Access to water and poor peoples' livelihoods: the case of Ward 16 of Bushbuckridge Local Municipality

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Executive summary

Over the past years, the NGO AWARD (Association for Water and Rural Development) has been working on a programme entitled SWELL (Securing Water to Enhance Local Livelihoods) in ward 16 of the Bushbuckridge Local Municipality, South Africa. The aim of the programme is to develop an approach for integrated planning of rural water services to enhance people's livelihoods, especially of the poorest and most vulnerable groups in the communities. This report aims to provide insight into the current role of water in people's livelihoods and especially how that is shaped by access to water.

The report shows that at first sight typical water-based activities, such as gardening, livestock or small business, are not the main source of livelihood for the people in the area. However, they do play a crucial role in diversifying and reducing vulnerability and dependency on other sources of livelihood. They also do provide important nutritious food and cash to the poorer households.

The extent to which these livelihoods activities can be undertaken depends to a large extent on access to water. Whereas in the area access to water resources is not a major limiting factor, the current infrastructure and its management is. Poor design, operation and maintenance result in frequent break-downs and unreliable supply. As a result people curtail or delay their productive activities. But they are also affected in other aspects of their livelihoods, especially time spent on water collection. As coping strategies they may have to go to neighbouring villages to collect water, buy expensive water from private vendors or store water at household level. The poorest and most vulnerable groups lack the assets to deal with these stresses.

Main recommendations include a number of strategies to improve immediate access to water, especially through clarifying institutional roles and responsibilities and developing operation and maintenance plans. In addition, recommendations are given to integrated planning for multiple uses. Understanding livelihoods, especially of the poorest people and households, is crucial in this.

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Acknowledgements

AWARD is a non-profit company that has been working in the north-east of South Africa in the Sand River Catchment (SRC), on the border of Limpopo and Mpumalanga Provinces, since 1993. AWARD works to secure water to improve the quality of life of the rural populations and the sustainability of the natural resources within the Sand River Catchment.

Over the past year, AWARD has been developing a programme, which looks specifically into the links between water security and livelihoods, called SWELL (Securing Water to Enhance Local Livelihoods). A number of partners and funders have been part of this effort. We would like to acknowledge their contributions.

First and foremost these are the villagers in Ward 16 of Bushbuckridge Local Municipality, and the various local institutions who have been participating in the SWELL process.

This report, specifically, has been developed with financial support from the MUS (Multiple Use Systems) project, part of the Challenge Programme on Water and Food, and has been partially co-financed through the FSP (Fonds de Solidarité Prioritaire) Echel-Eau program, funded by the French Ministry of Foreign Affairs.

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1 Background and introduction

1.1 Overall background

Many villages in South Africa's rural areas are characterized by a disjuncture between villager's water needs on the one hand, and the actual supply of water and peoples' access to and use of that water on the other. When considering rural people's livelihoods strategies, it becomes evident that people require water for both domestic and productive needs. Research undertaken in relation to AWARD's work to improve the access of poor people to water resources in the Sand River Catchment in 2001, provided the first groundwork for our understanding of these needs.

The primary researcher Perez de Mendiguren (2001) shows that all people in the area have similar basic consumption levels for domestic uses (slightly less than 25 lpcd), but that many people also engage in productive activities, ranging from backyard gardening to ice block making. His work suggests that the degree to which this is happening is partially determined by the nature of the productive activity itself, and the returns it may generate. Some activities which require small amounts of water, like hair saloons and making ice blocks, provide a very high return per amount of water used. At the same time, only few households can be engaged in such activities, as there is only a limited and easily saturated market for such activities. Other water-based livelihoods activities are practised by a larger percentage of households (such as growing fruit trees and backyard gardening) but these provide only very low returns per amount of water used. According to Perez de Mendiguren these are not limited by the market size, as the larger part of the production is consumed within the household. Even though there are significant differences between households, on average for the area these small-scale productive uses provide a significant, though not the most important, part of household income.

The research also showed that there is a significant difference in water consumption for these water based livelihoods and the degree of involvement in these on the basis of the status of water supply in the village. The analysis differentiated between best and worst case villages on the basis of characteristics of water supply such as the functioning of the system and the service levels. Where water is reliable and relatively easily accessible for a large part of the population more households engage in productive activities and use larger amounts of water for these activities, suggesting a higher production.

Access to water is thus a key factor enabling or hindering engaging in livelihoods activities. Currently, many poor rural people in South Africa experience insecurity in terms of access to water. Water insecurity can be the result of a number of factors: water supply facilities may not exist; where infrastructure does exist it may not supply enough water to meet all people's demands; it may not be accessible to all; or it may provide an erratic supply.

The reasons for this situation are manifold, but much can be traced back to planning; for too often services are not planned on the basis of an understanding of villager's real needs and capacities. Moreover if the multiple uses of water by rural villagers, and the multiple sources and various water-based livelihood strategies of rural communities are to be met, this will require more integrated planning and service

provision across sectors. There are range of organisations and structures that play a role with regard to water, and while there is a call for cooperative governance and attempts are made to seek integration, this remains a problem in practice. Last but not least, in planning, the most poor and vulnerable groups are usually excluded.

In recognizing the need for a more holistic and inclusive approach to water services provision, AWARD (the Association for Water and Rural Development) has been conducting an ongoing action-research programme called SWELL (Securing Water to Enhance Local Livelihoods), in the area of Bushbuckridge (for more information on the study area, see chapter 3). SWELL is an approach that employs participatory methodologies in order to engage all stakeholders (including villagers and service providers) in participatory processes of enquiry, knowledge exchange and learning in order to plan for water services that consider multiple uses (Maluleke *et al.*, 2005). SWELL has been developed and consolidated as an approach over the last few years, and been applied in Ward 16 of the Bushbuckridge Local Municipality.

One of the components of the SWELL programme has been the development of a better understanding on the role of water in people's livelihoods, and how this is shaped by access to water, as this is considered a crucial basis for planning for water services. This report aims to share the findings of this research.

1.2 Objective

The overall objective of this research was:

For villagers and service providers in the Bushbuckridge area to develop a better understanding about the current and potential use of water in people's livelihoods, especially of the poor and most vulnerable people, and how this is shaped by access to water, so as to inform integrated planning.

Specific research questions were formulated as follows:

- How do water resources, water infrastructure and water demand shape people's access to water, and their livelihood activities?
- What is the actual and potential role of water in people's livelihood strategies?
- What is the nature and scale of vulnerable households, and what are the special water issues that affect those households?

2 Methodology

The SWELL methodology has been the core of the methodology to answer the research questions. A detailed introduction into the SWELL methodology and its application in Bushbuckridge has been given in Maluleke (2004a) and Maluleke (2004b). Below the main elements of the methodology are summarized, including some specific details, relevant to this report.

2.1 SWELL

The SWELL methodology seeks to provide a comprehensive framework and set of tools for the participatory assessment of the role of water in people's livelihoods and

the planning of water resources and water services to respond to these. In doing so, it tries to link up with the local government's planning process.

2.1.1 Conceptual and methodological frameworks

SWELL has drawn mainly on two frameworks to inform its research design and for analysis.

The Sustainable Livelihoods framework (Chambers and Conway, 1992) suggests that livelihoods comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. Understanding these and the coping strategies (especially poor) households use to deal with shocks and stresses is critical if we are to support vulnerable villagers' livelihoods to become more resilient and sustainable.

The RIDA (Resources, Infrastructure, Demand and Access) approach (Moriarty et al., 2004b) suggest that by looking at the linkages between demand, access, infrastructure and resources one can develop a deeper understanding of where the causes of problems related to water access lie, and identify potential solutions.

Table 1: The frameworks and their respective themes

SL Framework themes	RIDA Framework themes
1. Resources (or assets)	1. Water Resources
2. Capabilities	2. Infrastructure
3. Activities and Strategies	3. Demand/Uses
4. Vulnerability context	4. Access
5. Institutional context	

Intersections between the SL and RIDA frameworks provide a useful way to understand the complex dynamics of the water provision, access and use. Water can be viewed as one important resource that households employ to undertake certain activities and strategies, subject to their capabilities, to secure their livelihoods. Infrastructure for water can either be an enabling or a limiting factor in the water-dependent livelihoods complex, as the availability (or lack thereof) of infrastructure has significant impacts on whether households can access and utilize available resources. There exists a strong link between the availability of resources and infrastructure and the status of vulnerability of poor households, where reduced access to resources and infrastructure leads to increased vulnerability by curtailing the ability (capability and capacity) of households to sustain their livelihoods. The institutional context impacts on infrastructure and access in fundamental ways.

2.1.2 Four levels of research and analysis

Based on the two frameworks, research must be conducted at least at four different levels:

- The household; to understand the livelihood contexts of different households
- The village; as this is the level where water services are normally organized,
- The broader institutional context, which includes the ward as the lowest level of municipal services planning and delivery.
- The catchment; which is the context in which water resources are managed

These have been considered in the different phases of the process.

2.1.3 Outline of the process

The process started off with preparatory work with stakeholders, followed by participatory village level assessments, and then household level assessments ensued. After this results were compiled to enable first participatory village level analysis. Finally participatory Ward level analysis and planning was done, after a number of villages were completed. In all this process AWARD played the role of facilitator.

Table 2: Flow diagramme of SWELL process

STEP	ACTIVITY	MOTIVATION
1. Preparation and training	• Preparatory meetings with stakeholders and villagers for awareness raising • Plan the process in detail • Training the field team (includes NGO and departmental staff) in SWELL in understanding concepts around livelihoods and water for productive us, and the linkages between them • Learning methods to use in assessing water and livelihoods situation	• Presenting SWELL to Local municipality and other stakeholders to get their buy-in • Villagers, structures and stakeholders enabled to participate • Needed in the beginning, to build the skills and the team • Enables to create capacity of the local municipality necessary to further carry out planning
2. Village water and livelihood security assessment	• Carry out the assessment in the villages • Document and carry out initial analysis of information gathered	• Understand the particular village's water and livelihood situation • Explore the link of water to improving livelihoods with villagers and stakeholders
3. Village Synthesis	• Present findings of the assessment to villagers • Villagers identify factors that threaten or potentially improve the community's local water and livelihoods situation, and identify areas for priority action	• Enable villagers to engage water sector role • Enable village to identify action projects to seek support to undertake.
4. Ward level stakeholder s' synthesis	• Stakeholders analyse the assessment information • Villagers present their assessment findings and analysis • Collective analysis and planning	• Empower village in relationship with water sector role-players • Enable informed decisions based on participatory assessment • Departments and municipality can pick up cross sectoral priority concerns as identified by villagers to integrate them into their plans

Below further details are given about the assessment and analysis phases, as most relevant to this report.

2.1.4 Assessment phase

Households

The assessment at household level focused at:

- Confirm the well-being or wealth categories of sampled households.
- Identify key livelihood strategies of sampled households, focusing on

- Identify the demand for and use of water within these livelihood strategies of sampled households

The assessment entailed conducting interviews in 12-20 households in each of the 11 villages that constitute Ward 16 (in total 158 households were interviewed). Households were identified with villagers on the basis of a well-being categorization exercise. This was complemented by a number of focus group discussions.

As we expected differences in water access and use between different wealth categories, before the household assessments, a wealth ranking exercise was carried out. For this, the methodology developed by Care International (Drinkwater, 1999) was followed, in which villagers position themselves within their own defined well-being categories. On the basis of that, households were selected in each of the villages, trying to get a cross-section of different wealth categories. In the latter part of the research, the most vulnerable households were specifically targeted.

