service provider
2 Resident(s)
3 No one
4 Not sure

Question 11

Ask all

During the past 6 months, has your household experienced any of the following problems with regards to the toilet facility usually used by this household?

Yes/No/Not applicable for each.

1 No water to flush the toilet
2 Toilet blocked up
3 Toilet pit or chamber full
4 Toilets not well maintained and broken
5 Poor lighting
6 Toilet not enclosed well or structure damaged
7 Broken pipes or blockages in the municipal system (sewerage flowing in the street)
8 Problem reported but not repaired within 5 working days
9 Toilet system overflowing in yard
10 Toilet system not working properly causing odours and insects
11 No tap or water point to wash hands after using the toilet
12 Sewer problems being repaired that the municipality informed you about

Question 12

Ask all

During the past 6 months, have you experienced any of the following problems while using the toilet facility usually used by this household?

Yes/No/Not applicable for each.

1 Toilet unsafe to use, due to risk of assault
2 Toilet unsafe to use, due to health risks
3 Too many people, long waiting times
4 Toilet not cleaned (if shared public toilet)
5 Toilet does not provide privacy
6 Unable to dispose of sanitary items (women and girls)

Question 13

Ask all except if respondent selected option 11 in Q8 (open defecation)

Is the toilet facility shared with other households?

1 Yes
2 No

Question 14

Ask all except if respondent selected option 11 in Q8 (open defecation)

Does your household have hand washing facilities (e.g. basin, bowl or functioning tippy tap)?

1 Yes
2 No
3 Do not know

Question 15

Ask all except if respondent selected option 11 in Q8 (open defecation)

After using the toilet, do household members clean their hands using one of the following methods?

1 Rinse hands with water
2 Wash hands with soap and water
3 Clean hands with hand sanitiser or wet wipes
4 Do not clean hands
5 Do not know

Questionnaire 2

Question 1

Ask all

What is the household's main source of drinking water?

1 Piped (tap) water in dwelling/house
2 Piped (tap) water in yard
3 Borehole in yard
4 Rain-water tank in yard
5 Neighbour's tap
6 Public/communal tap
7 Water-carrier/tanker
8 Water vendor (charge involved)
9 Borehole outside yard
10 Flowing water/stream/river
11 Stagnant water/dam/pool
12 Well
13 Spring
14 Other

Question 2

Ask all

Is the household main source of drinking water supplied by a municipality?

1 Yes
2 No
3 Do not know

Question 3

Ask if water is not in dwelling or in yard (Options 5-14 in Q1)

How far is the water source from the dwelling or yard (Note that 200 m is equal to the length of two football/soccer fields)?

1 Less than 200 metres
2 201-500 metres
3 501 metres-1 kilometre
4 More than 1 kilometre
5 Do not know

Question 4

Ask all respondents who said that they get water from a municipality (Option 1 in Q2)

In the last 12 months, has this household had any interruptions in piped water supply?

1 Yes
2 No *Go to Q7*

Question 5

Ask if Yes in Q4 (had interruptions in the last 12 months)

Did any specific interruption(s) of piped water supply last longer than two days?

1 Yes
2 No

Question 6

Ask if Yes in Q5 (had interruptions for longer than two days)

If a municipal water supply interruption over the last 12 months lasted for longer than two days, what alternative drinking water source did the household use during interruption?

1 Borehole
2 Spring
3 Well
4 Rain water tank
5 Dam/pool/stagnant water
6 River/stream
7 Water vendor
8 Water tanker
9 Saved/stored water
10 None
11 Do not know
12 Other

Question 7

Ask all

Do household members treat the water used for drinking?

This may include filtering, boiling, adding chlorine or other chemicals

1. Yes, always
2. Yes, sometimes
3. No, never

Question 8

Ask all

What is the MAIN type of TOILET facility used by this household?

1 Flush toilet (connected to sewerage system)
2 Flush toilet (with septic tank)
3 Chemical toilet
4 Pit toilet with ventilation (VIP)
5 Pit toilet without ventilation
6 Bucket toilet
7 Other
8 None

Question 9

Ask all except respondent who answered 'None'' in Q8

Is the toilet facility shared with other households?

1 Yes
2 No

Question 10

Ask all except respondents who answered 'None' in Q8

Is the toilet facility in the dwelling, in the yard or outside the yard?

1 In dwelling
2 In yard
3 Outside yard

Question 11

Ask if toilet is outside the yard (option 3 in Q10).

How far is the nearest toilet facility to which the household has access (Please note 200 m is equal to the length of two football/soccer fields)?

