Institutional framework, water pricing structures and costs of domestic water services in rural poor areas of the Olifants River Basin, South Africa

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Institutional Framework, Water Pricing Structures and Costs of Domestic Water Services in Rural Poor Areas of the Olifants River Basin, South Africa

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List of abbreviations

ANC	African National Congress
CBO	Community Based Organisations
CEEPA	Centre for Environmental Economics and Policy in Africa
Cemagref	Centre National du Machinisme Agricole, du Génie Rural, des Eaux et Forêts
CGIAR	Consultative Group for International Agricultural Research
CIRAD-TERA	Centre de coopération Internationale en Recherche Agronomique pour le Développement, département Territoire Environnement et Acteurs.
CWSS	Community Water Supply and Sanitation Programme
DAA	Diplôme d'Agronomie Approfondie
DM	District Municipality
DPLG	Department of Provincial and Local Governments
DWAF	Department of Water Affairs and Forestry
ERW	East Rand Water
ES	Equitable Share
FBW	Free Basic Water
FSP	Fonds de Solidarité Prioritaire
HIV	Human Immunodeficiency Virus
IBT	Increasing Block Tariffs
IHE	Institute for Water Education
IRC	International Water and Sanitation Centre
IWMI	International Water Management Institute
LM	Local Municipality
LNW	Lepelle Northern Water
MCM	Million m3 per Annum
MIG	Municipal Infrastructure Grant
MUS	Multiple Uses System
O&M	Operation and Maintenance
OECD	Organisation for Economic Co-operation and Development
PCA	Principal Component Analysis
PEAE	Politique Economique de l'Agriculture et de l'Espace
RSIP	Regional Strategy and Infrastructure Plan
SA	South Africa
SFWS	Strategic Framework for Water Services
SSD	Sum of Squared Deviation
UNICEF	United Nation Children's Fund
WHO	World Health Organisation
WRC	Water Research Commission
WSA	Water Services Authority
WSDP	Water Services Development Plan
WSP	Water Services Provider
WUA	Water Users Association

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Introduction

Study origin and stakes

Water is used for various purposes, and some of these purposes receive less attention than others. On one hand, domestic uses include not only drinking water but also water for washing, dishwashing and bathing. On the other hand, water is often used for productive purposes, which means using water to earn an income (such as gardening, field crops, livestock, brick making) especially in rural and peri-urban areas.

In many cases, and especially in developing countries, uses and users of water are managed separately and not well integrated. Moriarty, P. et al., (2004) consider that better integration of the different uses of water would improve water use efficiency and equity in water access, and increase beneficial impacts on livelihoods.

The Multiple Use Water Supply Systems (MUS) project led by the International Water Management Institute (IWMI)[1], is an action-research project supported by the CGIAR's[2] Challenge Program on Water and Food (CPFW)[3], being undertaken across countries in various river basins around the world, including the Limpopo River Basin in South Africa and Zimbabwe. Its objectives are a) to identify how best to apply a Multiple Use approach to providing water services to rural poor; and b) to provide evidence that such an approach leads to greater sustainability and is more effective in tackling poverty than conventional approaches (Challenge Program Water and Food, 2003). Practical objectives of this project are to build and promote guidelines for implementing integrated management of the multiple uses of water. Identifying and improving knowledge about the current uses of water was seen as a first and indispensable step in the project. Different points of water use must be clarified including: institutional arrangements, financial issues, and level of demand by different categories of users. Before starting the study of specific multiple-uses, this research tackles the institutional and financial aspects of domestic water supply in South Africa.

Indeed, in South Africa uses of water are specifically delimited in legislation. Moreover, due to unequal distribution, there are water resource scarcity issues in some localised places justifying better resource management and efficient use of water. Another main challenge facing the water sector is the provision of free access to basic water services for all users while promoting and planning for providing higher levels of service to enhance future livelihoods.

In this dynamic context, designing financing mechanisms that ensure improved access to water for rural poor while ensuring the sustainability of water services has been identified as a key to fulfilling the goals of water policy in South Africa. Even though several studies have analysed determinants of water demand and users' willingness to pay, less is understood about characteristics of rural water supply in terms of level of services, costs and financing therefore justifying this study.

Among the various water uses, domestic water use merits particular attention. Indeed, the World Health Organisation (WHO, 2000) defines it as a basic human right, and as essential for improving health, gender equity, education, and other dimensions of development. Various aspects of domestic water services management can make a difference regarding poverty and resource management:

a) Institutional organisation (centralization or decentralization, capacity, community involvement, government control)

b) Water pricing (in its broad sense, the arrangement between a subsidy system and domestic water tariff setting)

[1] See Annexe 1 for a presentation of the host institution.