We did not seek to interview a significant sample numerically, nor to have a random sample, but rather to get a more detailed picture than would emerge from large village meetings, working with the generated well-being categories and what they saw as significant to the issues at hand, which would give a picture of realities and of trends.

Village

The village assessment focused on developing an understanding of the functioning and management of water supply services at village level. Attention was also paid to inter-village interactions.

Village assessment workshops and village synthesis workshops (for a first analysis of outcomes) were conducted in each village of the ward but one (where internal power dynamics created a blockage). During these workshops, assessment activities were carried out including mapping exercises, transect walks, time-lines, income-expenditure tree construction and focus group discussions.

It is important to note that the assessments which culminated in this report unfolded at different intervals over a three year time period, going through different steps of developing and refining the methodology (see Maluleke et al., 2005b). This was related to the participatory and learning nature of the action–research process, as well as partially influenced by the need to obtain funding for different "projects", as full programmatic funding was not found. The table below provides details of the villages that were covered in each phase of SWELL's document, and the number of households in each of them.

Table 3: stages of the SWELL process and villages of Ward 16

SWELL stage – focus and timing	Villages covered[1]	Population size/number of households (source of data between parenthesis)	No. of households interviewed/
Stage 1: Pilot study (2003/2004)	Utah	5.000/496 (CDF member)	20

[1] Some villages have two names, a local one and an official one. These are used interchangeably in various databases and documents. If relevant, the second name is given in between brackets.

Stage 2: Water and Livelihoods Assessment (2004/2005)	Delani (Eglington C) Seville A Thorndale	2.300/365 (DWAF) 680/107 (CDF chair) 900/142 (CDF chair)	12 12 14
Stage 3: Water and Livelihoods Assessment (2004/2005)	Gottenburg Hlalakahle Seville C	6.200/830 (Mnisi Tribal Authority) 400/60 (Award assessment) 400/60 (Award assessment)	13 15 15
Stage 4: Mainstreaming Vulnerabilities (2005/2006)	Dixie (Pungwe) Hluvukani Lephong (Allandale B) Seville B	500/123 (CDF member) 9.375/1250 (CDF chair) 3.233/431 1.435/205 (CDF chair)	16 11 16 14
Total	**11 villages**	**30.423 inhabitants, spread over 4,069 households**	**158 or appr. 1,042 persons**

Ward

As mentioned, the ward is the level at which planning for water services is supposed to happen. No specific assessment activities were carried out here. Through a synthesis workshop, which brought together both villagers and service providers, we brought together findings of the household and village assessments, validated those with the stakeholders, and analysed the results with a view to taking these forward in municipal planning.

Catchment

As part of the RIDA framework, the water catchment would be a logical level of analysis to include, in terms of understanding water resources and access to water in the that context. Within SWELL, we haven't gone into great detail into this level, as previous work on the catchment (the Sand River, see chapter 3) had already revealed the main relevant insights into access to the resources (see Pollard et al. 1998; Smits et al., 2004.) A key conclusion from that work was that inadequate services (infrastructure and their governing institutions) are in general more of a limiting factor to access to water, than the resource base itself. Therefore, it wasn't deemed necessary to do more additional work on this, but take these as a given.

2.1.5 Analysis

The assessment processes described above yielded both quantitative and qualitative data. Consequently, quantitative and qualitative methods of analysis were applied to the respective sets of data as follows:

Household level

Data was collected on aspects such as: food production and income generation strategies of households, water use (demand), quantities of water collected and used, distance travelled to primary and secondary collection points and time spent collecting water. These were then analyzed by using basic functions of MS Excel to compute average figures of the numerical responses provided.

Pivot tables (an MS Excel data analysis tool) enabled figures to be obtained for the following categories of qualitative data:

- Percentage of households falling within well-being categories:
- Percentages of households engaging in various general food and income generating activities.
- Percentages of households relying on specified sources of water.
- Percentages of households engaging in specific water-related activities to generate food and income.

The data categories above merited only basic analysis by entering data into spreadsheets and making use of pivot tables to group responses for each category and computing overall percentages of households. However, responses to certain questions regarding coping strategies to water shortage, storage facilities for water, main sources and alternative sources of water did not fall into categories identified prior to the interviews. The respondents provided varying answers for the above-mentioned questions; these answers were then grouped by similarity and assigned codes. Basic spreadsheet analyses were then employed to provide a count of the frequency of the appearance of each code in order to provide a percentage of how many households employed similar coping strategies, or how many households preferred certain alternative sites for collecting water.

Village level

Analysis at the village level involved analyzing data obtained from participatory assessment processes that included: focus group discussions; mapping exercises, and problem identification discussions. Stakeholder workshops yielded data such as water source and use matrices; social and infrastructure maps; daily activities profile tables; lists of community structures and their roles; and lists of problems perceived or identified.

Analysis of the above-listed types of village level data involved capturing the data in tabular form for each village, identifying similar sets of data from each village and grouping the data to present an over-all ‘ward’ level data set. As the data was primarily of a categorical nature, the various categories of data were grouped, and analyzed by frequency of occurrence. However, the nature of the water situation in Ward 16 is grounded in different experiences and conditions. As a result, the village assessments produced a myriad of ‘stories’ and narratives, which are presented in this report as they were accounted for each village.

At village and ward level, syntheses were done to validate the information with stakeholders at these levels. This was consolidated and compiled into numerous reports, including household and village assessment reports, as well as village and ward synthesis reports. (See the full list of reports in the reference list).

Cross level analysis

One of the hypotheses of the research is that there are linkages between water access at different levels, especially that performance of water services at village level is determined by planning at ward, municipal and catchment level, and that in turn household access to water is shaped by the status of village water supply, by internal community dynamics and by characteristics of the household itself. This cross level analysis therefore goes top-down, from the general picture of water management in

the area to the shaping of access to water at village level, and then to implications for access and use at household level.

2.2 Limitations

As noted above, the assessments, which culminated in this report, unfolded at different times over a three year time period. This was related to the participatory and learning nature of the action–research process, as well as partially influenced by the need to obtain funding for different "projects", as full programmatic funding was not found. As the different stages evolved, assessment tools were adapted in response to what was emerging. One consequence is that some of the data is not consistent for the different villages across the ward, at times limiting cross-village analyses. Table 3 (section 2.1.4) summarises which villages were assessed when. It also specifies the number of household interviews

A second limitation came as a result of undertaking a participatory process, which sought not only to collect data but to involve villagers and other stakeholders as co-researchers. This did lead to quite a lot of unevenness in the quality of the data collection. Thus there are some gaps in the information.

Thirdly, the establishment of the data base form the material, as the basis for analysis has proven to be a greater difficulty than we anticipated. This is a result of being an NGO with in a remote rural area, with limited resources and developing skills. Not all the information is completely collated as yet, and yet we are unwilling to delay this report further. The database completion shall continue after this report is completed, for the many purposes that it will fulfil. Nonetheless, there are some questions we would wish to pose and answer, that we are not able to as yet.

2.3 Structure of the report

The report will start with an introduction to the study area, Ward 16 of the Bushbuckridge Local Municipality. In this, some more attention is given to the broader physical and institutional environment in which it is located: the Sand River Catchment and the Bushbuckridge Municipality. It is felt that many issues detailed here for Ward 16, are, in a general way, also happening in communities in other wards in Bushbuckridge.

The presentation of the results is done along the lines of the cross level analysis. It starts by giving the overall picture of water management in the area, as well as the diversity between villages. Based on that, an analysis of water access at village level is made. Then, we go into the details of people's well-being and their livelihood activities. We try then to link these to access to water, both at a village level and at a household level. We look at implications for water use at household level, and people's coping strategies.

Finally, conclusions are drawn and recommendations for further work are given, both in terms of research as well as development activities in the area.

3 Bushbuckridge in the Sand River Catchment

The area of this study is defined as Ward 16 of the Bushbuckridge Local Municipality. This chapter gives a further introduction into the Bushbuckridge area in general, in terms of its location and population. Many of the general trends for the entire Bushbuckridge area equally apply to Ward 16. Of relevance for this report is also, that the area is located in the Sand River catchment. This largely determines water resources availability, and thus further details are given for the catchment are given.

The Bushbuckridge (BBR) Local Municipality is located in the north-east of South Africa, on the border of Limpopo and Mpumalanga Provinces. After1994, BBR became a disputed area in terms of the demarcation of provincial boundaries: it was moved from Mpumalanga into Limpopo in 2000, and then back into Mpumalanga in early 2006. See figure 1 for its location in South Africa.

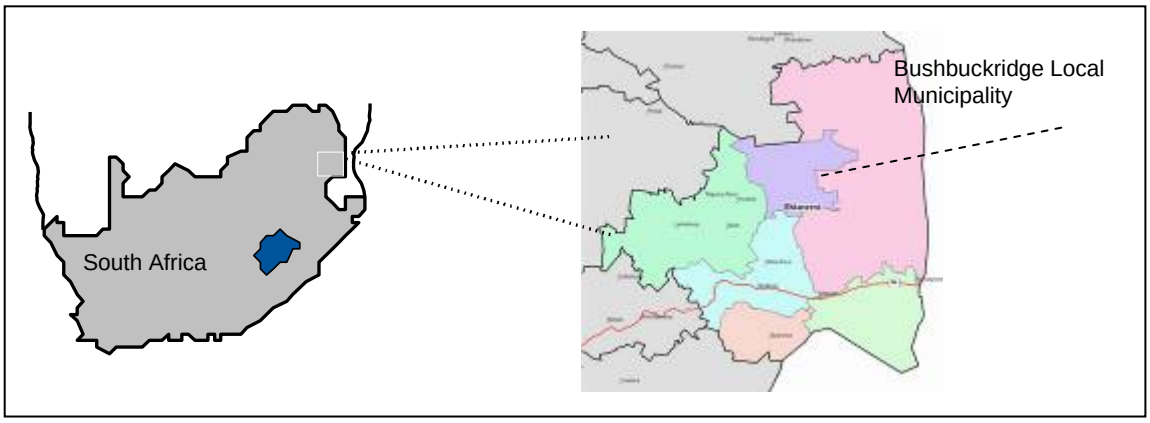


Figure 1: Location of the Bushbuckridge Local Municipality in South Africa (Source: Municipal Demarcation Board)

Its population is made up of many dislocated communities, often moved two or three times under Apartheid's grand plan in the 1970s and 1980s. There are dense settlements as people were crowded together into two 'homelands', Lebowa and Gazankulu, which were defined along ethnic lines.

It is estimated that the population of the Sand River Catchment is about 400.000 people, including Mozambican refugees, who have been in this catchment for a period of 10 to 20 years. The population of the entire Bushbuckridge area is estimated at 701.304 people. The current average density is of 176 people/km², which is more typical for a peri-urban settlement pattern than typical rural. The average household size is estimated at about 6.2 persons. It is not unusual for households to have more than 10 members. There is also a large floating population, with many families have a number of relatives involved in migrant labour in Johannesburg and other parts of the country, who come back during festive periods.

Unemployment estimates are between 40% and 80 %. A large number of adult males and fewer adult females engage in migratory labour. Within the area the major sectors of formal employment are commercial, tourism, forestry, civil service posts such as

teachers, nurses and other personnel. There is a significant proportion of single headed households. (Pollard et al. 1998)

This study focuses specifically on Ward 16 of the BBR Local Municipality. Among the reasons why this ward was selected is that AWARD had been working in this ward for some time, so it knew relevant people and communities in this Ward. Moreover the first pilot was conducted in a village in this ward, and some prior research on water and livelihoods had been carried out in other villages in the Ward.