1 Less than 50 m
2 51-100 m
3 101-200 m
4 201-500 m
5 More than 500 m

Question 12

Ask if respondent answered "bucket toilet" (option 6) in Q8

Which type of bucket toilet does your household use?

1 Toilet that contains a black bucket that is provided and cleaned by the municipality or service provider
2 Night bucket used by household members at night, or sometimes during the day
3 Porta potti that is cleaned weekly, or more regularly, by the municipality or service provider
4 Chemical toilet that is provided and cleaned by the municipality or service provider

Question 13

Ask if respondent answered "bucket toilet" (option 6) in Q8

Who cleans the bucket?

1 Cleaner provided by municipality or service provider
2 Resident(s)
3 No one
4 Not sure

Question 14

Ask all

During the past 6 months, has your household experienced any of the following problems with regards to the toilet facility usually used by this household?

Yes/No/Not applicable for each.

1 No water to flush the toilet
2 Toilet blocked up
3 Toilet pit or chamber full
4 Toilets not well maintained and broken
5 Poor lighting
6 Toilet not enclosed well or structure damaged
7 Broken pipes or blockages in the municipal system (sewerage flowing in the street)
8 Problem reported but not repaired within 5 working days
9 Toilet system overflowing in yard
10 Toilet system not working properly causing odours and insects
11 No tap or water point to wash hands after using the toilet
12 Sewer problems being repaired that the municipality informed you about

Question 15

Ask all

During the past 6 months, have you experienced any of the following problems while using the toilet facility usually used by this household?

Yes/No/Not applicable for each.

1 Toilet unsafe to use, due to risk of assault
2 Toilet unsafe to use, due to health risks
3 Too many people, long waiting times
4 Toilet not cleaned (if shared public toilet)
5 Toilet does not provide privacy
6 Unable to dispose of sanitary items (women and girls)

Question 16

Ask all except if respondent answered "None" (option 8) in Q8

Does your household have hand washing facilities (e.g. basin, bowl or functioning tippy tap)?

1 Yes
2 No
3 Do not know

Question 17

Ask all except if respondent answered "None" (option 8) in Q8

After using the toilet, do household members clean their hands using one of the following methods?

1 Rinse hands with water
2 Wash hands with soap and water
3 Clean hands with hand sanitiser or wet wipes
4 Do not clean hands
5 Do not know

Annexure 2: Example of a discussion guide

Landscape Interview summary-

Annexure 3: Development of questions across Rounds

Development of questions across Rou

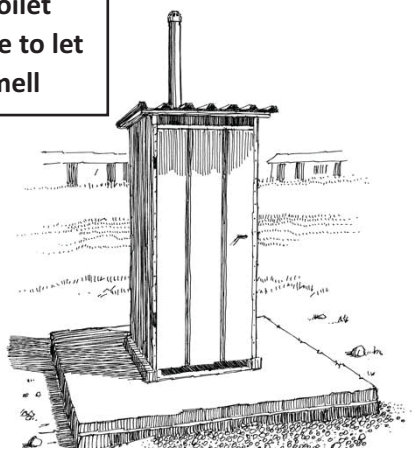
Annexure 4: Showcard

1. Use a plastic bag or the bush

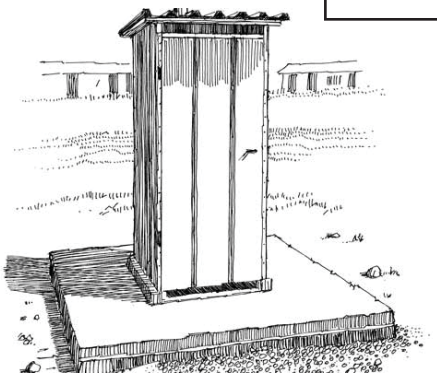
2. Flush toilet

3. Pour flush/ bucket flush toilet

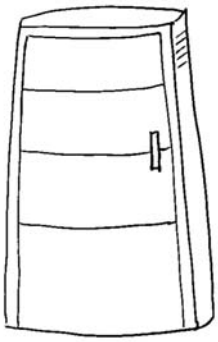
4. Pit toilet WITH pipe to let out smell



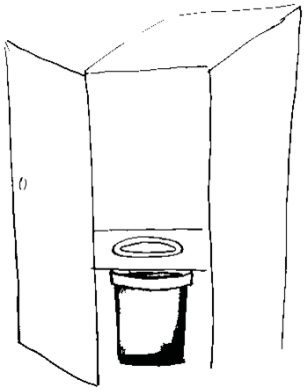
5. Pit toilet WITHOUT pipe



6. Mobile toilet like the one used at events



7. Bucket toilet that the municipality cleans



8. Not one of these (Describe):