[2] The CGIAR is the Consultative Group for International Agricultural Research. IWMI is one of its member institutions.

[3] The CPWF approaches the challenge of increasing the productivity of water used for agriculture, leaving more water for other users and the environment (see: http://www.waterforfood.org/)

c) Condition of domestic water service networks (people, even the poorest, will not pay for a service that is not efficient or that is not well adapted to local conditions).

Setting of problem

Given the MUS and scientific background presented above, we can raise three principal questions.

- *How is the domestic water services sector organized?* This question could justify a thesis on its own, but would only partly fit in an agricultural economics thesis. However, in order to define a methodology in a country like South Africa it is impossible not to highlight and analyse the institutional context of domestic water services.
- *What are the water services pricing policies used, relative to development objectives*? A part of this research will help to define these objectives.
- *What are the conditions of water service networks in poor rural areas?*

Methodology

A two-step strategy was chosen to reach these three objectives. It was built as two-scale investigation. Interview and literature at national level (and international level with regard to water pricing policies issues and goals) would permit to specify the local context and tools and objective with which analysing water pricing policies and therefore design the second scale of investigation. In this second scale, after determining the level of analysis, questionnaire for a survey beside officials and representatives of the institutions in charge of water services were built. Objectives determined and exposed in the problematic were used to analyse data gathered during this survey. At least, the survey would have permit to gather information on domestic water networks.

Objective and expected results

Based upon these guiding questions, this research had three objectives and expected results:

- Synthesising existing knowledge on financing mechanisms and water tariffs of water services in rural areas in the Olifants River Basin
- Collecting preliminary data at the level of water services providers on investment, operation and maintenance costs as well as on water pricing practices and associated costs.
- Analysing advantages and drawbacks of existing financing mechanisms and water tariffs with regard to access to water services for poor people and sustainability of services.

Report Progress

Literature and interviews at national level help to understand the socio-economic context of the study area and the organisation of the domestic water sector in South Africa. This information is presented in section 1 to help the reader to understand the South African context of domestic water before introducing economic theory. Literature on economic background helps to explain and specify the problematic of this study. This will be presented in section 2. Context and economic background contribute to the methodology chosen. Section will present and explain this methodology, which involves a three-step strategy with meeting of national stakeholders of the water services sector and a survey a more local level of water services responsibilities. The survey provided for the second step of the strategy permitted to precise the real organisation of the domestic water sector in the study area. As presented in section4.1, this organisation is not as well structured as the theoretical one. Section4.2 presents pricing policies applied in the study area and their evaluation. At least, section 4.3 offers a description and a typology water services networks in our study area.

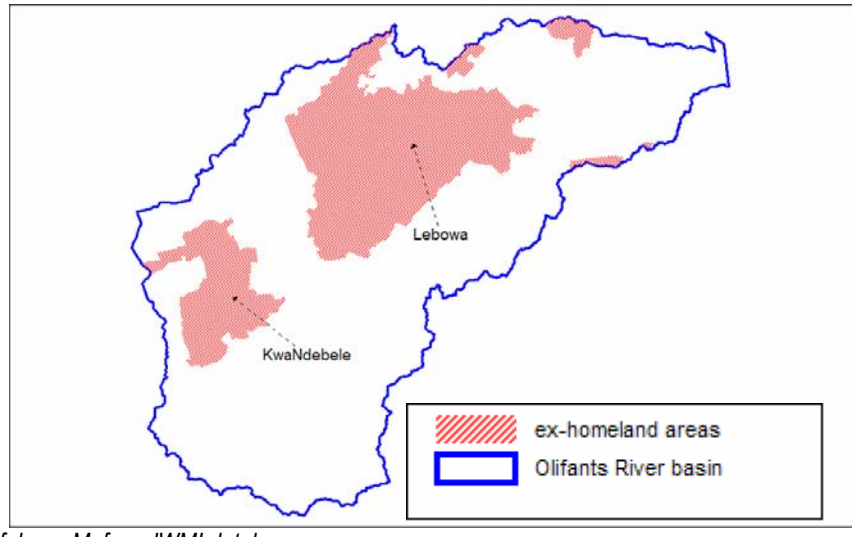
1 Context of the study

Before analysing domestic water pricing policies in the study area, it is important to know and understand it socio-economic context and to describe the domestic water sector functioning. This section involves information gathered through South-African literature but also some first data treatments. The first section describes the study area, mainly from a socio-economic point of view. The following section (section 1.2) exposes the legislative and institutional context of the domestic water services sector in South Africa, necessary for understanding the subsequent choice of methodology.