Many of the trends mentioned above for the entire BBR Local Municipality hold true for Ward 16, such as its levels of poverty. A Local Area Planning document produced in 2003 (In Touch CC, 2003) estimates the population size of Ward 16 to be 21,503, some 2.9% of BBR, a significantly lower figure than what we compiled from the various sources for individual settlements. This indicates the difficulty in assessing the total population, in a context where part of the population is involved in migrant labour. This report asserts that approximately 50 % of households are headed by women, with some 7.9 % headed by children.

As can be appreciated in figure 2 and 3, the population density in Ward 16 is lower than in the rest of BBR. The villages are smaller and further apart. It has a more rural feel than the other parts of BBR, which have more peri-urban characteristics as mentioned above. This is because it is further away from the main road, and is in the drier part of the catchment.

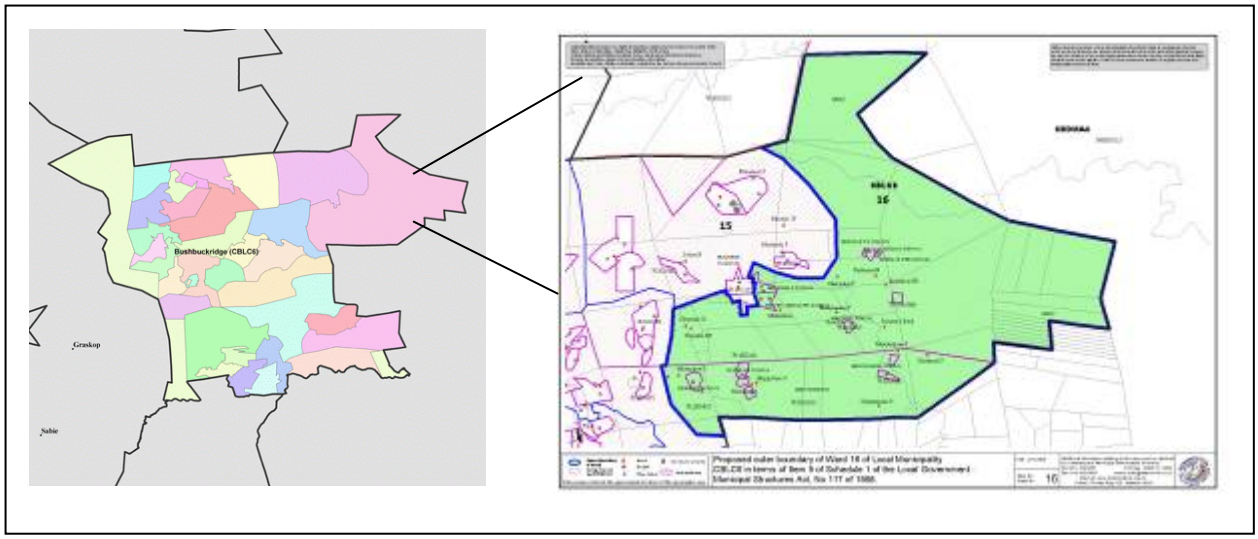


Figure 2: location of Ward 16 in the Bushbuckridge Local Municipality (Source: Municipal Demarcation Board)

4 Results

The presentation of the results follows the same lines as the analysis, going from the big picture of water management in the Bushbuckridge area to the specifics of water supply at village level in ward 16, to use of water and access to it at household level.

4.1 Water resources: the Sand river catchment

Most of the BBR Local Municipality lies in the Sand River Catchment. Ward 16 falls entirely into it. The Sand River originates in the Klein Drakensberg escarpment, and flows through the BBR area into the Kruger National Park, where it joins the Sabie, and, ultimately, the Inkomati River. Figure 3 gives a map of the catchment and its major forms of land use. The approximate location of Ward 16 in the catchment is given.

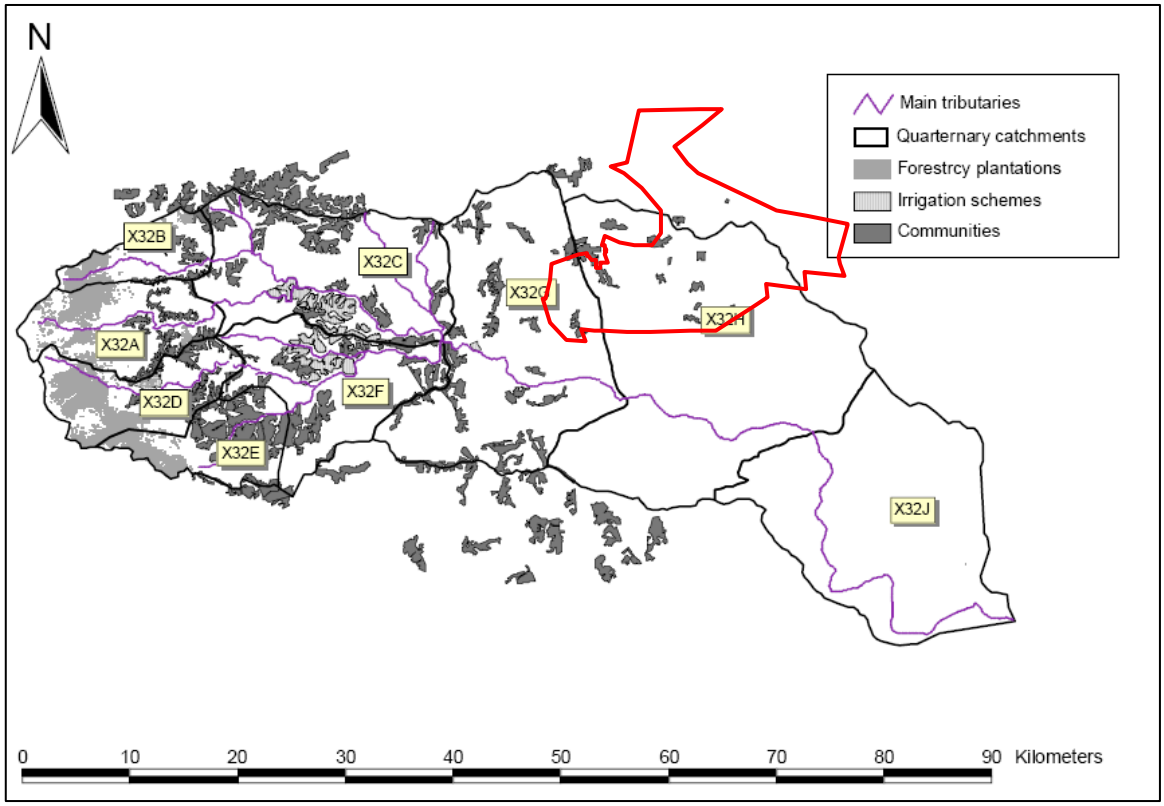


Figure 3: Sand river catchment and approximately location of Ward 16 of BBR Local Municipality

Land use changes with water availability along the catchment. The upper part of the catchment is relatively wet, receiving around 1800 mm of rainfall/year. The main type of land use here are commercial forestry plantations, and few remaining natural forests. The further one goes down the catchment the drier it gets, with average rainfall going down to 500 mm/year. The middle part is home to most of the communities. In that area there are also some smallholder irrigation schemes, in addition to dryland farms and extensive rangeland for cattle. The lower part lies in the Kruger National Park and privately owned game reserves.

Detailed studies have been done regarding water resources and water use in the Sand River (see Pollard et al. 1998; Smits et al., 2004). These have given the overall

availability of water resources at (sub)-catchment level, and indications for village level. The main results of these studies of relevance for this report:

- Given the highly variable rainfall regime (within and between years), the average run-off from the river is not a useful measure. Rather it makes sense to express water availability through a flow duration curve[2] (see figure 4). This graph shows that the flow is less than 50 Mm3/yr once in five years. Detailed studies on groundwater are not available. The most cautious estimates indicate a sustainable recharge of 31 Mm3/yr, which is independent of surface run-off.

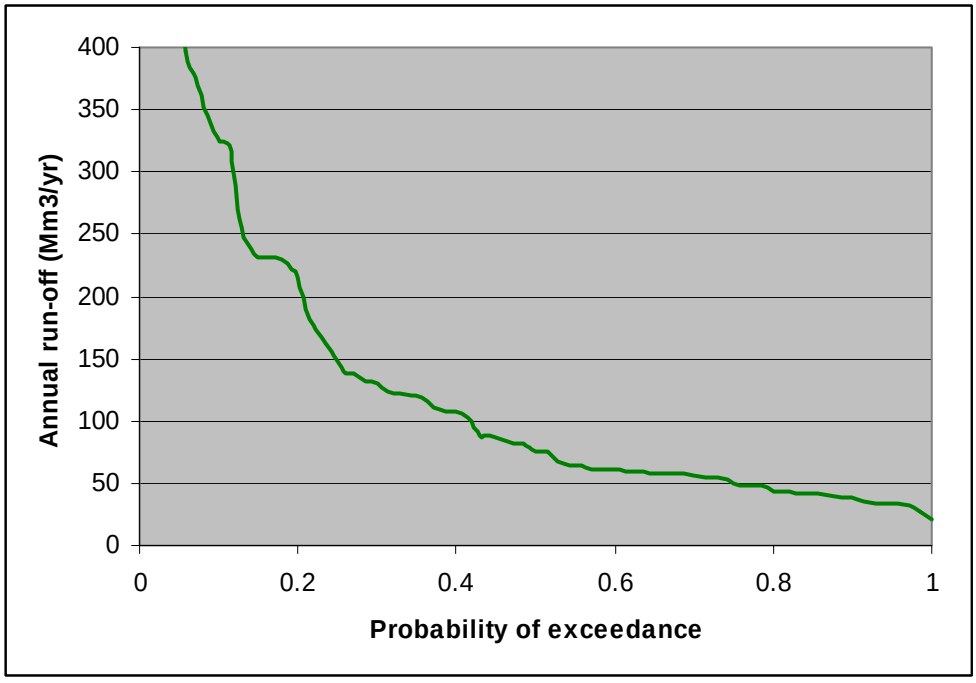


Figure 4: derived flow duration curve for annual run-off (Mm^3/yr)

- Water demand for the main uses in the catchment is as given in Table 3. In addition to these demands which remain more or less similar across the years (though not within the year), there is a legally established Ecological Reserve (ER), or the amount of water which, with a certain level of probability, needs to remain in the river course to support the ecology. This is not a fixed or average amount, but also expressed in terms of probability of exceedance. For the Sand this is between 12.3 Mm^3/yr and 38.6 Mm/yr for the 90% and 50% probability of exceedance respectively. These amounts need to be added to the fixed demands below.

Table 4: annual water demand in the Sand River catchment

	Demand (Mm^3/yr)
Forestry	6.8
Irrigation	11.4
Domestic	3.1
Total	**21.3**

[2] A flow duration curve shows the cumulative probability of a given flow quantity being met or exceeded

- Considering these demands, it can be concluded that the surface water resources in the catchment are under stress. There is just enough to meet an average gross demand for domestic water supplies of around 80 lpcd (which is higher than the legally required Basic Human Needs Reserve (BHNR) of 25 lpcd), and the Ecological Reserve (ER).
- Demands for irrigation and forestry cannot be met. In reality these take place, which in practice means that the ER is hardly ever met.
- At the same time, groundwater resources seem to be under-used. Although more detailed studies are needed, cautious estimations show that only a 10% of sustainably extractable groundwater resources are currently developed. Using groundwater instead of surface water resources could alleviate the stress on surface water resources.
- In most villages basic supply infrastructure has been put in place in the form of either bulk supply reticulation schemes (fed by surface water) with public standpipes, or stand-alone, groundwater-fed, reticulation schemes with public standpipes. It must be noted that for around 50% of the population, these standpipes are further away than the 200 m standard in South Africa. Further details of infrastructure in ward 16 will be given in the next section.
- For domestic users, the main problem around access to water lies not in water resources, but in the infrastructure. Capacity of infrastructure is insufficient to convey available resources to their homes. Operation of dams and bulk water schemes is complicated as all are interconnected, or lack proper operation infrastructure. This leads to sub-optimal water use. In addition, most water schemes only function erratically, due to a number of reasons, such as lack of skilled staff, confusion over institutional roles and responsibilities, etc. We will see some of these issues in more detail in the next section.

The above means that there are in principle sufficient water resources to support gross demands of 80 lpcd as an average for the catchment, which would be a reasonable amount for small-scale productive uses. As infrastructure is the main limiting factor in terms of access to water, this study has mainly focused on that, by looking in detail in how people access water from available infrastructure, and how they deal with its operation, maintenance and use. Therefore, no further studies on water resources at catchment level have been done in the context of the SWELL programme.

4.2 Water supply services

4.2.1 History of water development

Large part of the current situation in water supply dates back to the Apartheid era. The two homeland government systems developed their own water supply systems. Plans for neighbouring communities were developed independently, pipelines were diverted around artificial boundaries, there was no allocation or permitting systems, and unauthorised connections at bulk and domestic level were the norm in most areas. The resulting infrastructure in the entire Bushbuckridge area turned out to be insufficient, inefficient and chaotic. Smits *et al.* (2004) show the spaghetti-like lay-out of infrastructure, complicating hugely the efficient operation of the systems (see figure below).

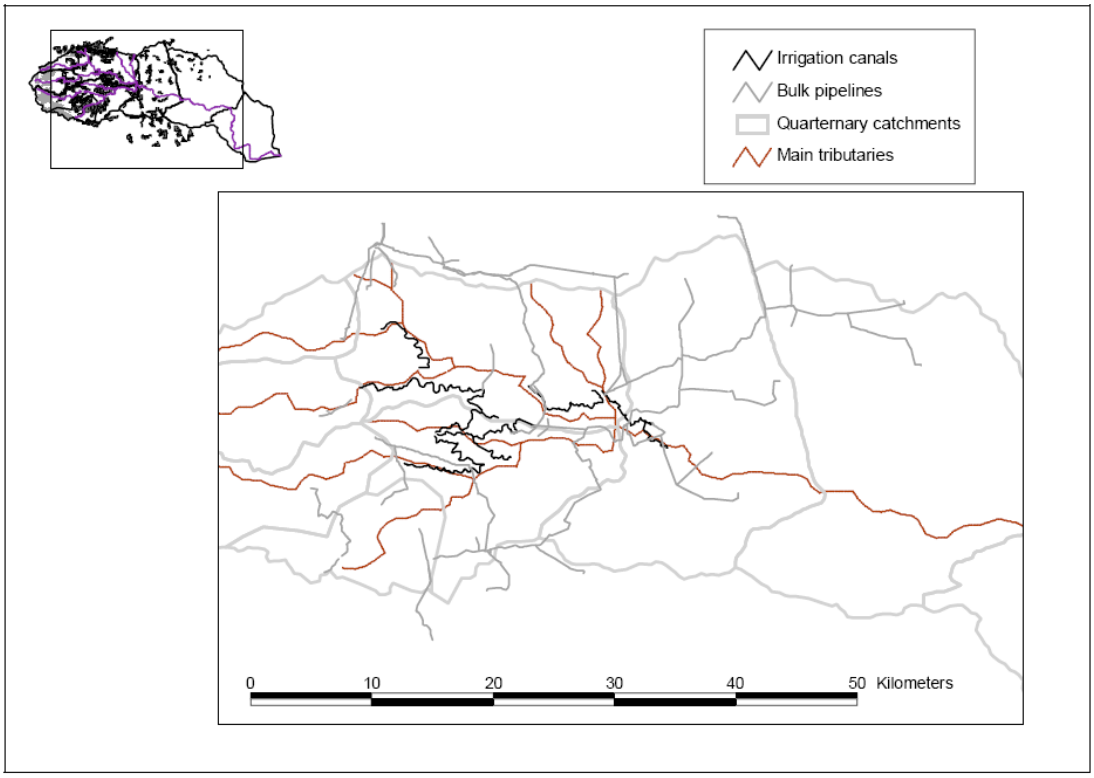


Figure 5: Map of main domestic and agricultural water supply infrastructure in the middle part of the Sand catchment (Smits et al. 2004)

But also after the end of Apartheid, rapid institutional changes took place, each with implications for water services development and management. Initially, the focus was on rapid upgrading and expansion of services, often carried out by Non Government Organisations (NGOs), with a focused on community-based management. At the same time, there is a tendency to include stand-alone water supply schemes into bigger bulk supply schemes, such as the Injaka scheme.

With further decentralisation and consolidation of democratic local governments, more responsibility for water services delivery went to the local government. As the area went backward and forward from one Province to the other, responsibilities in water services delivery changed for the municipality. The recent move back into Mpumalanga, for example, has meant a change of District Municipality (DM), under which BBR falls. This impacts directly on water services authority arrangements. Now the BBR Local Municipality will be the Water Services Authority, while previously that was the mandate of the DM. The exact role of village water committees has changed as well, but leaving villagers and local government officials confused on what their current institutional role and responsibility is. A more detailed analysis of institutional roles and responsibilities is made in Dlamini (2007 forthcoming).

History of water services delivery therefore leaves a legacy of, in general, inadequate and inefficient infrastructure, and confusion on institutional arrangements.

4.2.2 Village water supply infrastructure

In Ward 16 each village has some piped water infrastructure in place, and its own reticulation scheme. This means that villages use groundwater sources, accessed through one or more boreholes. The boreholes have pumps which are fitted with either diesel driven or electric pumps. The design is that water is then pumped into a community reservoir, from which it is distributed into a village reticulation system. These are known locally as "stand-alone" systems. In only three villages, Seville A, Seville B and Thorndale, underground water form boreholes is shared, and in these cases water is pumped into reservoirs for each village, through a system of "turns", which the pump operator manages, and goes from there into the village reticulation system. In some villages there are boreholes with pumps, in some cases hand pumps, in others electric or diesel driven, that are not linked into the rest of the system.

In addition to this all the Ward 16 village schemes are linked to the so-called bulk supply scheme. These are surface water fed systems which serve a large number of villages. The Edinburg bulk supply scheme is designed to complement the village 'stand alone schemes" in Ward 16 by providing extra water, but in reality this has not worked in a very long time. As elsewhere in Bushbuckridge, over the years so many linkages within and between villages have been made , through reservoirs, booster pumps and additional pipelines that a spaghetti-like lay-out has developed. This is mostly not well understood by villagers and service providers. The information in this report reflects villagers' and local technicians' understanding.

From the reservoirs, water is distributed through the reticulation systems, which are normally made up of communal standpipes. Some people have made connections in their own yards; usually this in done unofficially, and are referred to here as unauthorised connections, although some call them "illegal" connections – a loaded connotation, as villagers to not consider themselves to be breaking the law.

The presence of infrastructure does mean it is functioning consistently, and much so it is erratic. Reasons for poor functioning include the inefficiencies in the system design and confusion over institutional roles and responsibilities, which will be elaborated later.

The table below gives a detailed overview of available and functioning infrastructure in the 11 villages of ward 16. This has been compiled from the database developed under the earlier mentioned WHiRL project, which used scattered figures from DWAF and consultant's reports. These were checked in detail in the 11 villages in Ward 16, which lead to huge discrepancies. Hence, the seemingly huge installed capacity often means that various boreholes have been installed while only few actually supply water. The unclear connections between villages further complicate asserting the value of installed supply capacity.

Table 5: Village infrastructure status

Name village	Installed supply infrastructure (2001)	Description of main supply infrastructure	Reticulation	Functioning
Seville C	198 lpcd	Groundwater-fed system supplying 3 villages (Seville A, Seville C and Thorndale) There are 2 boreholes, each with an electric engine. There is a seasonal stream used for cattle watering	N/d	The 3 villages should take one-week turns to access water. However, the Seville C continuously gets water while the other two villages have to await their turn. One of these two engines has not been functioning for the past ten months after an electric cable leading to the engine was stolen(an electric cable leading to the engine was stolen)
Seville A	198 lpcd	Groundwater-fed reticulation system, receiving water from both a local borehole (equipped with a diesel engine), and through a connecting pipe and reservoir from Seville C. There is an earth dam for cattle	18 communal taps 1 yard tap at the local school Unknown number of unauthorised yard taps	Government provides fuel. It is mostly in working order, but there are breakdowns, and then delays in repair
Thorndale	198 lpcd	There is a reticulation system, fed through the main reservoir, which is connected to both village borehole and the one in Seville C There is a stream and an earth dam for cattle watering	15 communal taps Unknown number of unauthorised yard taps	Only 3 communal taps are frequently used, eight only work when the reservoir is pumped full and the other 4 are broken.
Seville B	427 lpcd	This village scheme is fed by 5 boreholes: 3 of which are hand pumps, and 1 of these is located at the local crèche/kindergarten. All 3 are broken. 2 boreholes are engine-driven and 1 of these is broken. These 2 boreholes are not connected to the reservoir, but pump water directly into the reticulation	16 communal taps	4 boreholes are not functioning 5 out of the 16 taps are not functioning. People complain of the quality of water from the dam and local purification plant.

Name village	Installed supply infrastructure (2001)	Description of main supply infrastructure	Reticulation	Functioning
		system. The community reservoir is linked to the Edinburgh bulk and also to a community dam (sometimes known as Thorndale dam) that has a mini-purification plant.		
Hlalakahle	80 lpcd	Hlalakahle reticulation system is fed by 2 boreholes, feeding into the reservoir and then into the reticulation. The reservoir also supplies the Gottenburgh school (the school is located in another village). It is not clear how water is shared between the village and the school	17 communal taps 39 yard taps	1 borehole is not functioning. The storage function of the reservoir is not being fulfilled as the valve is kept open. Only 3 communal taps and few of the yards effectively providing water
Gottenburgh	80 lpcd	There are 4 community boreholes and 2 private boreholes (Private in that they were installed to specifically cater for a local clinic and a chicken farming project, respectively). 3 of the 4 community b/hs are connected to the community reservoir and the 1 is not. All 4 are engine-driven. The reservoir is also connected to the Edinburgh bulk supply.	80 yard taps	The interconnected reservoirs do not receive any water, as the pumps cannot provide sufficient head to fill them. "Volunteers" were trained to undertake pipe maintenance work in 1996, the trainees made many yard connections.
Delani	90 lpcd	The reticulation system is fed by 3 boreholes equipped with electric engines. The boreholes pumps directly into a community reservoir which is also connected to Edinburgh bulk line/supply. The reservoir is located in an enclosed/fenced area There is an earth dam for cattle.	28 communal taps	Regular breakdowns occur. The engines are supposed to be automatic, but the operator intervenes manually in their operation. The reason seems to lie in the inter-connection between the 3 engines. Only few taps are effectively providing water
Hluvukani	25 lpcd	Hluvukani receives water from a number of	25 communal taps	Some break-downs of the main