1.1 Description of the study area

The study took place in the Olifants River Basin, a benchmark basin for the Southern African office of the International Water Management Institute. The MUS project, being interested in water services in poor and rural areas, focused primarily on the main former homelands[4] of this area, Lebowa and Kwa-Ndebele, which together represent 25% of the total surface of the basin but 57% of the population (Thulani Magagula, PhD thesis, personal communication). Due to the isolation imposed by the apartheid government, these areas show socio-economic figures significantly different from the other part of the Olifants River Basin and suffer huge backlogs in basic services supply. Fig. 1 presents the different former homelands in the Olifants River Basin. A description of the physical context is given in section 1.1.1., followed in section 1.1.2 by a socio-economic description of the study area.

Fig. 1- Former homelands area in the Olifants River Basin



Source data: Lefebvre, M. from IWMI database.

1.1.1 Physical description of the Olifants River Basin

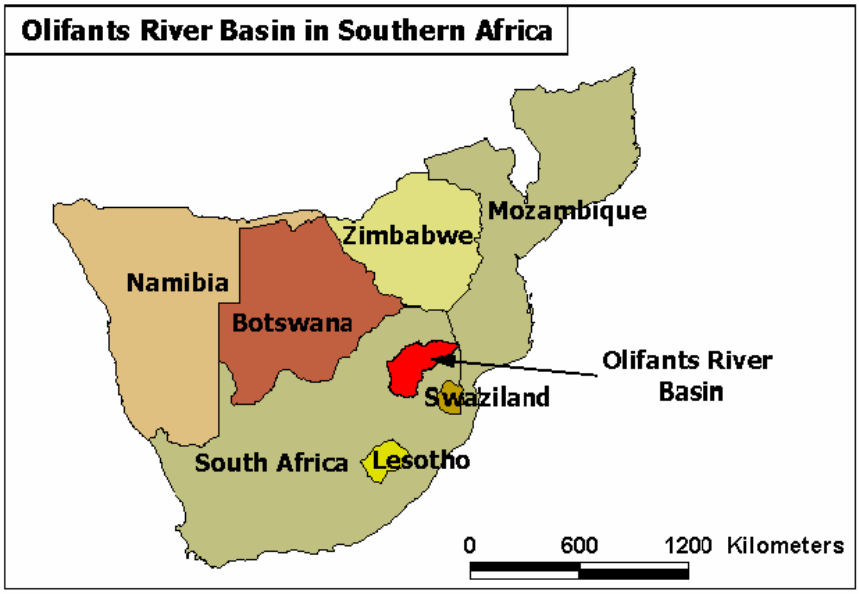
1.1.1.1 Location

The Olifants River Basin is a transboundary basin (see Fig. 2) as the river rises in Gauteng Province in South Africa and runs off North-East toward Mozambique where it flows into the Limpopo River. The

[4] Homelands, or Bantustans were created during the Apartheid era as black population self-governing territories. Section 1.2.1.1 will give a broader historical description of the homelands.

South-African part of this basin is located in the North-East of South Africa and covers part of the Mpumalanga, Gauteng and Limpopo Provinces. The whole basin covers an area of 54 600 km2.

Fig. 2- Location of the Olifants River Basin[5] in Southern Africa



Source: IWMI database

1.1.1.2 Climate and hydrology

The mean annual rainfall of the basin is 631 mm and potential evaporation reaches an average of 1 700 mm (de Lange, M. et al., 2003). Rainfall occurs from October to March (summer) but is quite unreliable and often in the form of violent storms. There is virtually no rainfall in the winter period. During this period, most waterways in the northern area (except the biggest) go dry. As a result, groundwater is an important source of water supply for many small towns, villages and small-scale farms, where it is used for consumption, stock watering and some irrigation.

Total water demand was estimated to be 982 million m3/annum (MCM) in 1995 and is predicted to rise to 1216 million m3/annum by 2010 (DWAF, 2000). The total groundwater recharge in the basin is estimated by the Department of Water Affairs and Forestry (DWAF) to be 3% to 6% of the mean annual precipitation. This would amount to approximately 1800 MCM. Most of this recharge occurs during periods of heavy precipitation. When comparing these two figures (storage and usage of the basin), it may seem as if the basin is not water scarce. This is however not the case as seasonal and spatial shortages often occur. The upper middle part of the basin, for example, is already facing shortage of water (for 1995, a deficit of 63 MCM (Rouzere, 2001)). Moreover, irrigated agriculture, mining and hydroelectricity use a large amount of water (540 MCM for irrigated agriculture, 147 MCM for hydroelectricity and 94 MCM for mining in 1987) (DWAF, 2000). Negative balances as quoted above occur especially during the dry winter when extra water is needed for irrigation, electricity generation and domestic use. Due to expected population increase and the improvement of living standards in the former homeland areas, the total urban water demands are estimated to double by 2010 (reference year 1995). In some regions, the water demand for irrigation and for mining/industrial sectors leads to conflict and may not be met in 2010. In the eastern part of the basin, the water needed for power generation is imported because of scarcity and low quality of Olifants River water (van Veelen, M. et al., 2002).