Name village	Installed supply infrastructure (2001)	Description of main supply infrastructure	Reticulation	Functioning
		sources, which is distributed through its reticulation system. Its main reservoir is fed by 3 local boreholes. The reservoir is also connected to the Edinburgh bulk line, operated by the Bushbuckridge Water Board (BWB). There are 3 private boreholes: 1 is at a school; 1 supplies a community garden, and 1 supplies two small panel tanks. There is an earth dam for cattle	50 - 60 yard tap	boreholes, leading to delays in filling the reservoir The Edinburg bulk line doesn't supply the Hluvukani reservoir all the time since it supplies other villages as well so Hluvukani does not rely heavily upon it. The old reticulation line is functioning reasonably
Lephong	15 lpcd	The reticulation system is fed by 2 boreholes. A third borehole is located in the community garden Two households own private boreholes There is a hand dug well, which is used then boreholes break down There is an earth dam for cattle.	7 communal taps 4 yard taps	Of the two boreholes, one provides most water, the other only supplements. The borehole at the garden has not been equipped with an engine or pump. Of the communal taps 5 are functioning. It is not clear whether the private boreholes are licensed, but they are at times accessed by other community members.
Dixie	834 lpcd	A matrix of reticulation systems has been integrated to form one. 1 borehole pumps water directly into two of the sub-systems, instead of into the community "Jojo" tank (plastic tank) A large reservoir is located outside the village, but seen to belong to this community, with coming into it from Thorndale (Before the bulk supply reaches Dixie, it passes through Seville B reticulation. This reticulation is supplied by	12 communal taps 7 unauthorised yard taps	Of the 12 taps only 5 work

Name village	Installed supply infrastructure (2001)	Description of main supply infrastructure	Reticulation	Functioning
		both Edinburgh and “Thorndale dam”, but villagers understand it to be water from Thorndale)		
Utah	101 lpcd	There are 4 boreholes, feeding into the reticulation system There is also windmill pumping water for livestock dipping and domestic uses.	n/d	Of the 4 boreholes, 1 has not been equipped with a pump, 1 has broken down, and 1 (solar powered) is not working as the solar panels were stolen. The windmill has broken down and is not functioning

It can be noted that all villages have a big difference in installed infrastructure and what is actually functioning, both in terms of bulk supply and reticulation. All but Seville C suffer from frequent break-downs with more or less delays in repair.

In addition, there are some smaller dams for cattle (developed by the Department of Agriculture), but increasingly also being used for domestic consumptions. Many of these have silted up, reducing their capacity. Finally, there is also some very crude rainwater collection, into drums under makeshift gutters off roofs.

The mix of infrastructure and their functioning, make it difficult to define the implications for overall village water access, in terms of commonly used performance indicators such as average supply in lpcd, down-time of services, etc. That also complicates a cross-village analysis. Therefore a similar approach to Perez de Mendiguren (2004) was followed, of categorizing the villages according to their performance in simple categories. We defined a worse, medium, good and best case status on the basis of the following characteristics. A similar classification in the Water Services Development Plan (Bohlabela DM, 2003) came to similar conclusions, even though boundaries between categories are not always that clearly defined.

Table 6: categorization of village water supplies

Classification	Worse	Medium	Good	Best
Criteria	Reticulated supply not at RDP standards Frequency of water supply is unreliable	Reticulated supply at RDP standards for part of the households Frequency of water supply is reliable but low	Reticulated supply for part of the households Reasonably reliable supply	Functional reticulated supply at RDP standard for most households Reasonably reliable supply
Villages	• Thorndale • Hlalakahle • Utah • Dixie	• Seville B • Gottenburgh • Lephong • Seville A	• Hluvukani • Delani	• Seville C

Having seen the complicated infrastructure situation, let's have now a detailed look into how at village level, this infrastructure is being managed, and how that further shapes access.

4.2.3 Water services management

In the South African institutional set-up, clear roles and responsibilities have been defined and assigned to a range of actors at intermediate level. These include responsibilities for functions such as decision-making, service provision, regulation, daily management of utilities and financing. Municipalities must all take over functions previously carried out by DWAF, and set in place institutional arrangements, about which they have some choice, and so these vary form area to area.

Also in Bushbuckridge this process is taking place, with a plethora of organisations engaged in some way in water supply or water resource management (see diagramme below).

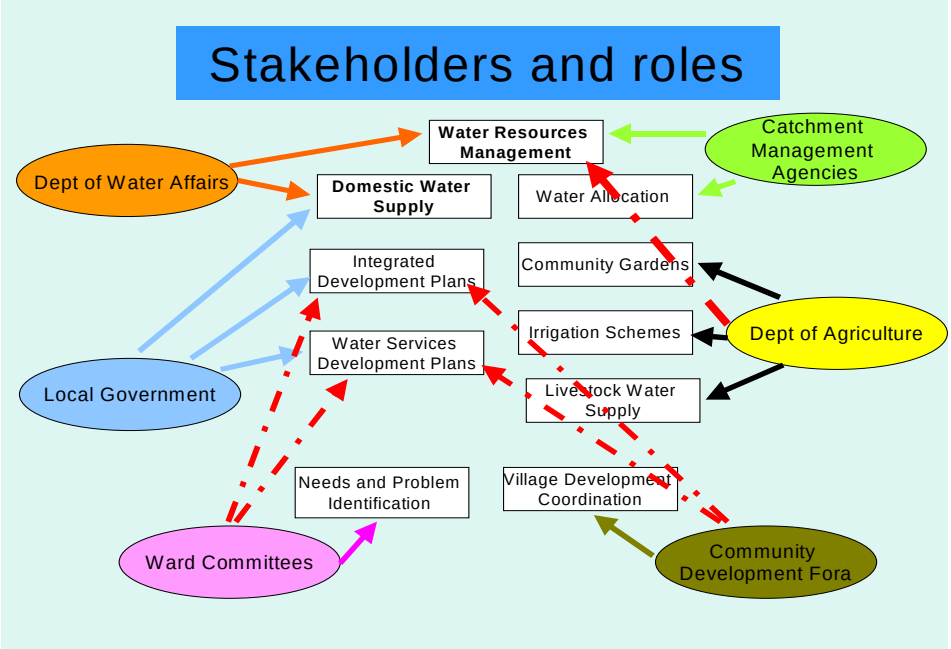


Figure 6: key stakeholders and their roles with regards to water in Bushbuckridge
Note: the broken arrows show where stakeholder involvement is weak

In Bushbuckridge there were long delays in finalising the arrangements for transferring responsibility from DWAF to the Municipality, in part due to lengthy negotiations with DWAF and unions, and more recently its move from the now disbanded Bohlabela District Municipality to the Ehlanzeni District Municipality (EDM). This latest change means that BBR LM will now be the Water Services Authority (WSA) and not the Water Services Provider (WSP) as previously agreed. This delay has lead to an institutional insecurity at intermediate level. For more details, see Dlamini (2007 forthcoming).

But, also at community level, there are gaps in the institutional framework. Although between DWAF and the Municipality responsibility should be taken for operation and maintenance tasks, communities or sometimes individuals have stepped in to take up some tasks, often without having formal responsibility. Most communities have a Water Committee, with or without a specifically designated operator. But also the Community Development Fora (CDF) and the Induna (traditional authority) play a role. In 2003, AWARD undertook a capacity assessment of community based organisations in relation to their becoming formally Water Services Providers for the municipality (AWARD, 2003). In a follow-up to that study, in 2004 a detailed study was done in ward 16 into the various functions and capacities needed for managing and maintaining water supply in the villages, and identifying and classifying these functions with stakeholders. The aim was to develop a curriculum for training that could be formally provided by Sector Training Authorities. During both studies the ad hoc response of communities to the lack of operation and maintenance was noted. For example, the Water Skills Development report (AWARD, 2004) noted the following:

"*The previous system of off-site technical support services provided by DWAF has not proved optimal in the past, and is currently increasingly undermined due to rapid reductions of technical support staff. While one municipal official is utilizing the services of a village level operator to supplement support services as needed, another felt that the DWAF technical team support was sufficient. Currently, as in the past, many of the day-to-day tasks associated with maintaining water supplies on a local level are carried out by village level operators. This is often on a voluntary basis, as designated by Community Water Committees, which provide partial and informal supervision and management support. The voluntary mode of committee's undertaking responsibility to the extent that they can appear to have become a norm for those municipal officials not directly involved in dealing with breakdowns and interruption of water supply."*

This situation leaves many users confused about or unaware of the roles and responsibilities of both community and external institutions in water supply. In the village of Delani, detailed discussions were held about the role of users and the community institutions around water supply. Most users see the role of the Water Committee, the CDF and the Induna as being similar: reporting problems to DWAF or the Local Municipality. But, then most users are not able to further differentiate the role of each one of them. For example, in Delani, many people complained that the engine operator isn't doing a good job. But, it is not clear what the appropriate channels are to hold him accountable: through the water committee or through DWAF and local government. It also appears that the community bodies do not have any decision-making power. They merely serve as communication channel to higher levels. When they take up action, as for example shown in the text above, it is done on a voluntary basis.

4.2.4 Rules and regulations around water use

Even though the Water Committees and other community organizations do not seem to have a lot of power, among the community rules are defined around water use. These are enforced among the users themselves. These mainly deal with assuring that everybody gets a basic amount of water, when supply is erratic or insufficient. One of the rules mentioned is the three (or two) bucket rule, where a person may only fill three (some say two) buckets of water at a time until everyone in the queue has filled their two buckets. No official prohibition on the use of tap water for productive uses was found. In most villages any such activity is limited by the erratic supply.

4.3 Livelihoods activities at household level

4.3.1 Well-being categories

Well-being categories were defined by the villagers themselves on the basis of their own criteria. They then identified which households belonged to which category. These definitions were also verified during the village synthesis processes that ensued after the village and household assessments. Similarities between the definitions provided by the community members across the villages made it possible to divide households into different classes of well being across the ward. More details of this study are available in Maluleke (2007 forthcoming). The identified categories are:

- Best off: households that have access to a constant, reliable source of cash income (every month); and are able to meet all there basic needs.
- Well off or middle category: households that have average access to income (most months); and are able to meet most (but not all) of their basic needs.
- Poor: households that have limited access to cash income (unreliable and infrequent income), and are able to meet only some of their basic needs.
- Very poor: households that have completely no access to cash income; and are unable to meet any of their basic needs without aid from others (rely on social and government assistance).

The definitions of these categories emerged from villagers identifying the various factors that determine and describe a household's well-being. The table below shows these factors, as defined by villagers, of the various well-being categories. These factors should not be seen as absolute, but as describing trends –e.g. not every single "very poor" household will be headed by a woman, but most are likely to be.

Table 7 Factors determining well-being categories as identified by villagers

Factors that determine household well-being category	**Well-being category**			
	4 Best -off	**3 Middle**	**2 Poor**	**1 Very poor**
Gender of household head	Male	Male/female	Female	Female
Age of household head	Middle aged	Middle aged	Pensioner Middle aged	Pensioner Young adult (18<x<30) Child/orphan (< 18 yrs)
Health status of household head	Good-Average	Good- Average	Poor	Very poor
Employment status of household head	Formal employment	Part-time employment Self employed	Unemployed	Unemployed
Main source of income	Salary	Wages	Government grants	None
Reliability of income	High	Moderate	Low	Very Low/None

This exercise depicts that well-being is strongly linked for villagers to source of income; the best –off being those formally employed, through to part-time or self-employment, through to those receiving government grants, to those with no regular source of income. It is notable that assets other than financial were not counted as significant in terms of well-being, such as numbers of livestock owned, education level, the number of fields, or type of house. Other exercises in Bushbuckridge have confirmed this emphasis by people on cash income as the measure of well-being (Pollard et al., 2004, pg 57).

The correlation people made between gender and age of the household head and the well-being level is also significant, as clearly people identify women-headed households are less well-off, and the worst-off likely to be with very old or very young household heads. That these are likely to be of poor health was also seen as significant part of their relative poverty.

What was confirmed through interviews is that the "very poor" households are often ones that should be able to access government grants in terms of eligibility criteria. However they often lack official papers, such as birth certificates and identity documents, and do not have the resources to travel to centres to obtain these and make applications. Household interviews also elucidated that although the table shows the very poor as having no source of income, they sometimes did have access to one or another grant, but this is offset against the large call on that grant by that household.

In the first 7 villages, villages selected a cross section of categories for us to interview, whereas in the final 4 villages there was a special focus on describing and identifying and understanding the most vulnerable households (poor and very-poor). Of the total households we interviewed by far the most fell into category 2 (poor).

Table 8: well –being categories of Ward 16 households interviewed

	Category 1 Very poor	Category 2 Poor	Category 3 Well-off	Category 4 Best -off
First 7 villages	7%	50%	25%	17%
Final 4 villages	18%	81%	0	2%
Total % distribution	**11%**	**62%**	**16%**	**11%**

There are two reasons that this spread of interviews is considered a reasonable one by the team. Firstly our concern in this work is primarily for the poor and very poor, while keeping in perspective that there are the better–off in the community, and understanding their situation and strategies helps to give an overall perspective. Secondly we are satisfied that this selection, while not a rigorous sample, gives a fair reflection of realities of the spread of wealth categories in the villages.

It is worth noting that without a specific effort to identify the very poor, it is easy to exclude them and their perspective. This will be elaborated on in a forthcoming paper by Maluleke (2007) on vulnerability issues that emerged form these assessments.

4.3.2 Water and livelihoods activities

Livelihoods strategies consist of a number of activities utilizing a range of resources. The livelihood activities set out here focus on those related to cash income, as this has such a high priority in these villages, on food production, and to those that relate to water in some way. Note that domestic uses (drinking, bathing, cleaning and cooking) are not discussed in this section, although clearly they play a crucial role the well-being and livelihoods of people. They will be included later on in the report.

Income generation and expenditure

The construction of Income and Expenditure Trees during village assessment workshops in all the villages yielded similar results, indicating that patterns of income and expenditure do not vary greatly over the ward. Common sources of income and items of expenditure are shown below. The income generating activities have been clustered according to whether they don't require any water at all, only a limited amount or significant amounts. Obviously, boundaries between the categories are not clear-cut. In this way, we try to give a first indication of the role of water in people's livelihoods, which will be further elaborated in the next section.

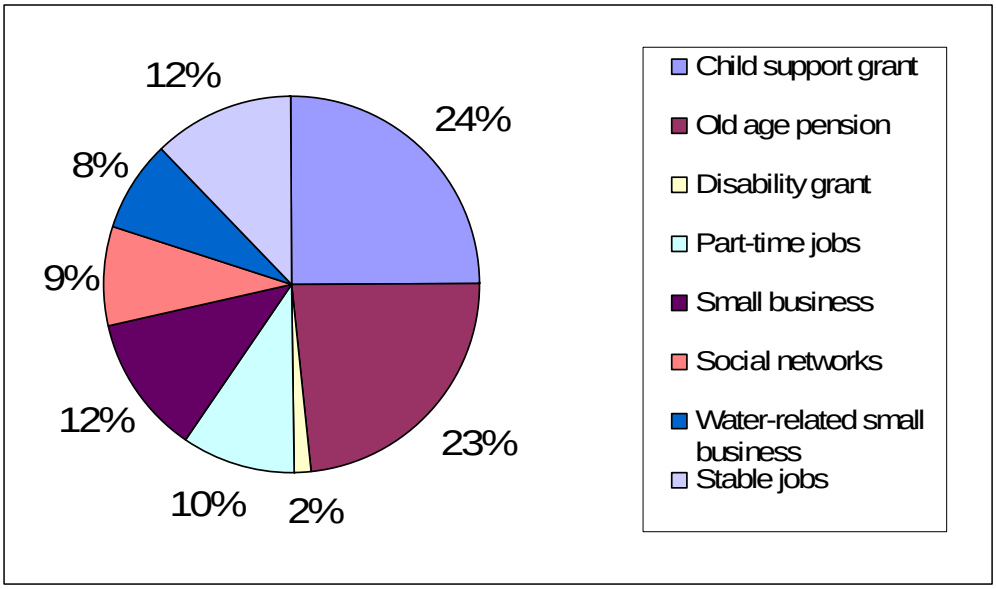
Table 9: Income and expenditure in Ward 16

Sources of income	Expenditure
Not requiring any water at all: • Grants from government • Salaries (public servants, workers at game lodges, businesses) • Migrant worker send contributions • Sell cell-phone time • *Marula* nuts • Traditional healing services • Chopping and selling wood • Sewing and selling clothes • Shoe repairs • Dig up and sell *muti* (traditional medicine) • Welding services • Poaching and selling meat locally • Making and selling crafts	• Food provision • Paying for school fees and uniforms • Household maintenance • Candles, paraffin • Building • Paying water vendors/ buying water • Hospital admission fees • Transport • Joining societies • Buying electricity, cosmetics and clothes • Buy "stock" of goods for sale • Electricity • Entertainment (alcohol) • Livestock • Buy petrol • Pay burial society and debts • Furniture • Funeral costs
Requiring only limited amounts of water: • Making and selling ice blocks • Making and selling reed mats • Grow and sell seedlings • Baking and selling "vetkoek" and bread • Domestic work (laundry and cleaning services)	
Requiring significant amounts of water: • Brewing and selling traditional beer • Selling fruits and vegetables (some bought, some grown) • Selling livestock (chickens to the community members) • Selling bricks • Selling fast foods (some bought, some cooked) • Running hair saloons and barber shops • Cooking porridge to sell at the market • Building/Construction services – houses and toilets • Herding cattle • Catching and selling fish • Car wash	

In terms of source of income, it shows that there is a wide range of small activities to generate income. Water is required for a number of these, even though not in large amounts in all cases. We will refer to these as water-related small businesses in the remainder of this report, as opposed to other small businesses which do not require any water.

Not all these activities generate the same amounts of cash income. The main source of cash income for the interviewed households is formed by government grants. The Child Support Grants (CSGs) and Old Age Pensions (OAPs) are the main ones, while the Disability Grants (DG) are important for some. Currently OAPs and DGs are R780 (€ 80) per month, and CSGs, for children up to 12 years old, are R179 (€ 20) per month. Figure 4 has averaged across all villages what households consider their primary source of income to be.

Figure 7: Main sources of income for households and their level of occurrence among interviewed households



While the above relates what people reported as their main source of income, most households seek to diversify their income sources, and have multiple sources of income. Every contribution that augments income to the household is seen as significant.

- In Hlalakahle water related businesses are a source of income for 50% of the households interviewed, although they do not contribute more than 10% to any one household's income. Only one activity (growing spinach) requires large amounts of water (this was not quantified, but it was reported that a hosepipe was left running for many hours).
- In Seville C, water related businesses of ice blocks, marula beer, vegetables and selling pigs are a source of income for 29% of the household interviewed, and contribute on average 28% to the total income for those households.

The diversification is especially important to the most vulnerable groups in the community. Women especially value some of these sources as they are mostly engaged in small businesses (water-related or not). While there is a great reliance on grants, such grants do have built–in risks and limitations, for the household becomes vulnerable once this grant is lost through death of a pensioner or a child becoming too old to be eligible. Diversity helps households cope with the loss of income from a particular source. It is in this light that the various water-related activities must be seen. They are only in few households the main source of income, but play a role in diversification of income in others, especially of the poorest among them, as shown in the examples below.

Box 1: Examples of diversification in terms of income sources across wealth categories

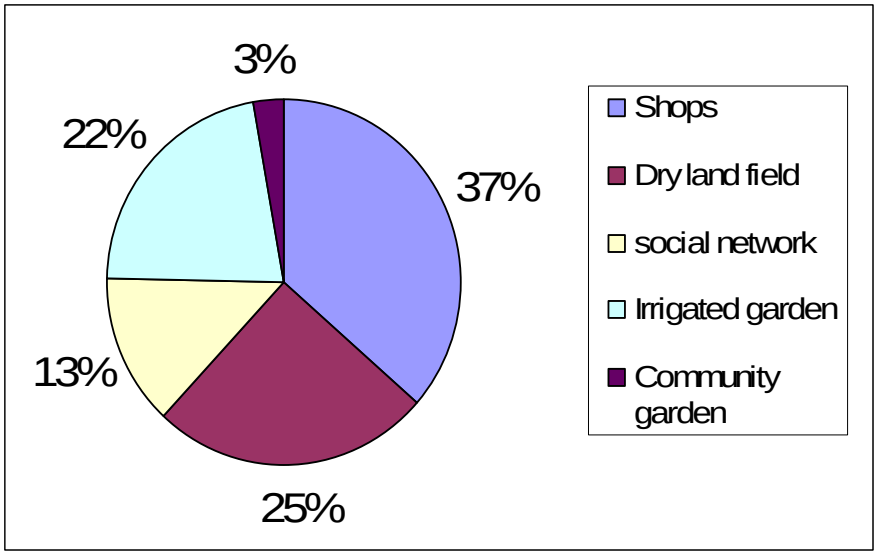
- Household 1 (very poor). It has irregular income from temporary jobs, but no access to government grants. It seeks additional irregular income from: selling firewood and dried vegetables. The mother works in other people's fields. Friends and relatives occasionally 'donate' food, clothing or money.

- Household 2 (poor). It relies on the granny's old age pension and 3 child support grants. Additional income is generated from selling traditional beer and a *stokvel* saving scheme
- Household 3 (well-off). The household's head has a fixed salary and sends R800 (€80/month and they receive 2 child support grants.
- Household 4 (better-off). The father is a waiter in a hotel in Lydenburg; this is the family's main source of income. The women (mother and eldest daughters) bake and sell cakes at schools and for special events. It receives one child grant

Food production

As the area is largely rural, it was felt important also to look at food production. The hypothesis was that instead of generating income and buying food, people might engage in producing their own food. Therefore, we looked at the primary origin of the food consumed in the households (see figure below). This showed that 37% of the interviewed households do not grow their food, but obtain it from the shops. In total, nearly half of the families grow their own food, with 25% getting it from dry-land fields, 22% from backyard gardens and 3% from community gardens. The remaining 13% rely predominantly on social networks (i.e. government food parcels, or family, friends and neighbours).

Figure 8: Origin of food for households interviewed



Households generally depend on a 'mix' or 'basket' of sources of food. These different sources of food provide different types of food, which provide different nutritional value, and which require different types of input. Shops commonly provide bulk and processed food such as *mielie-meal* (maize flour), beans, sugar, whilst fields and gardens provide vegetables and fruit. Out of these, backyard and community gardens normally require irrigation. Again, it means that water is not so much needed to support the bulk of food but has an important role in additional food supply. This is also illustrated by the following examples, showing the importance for the poorest again.

- In Gottenburgh 91% of respondents have a backyard garden, and 62 % of these irrigate their gardens in winter, some at a significant scale; but it is those in the lower part of the village where the water flow is stronger and people have yard taps, while in the upper part people cannot get water in their yards.
- In Hlalakahle every respondent had a garden, and 71 % irrigate it in winter: most of this is not intensive, with the exception of one who grows spinach for sale.

- In Seville C every respondent had a garden for food production, and 43 % irrigate in winter. The refugee section is poorly served, while the rest of the village has relatively the best access to water of all the villages in the Ward.

These differences also play out between the different households.

Box 2: Examples of how households obtain food

- Household A (very poor). It has a rain-fed field, where maize is grown. In addition, it has a backyard garden, where it grows groundnuts. This garden depends on rainfall as well, and does not receive additional irrigation. Whatever other food they need, they buy it.
- Household B (poor). The household buys some food from shops, like meat, sugar etc. But it also produces various vegetables, like maize, pumpkin and morogo in 3 fields during the rainy season.
- Household C (well-off). They buy most of their food from the shops. Occasionally, they produce vegetables in their backyard garden
- Household D (better-off). They buy the bulk of their food from shops in Acornhoek, like meat, rice etc.. In addition, they, produce maize in their rain-fed field. Vegetables, like spinach, carrots and beetroot are grown in their irrigated backyard garden

The sections above show that on the one hand, livelihood based activities are not the principal source of income, neither of food in the area. At the same time, they do represent a significant contribution to the total income levels, and food production, for a significant proportion of the inhabitants. They also constitute a way of diversifying income sources, and reduce dependency on one single source of income. This is in line with earlier work done by Pérez de Mendiguren (2004) across the Bushbuckridge area, which had indicated that these water-based activities can add between 17 and 31% of the household income, depending on 1) the type of activity and 2) the state of village of water supply.

4.3.3 Constraints to water based income generating activities

Household level assessments provided anecdotal information or ‘stories’ about the constraints that households face in generating income and maintaining their livelihoods. It is apparent that poor households are increasingly reliant on government grants as primary sources of income. Income generating activities are hindered by limitations such as illness and old age; but primarily by the lack of assets and resources – human, financial and natural.

Respondents noted that one of the main constraints to engaging in these activities is when the water supply is unreliable, or for those who have difficulty in accessing the water. As the example above in Gottenburgh illustrates, this can be to do with where in the village a household is located, and this may well relate to social status (such as being a refugee). It was tried to relate the status of the village water supply (as defined in the previous section) to the percentage of respondents engaged in production, but the sample size was too small for that.

Villagers identified factors other than water availability that constrain or enable their engagements in these livelihood activities. The most important factors identified by households are:

- lack of capital to purchase inputs,
- lack of fencing,
- lack of manpower,
- poor health,

- inadequate skills

It is these factors that lead to the situation that whereas the poorest households have less cash income with which to purchase food, they are not always the ones who grow most of their food – for they may lack other necessary factors. Thus in Thorndale, 20 % of the food of the "better off" in the village comes from their irrigated garden, while for the poorer households 30 % of their food comes from what they grow in their irrigated gardens. However in Seville A, villagers report that more of those households categorised as "better off" grow their own food than the poorer households. These other factors are therefore important in terms of whom can capture the benefits of water.

4.3.4 Aspirations

Households do have aspirations for improving their livelihoods should their water situation improve. The points below are some changes that households perceive they would make if water were to be readily available. These points also point to the key areas that households feel most impacted up on by the scarcity of water. The responses can be grouped as follows:

Table 10: aspirations of users in case the water situation improves

Type or response	% of respondents (n = 90)
Increase productive use of water	53
Use more water for bathing and laundry	8
Spend less time and money on water collection	6
Doesn't know or no change	33

As can be seen, most users would put priority into increasing their engagement in productive uses. Most would start up new gardens, or would increase them, or start selling vegetables. Only few would start up other business such as brick-making or selling ice-blocks. Increasing livestock rearing wasn't mentioned at all. Only few would put priority to increasing the domestic consumption, for laundry, or bathing. It must also be noted that for many it wasn't clear what they would do, or wouldn't see a change in their water use. These households are those that are either pessimistic about the Ward 16 situation, or who see the need to overcome other limitations in order to undertake activities to improve their situation.

4.4 Water use at household level

Having seen the various livelihood activities, and the role water plays in these, this last section looks into how people actually use water at household level, and what resources they mobilize that obtain access to water, and what coping strategies they have in case water isn't readily available.

4.4.1 Sources of water

In the earlier section we saw the different water sources that are available and their functioning. Originally, these have been developed for specific uses, with the domestic systems meant for domestic uses only, and surface dams for cattle only. In reality, however, communal taps are seen as the main source for all uses. Other sources only come in as back-up in case the main source of supply fails. In theory, one could expect that users will use high quality water for those uses which demand

that, while using poor quality water (e.g. dams) for cattle or irrigation. However, it seems people just whatever water is readily available to them. This is clearly illustrated by the graph below, showing the sources of water for different water-related productive uses.

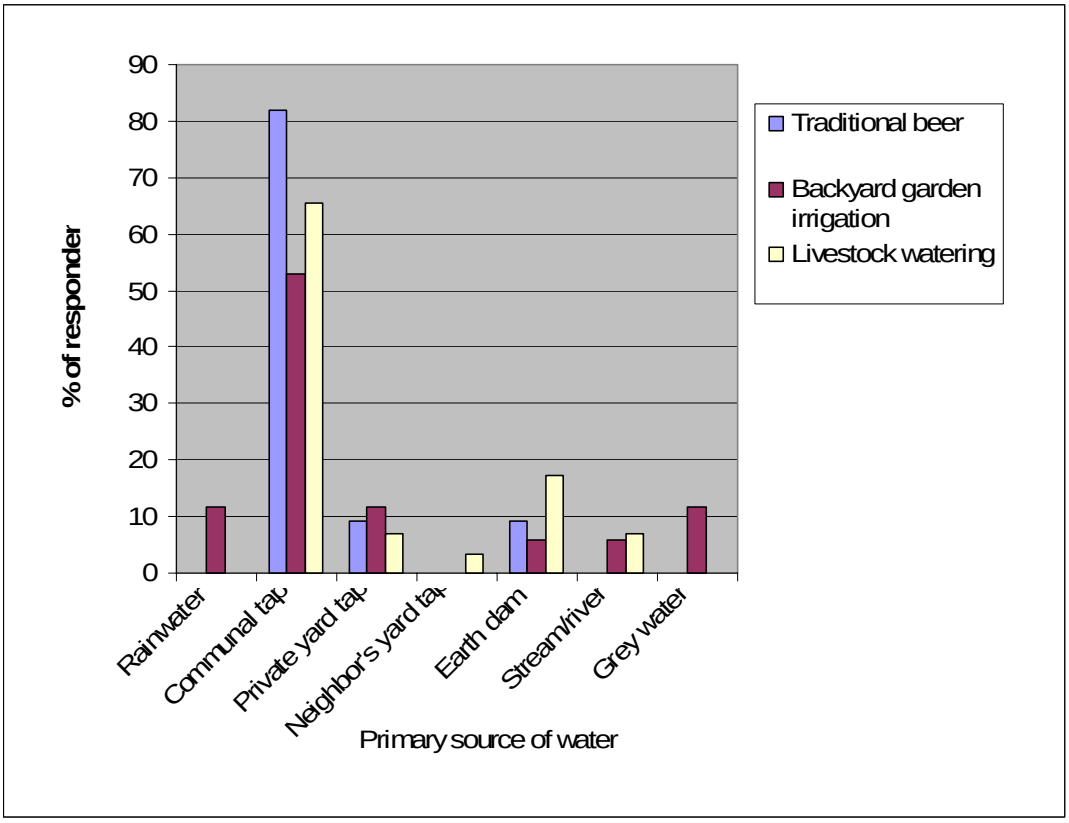


Figure 9: sources of water for different productive uses

4.4.2 Water use - quantities

Next to the source of water, the quantity of water used for different activities is important, to see how livelihoods translate into water demands. In that, it would be of interest to see whether there are any significant differences between villages that have a better or worse water access situation, or differences between types of households (poor, better-off, etc). It has been tried to get insight into this by asking people to indicate their actual weekly consumption, and the source of water. This proved to be difficult. Most people do know more or less how many containers of water they collect on a weekly basis, but then they store all their water in 200 litre drums and don't differentiate for which purpose they use it. People may under- or overestimate their consumption for different reasons. The results were double-checked and only a cleaned-up version of the results was used. Although the figures below need to be taken with lots of caution, it is felt that they give a good indication of the water use pattern in the area.

Table 11: water consumption pattern

Type of use	Average consumption (lpcd)[3]	Standard deviation	% of respondents involved (n=91)	Remarks
All domestic uses	26.7	20.2	100	
Livestock	2.8	3.7	21	Only amounts of water collected, not water drunk directly from streams or dams.
Irrigation	12.2	12.9	11	
Water-related businesses	12.4	7.7	7	
Total	**30.0**	**25.0**		

These figures show that for nearly all uses the standard deviations are more or less in the order of magnitude as the averages themselves, indicating a wide spread. This can also be seen in the database, with 20% of respondents having consumption patterns of less than 15 lpcd, but also a number of households using up to 120 lpcd. It also shows that the amounts required for productive uses, mean a significant increase in consumption compared to the average amount used for domestic purposes only. But, they seem small as compared to the spread of domestic uses.

One would expect that the average consumption depends largely on the access to water at village level, and hence is closely related to the status of water supply. The table below provides these figures, but doesn't seem to indicate a definite trend. Probably, the sample size has been too small for that anyway. It does show that there are big differences between the villages though.

Table 12: average consumption per village

Name of village	Average consumption (lpcd)	Status of water supply
Hluvukani	50.9	Good
Delani	38.0	Good
Seville B	31.8	Medium
Dixie	26.8	Worse
Lephong	24.8	Medium
Gottenburg	22.6	Medium
Seville A	18.7	Medium

4.4.3 Water collection

As only few households have yard taps, water needs to be collected from street taps, some of which may be located far away. As with many of the other domestic activities, women are responsible for water collection. This supports many of the other tasks such as cooking, watering gardens, and cleaning (for which water is collected frequently/daily). Men's activities include household maintenance and building and repairs, for which they collect water infrequently. This was reflected in daily activity charts done with villagers.

[3] All figures have been converted to the equivalent in lpcd. So, for example if people irrigate only once a week, these have been converted to a continuous flow per day, so as to allow easy comparison.

Table 13: Responsibility for water collection

Members of households	% of households	Comments
Adult women	50	Women (mothers) are largely responsible for collecting water and controlling how it is used- carry put most of the domestic activities
Young girls	17	Young girls collect water with adult women, and are also responsible for domestic usage
All children	13	All children assist in collection of water. Children also main collectors of water in orphaned households
Whole family	9	A few households reported that the entire family collects. This often is understood in the sense that the men help the women.
Young boys	6	Responsible for livestock, so water collection mainly for livestock
Teenage girls	4	Assist adult women, or are collectors in orphaned households
Hired person	2	Where main collectors (chronically ill or old women) are no longer able to collect water
Teenage boys	1	One household where teenage boy is the only occupant

This confirms the common picture that women and girls carry the main burden of water collection, which does take considerable time.

The time spent collecting water varies greatly, between villages and between households, depending on where a household is located in the village in relation to taps, which taps are working, what the quantities needed are for that particular household, where the secondary source is when the primary source is not working, and the means of transport. The variation reported from .05 hours to 2 hours when the primary source is functional, to 1.5 – 6 hours if the secondary source has to be used – which may be the neighbouring village.

Box 1: Example: time spent collecting water in Gottenburg

In Gottenburg villagers reported that a lot of time is spent on fetching water due only one engine supplying just a few standpipes. Flow is thus low and has to be shared by many villagers. The minimum time spent on fetching water (including going to the communal tap, queuing and coming back) is in average 1h 30 min. Waiting time can go up to more than 4 hours.

4.4.4 Household storage

The combination of the distance of the water sources, and the unreliability of many of the sources, makes means for water collection and storage an important aspect of a household's assets. The type of collection technology and distance from the water source make a major impact on how much water a household will have, and how much household energy and time is used for collection. It will also affect how the cost of that water to the household.

The most commonly used water collection and storage assets are 25*l* and 20*l* containers, and 200*l* and 225*l* drums, as well as wheelbarrows. People make fairly

wide use of basins to harvest rain water into. Other resources mentioned but not in wide use (only one or two respondents having them) are motor vehicle (bakkie), donkey cart, sleigh, homemade roofing gutters, hosepipe, and a rainwater tank.

Households differentiate between the uses of water, and consequently, when they can, between the sources and means of storage. Differentiation of water uses thus often mainly occurs once the water has been collected – but this too relies on people having enough storage available.

The assessments show that the majority of households (64%) collect water from one source, but store the water in separate storage facilities (drums and buckets) for different uses. For example, water for cooking and drinking is collected and stored separately from water used for bathing and laundry- and is often collected on different days. The other 36% collect water for all uses at once and do not differentiate between the uses. Some of the very poorest households simply suffer from a lack of enough containers.

It is notable that there is very inefficient use of rain water harvesting. It is also worth noting here, that, Utah, the 12th village in the Ward, which was not included in the assessment due to conflict dynamics within the village prevented the team from carrying out the assessment at the time, has a high profile rain water harvesting project underway. One piece of information that has emerged form the village is that the cement rainwater harvesting tanks are being used by households for storing water form the reticulation system. This indicates the importance that needs to be placed on household storage in livelihood strategies regarding water, especially when water supplies are unreliable, and are some distance form homesteads.

4.4.5 Water problems experienced by households

When households related stresses they face in relation to their livelihoods, the unreliability of their water systems featured strongly. Some 52% of respondents identified unreliable water supply their major water related problem, citing the problems to be with dysfunctional infrastructure – usually referring to breakdowns of engines.

Box 2: Examples of reliability of water supply in Ward 16 villages

Hlalakahle village reflects the more typical situation of all of the villages of Ward 16. Villagers report that they get water from the communal or yard taps for 75% of the time, while for 25% of the time their system is not working.

The village of Seville C, in contrast, is the village with the highest level of water security in Ward 16. People report that for 98% of the time they have water in the village and say that throughout 2004 they had water available; there was a problem with supply for less than one month in 2003; and for less than 3 months in 2002.

Where people identified inadequate water supply, it was in relation to there not being enough water for livestock or for gardening. However it can be seen in what people related about their coping strategies, that the unreliability of supplies leads to less water for any type of use, as the distance or expense incurred in obtaining water from other sources leads to people using less water than when their own systems are

working. It doesn't only impact on their productive uses, but also on other domestic uses, and above all their time availability for all activities.

The earth dams built for livestock watering do not hold water throughout the dry season, reportedly because of becoming silted up and so losing capacity.

What is also notable is that water quality isn't mentioned at all as a problem for users. This may be due to the fact that groundwater is the most common source, which doesn't have problems with bacteriological contamination usually. Other studies done in the area, and anecdotal evidence, show that at times people in the area complain about slight salinity of the groundwater. But overall, it is not a major issue compared to the poor reliability and quantity.

4.4.6 Coping strategies

Households are faced with numerous challenges in seeking to make their livelihoods, with the lack of sufficient water supply being one. In order to meet and overcome (or limit the impacts of) these challenges, households employ strategies. In the water-use context, coping strategies can be considered as the alternative decisions and activities that households make and engage in, in order to secure their livelihoods.

Coping strategies employed by the sampled households are those predominantly undertaken when there is no water (particularly no running water from communal taps) for their usual water-based activities. The identified coping strategies include:

Going to other villages to collect water (30% of respondents)

During times when villages do not receive water or infrastructure is damaged, other villages serve as an important source of water. People will also drive their livestock to other villages to drink. However fetching water from other villages gives rise to additional stresses such as travelling further distances, standing in longer queues, and expending more time and energy on collecting water. People report that they then tend to use less water. Some report hiring transport, but then need the cash to do so. Therefore, as a coping strategy, depending on other villages does add to the stresses or costs of water users. It also at times creates tensions between the communities.

Relying other sources of water (14%)

Local dams were built mainly provide water for livestock, and this water is generally of a poor quality and not suitable for domestic use, which people are well aware of. However during periods of water shortage households report they do make use of dam water for domestic activities. People also report collecting water from perennial streams and hand dug wells if they have water in them at such times of need.

Collecting rain water (10% of households)

Presently relatively few households collect rainwater but rather depend heavily on communal yard taps. Currently rain water is collected in an ad hoc and inefficient rather than systematic manner. Low rainfall and high seasonal variability result in rainwater being an unreliable source, and lack of specific collection and storage infrastructure make it currently a low water yielding strategy.

Water from other (private) providers (3.5%)

A few respondents did report purchasing water from water vendors. Only one respondent said they rely on the mobile water tank. These are supposed to be the back up for time of water system breakdown , or drought, but are notoriously poor in their service provision.

Curtail or delay activities

People mention cancelling healing ceremonies, not brewing traditional beer, stopping watering vegetables in backyard garden, and doing laundry less frequently as strategies.

All these coping strategies, imply additional expenditure, either in time or in money, or the foregoing of benefits of water (for example when productive activities are curtailed). Reducing the need to recur to coping mechanisms can already imply a big impact in people's livelihoods, as it will secure them of reliable income or expenditure patterns and reduce their vulnerability.

5 Conclusions and recommendations

The research which was at the basis of this report tried to gain understanding and provide insights into the current and potential use of water in people's livelihoods, and how this is shaped by water access, particularly for different groups, particularly the most vulnerable, in the communities of Ward 16 of Bushbuckridge of South Africa. It tried to do so by bringing together and analysing both qualitative and quantitative information which had been collected in a participatory planning process (called SWELL) over the past few years. A number of methodological problems were encountered in this. Partially, these had to do with the way in which the focus of the planning and our own understanding of the issues evolved, but also with some intrinsic limitations in trying to capture the complexities of livelihoods in figures.

5.1 Water access and livelihoods

The work showed that in the area, people have a wide range of livelihoods. Some of these are traditionally associated with rural areas, such as gardening, agriculture, livestock and the processing of agricultural products, such as beer brewing. But increasingly, there is a reliance on the cash economy, in the form of formal employment, reliance on remittances and above all, the various grants that are being distributed to resource-poor households. In terms of contribution to income, the latter category is even becoming the most important one. Yet, the various water-based livelihoods activities, such as gardening and small business are crucial in diversification of households' economies, and bringing in additional cash income. This is especially true for the poorest and most vulnerable. Also when it comes to food security, small-scale productive uses (notable gardening) play a similar role. People tend to rely for their bulk food upon rainfed field-scale agriculture or on bought food. Vegetables and fruits which are typically grown in backyard gardens complement these diets, and are the kind of food which otherwise wouldn't be consumed.

Although, many of the household aspire to engage more in these small-scale productive uses of water, access to water is a key limitation. It must be noted that water is not the only factor. Others, such as access to credit or skills are also important. Hence, an important percentage of users wouldn't know whether they would actually engage with productive uses if the water situation would improve.

Water access can be said to be formed at three levels: 1) water resources; 2) water services and 3) through local institutions. Earlier research had already indicated that water resources availability wasn't a limitation to water use for livelihoods in the Bushbuckridge area. Limitations would nearly exclusively lie in the infrastructure and their management.

This research showed the poor status of the infrastructure in the area, which has its roots in an uncoordinated and ad hoc development. Partially, it also lies in the lack of clarity and confusion over management responsibility which has existed for a long time between DWAF, the Municipality and the various community organisations. Whereas most users know the channels through which to report their problems, there is no power to take any decisions and respond rapidly to problems that emerge at the

community level. This results in frequent break-downs, but worse, slow responses to deal with these break-downs.

The unreliability of water supply has a number of impacts on people's livelihoods:

- People are only to a limited extent able to engage in productive uses. This goes back to the point made earlier, that the aspirations for this are higher than what is currently happening.
- A lot of time is spent on water collection, especially by women and children who carry most of this burden. Often it means that they have to go to other villages for water, which may even result in tensions between the communities.
- Expenditure on water from private vendors. Although, users are not expected to pay for water, as part of the Free Basic Water policy, they may end paying private vendors when service is unreliable.
- Most household are forced to store water at the homesteads. Whereas this has become common practice for most households, the poorest among them are struggling in even getting the required drums and other receptacles to do so.

The above implies that enhancing people's livelihoods starts by improving access. This doesn't necessarily mean providing more water. Many gains can be made by improving the reliability of services, and making effective and efficient use of the current infrastructure.

5.2 Recommendations to improve access

This section elaborates a number of pathways which could respond to the situation in Bushbuckridge.

Whereas nobody will argue the need to improve access to water services infrastructure in Bushbuckridge and similar areas, the question remains how. The need for coherent integrated planning is obvious in this, and has been dealt with in other studies within the SWELL programme. At the same time, it is realised that some relatively rapid responses are needed to deal with current emergencies. Looking back at some of the key limiting factors, the areas of improvement include the following:

Finalise institutional arrangements and get clarity on roles and communication lines. There is an urgent need to finalise institutional arrangements, for then roles can be defined, capacity built and communication lines strengthened. This refers both to the institutions at intermediate level, notably the Municipality, but also the community institutions. In the current set-up, community Water Committees do not have a lot of power of acting, and merely act as communication channel, if at all. Strengthening community management is crucial to allow for effective responses to deal with the problems. This implies also the strengthening of the relation between community organisations and local government.

Getting a clear understanding of the infrastructure and developing O&M plans. With the focus on providing new services, due attention to the operation and maintenance of existing infrastructure often gets off the table. It is especially crucial to pay attention to this in systems which have such a complicated operation as the ones in Bushbuckridge. This is already witnessed in the continued confusion over the status of the infrastructure, and its O&M. Getting this understood by all relevant stakeholders

is a first step, and then agreeing on O&M procedures and responsibilities must be clear.

Water storage at household level is likely to remain important, and the most vulnerable households can be assisted in poverty targeted projects to increase their water storage and transport assets. One of the particular ways in which this can be done is through rain water harvesting, which seems currently under-utilized. This will also combine storage at household level, with mobilizing additional water. Tanks can be used at times of crisis (such as drought and breakdown) as they can be filled from water trucks. These should be planned as part of the overall system, including the various sources of water, and their uses, to avoid that they are being filled in such a way that they cause lack of water in other villages, which are connected to the same system.

Overcoming other limitations. Whereas some further engagement in small-scale productive activities can be expected from improved water access, this can only achieve full force, when accompanied by efforts to overcome some of the other limitations mentioned earlier. The relevant departments, such as Agriculture and Social Development and the Local Economic Development section of the municipality can assist in aspects such as appropriate technology, providing start-up support and market access, where needed.

5.3 Recommendations for integrated planning for multiple uses of water

Whereas the recommendations made above, are especially meant as strategies for addressing immediate needs, there is also need for more structural approaches to sustainable water services delivery in areas such as Bushbuckridge. Undoubtedly, the elements mentioned above will be important building blocks in that as well.

However, this work also generated another set of recommendations on the methodologies and approaches for integrated planning for multiple use of water.

First of all, it is recommended to take a broad look at livelihoods in planning. Supporting people's livelihoods is not limited to providing water for productive uses only. Large livelihoods impacts can for example already be achieved by reducing time spent on water collection. Using different tools, both quantitative and qualitative, to understand people's livelihoods is important in this. Whereas that can give a good insight into current livelihoods, still problems may remain in assessing future livelihoods.

Related to that, is ensuring that the poorest and most vulnerable groups are specifically targeted. This starts from the assessment activities, through to the entire planning process. Here, it already appears that their livelihoods needs and support demands may be quite different from others in the community, for example, the issue of household storage capacity. Disaggregating information and working with the most vulnerable groups is therefore important.

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