Water quality is also an issue in the Olifants River Basin. Some mines, agriculture and industries are upstream of the basin and dump their wastewater in the river. This creates a serious concern considering that some populations consume non-treated surface water, especially in poor rural areas.

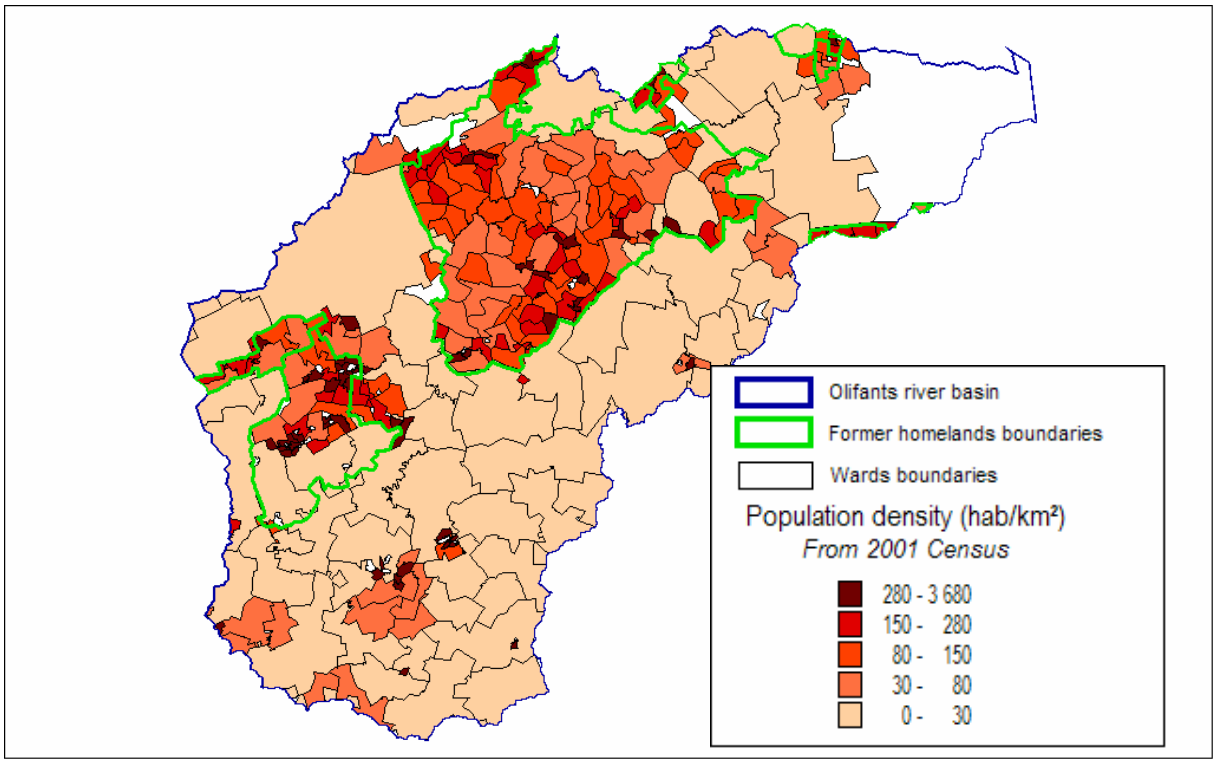
[5] Only the South African part of the basin is indicated here.

1.1.2 Socio-economic overview of the Olifants River Basin

1.1.2.1 Population

According to the 2001 South African Census form Stat SA, the 2001 population of the Olifants River Basin reached 2.8 million. But population characteristics vary significantly depending on whether one considers a "white area[6]" (50 to 100 inhabitants/km²) or a former homeland area (100 to 300 inhabitants/km²). Fig. 3 gives an overview of the population distribution in the basin.

Fig. 3-Population distribution in the Olifants River Basin



Source of data: Lefebvre, M. from Stat SA census (2001).

According to the 2001South African census, 1.46 million of the population stay in the former homelands of Lebowa and Kwa-Ndebele. However, according to consultants and some municipal representatives, this figure could be revised upward due to the considerable and recent arrival of Mozambican immigrants.

White populations represent 5.8% of the Olifants River Basin total according to the Census. In the former homelands area, this ratio falls to 0.2%. The other part of the population in both cases is mainly black, and 90% of the black population lives in rural areas.

This population is also heavily touched by HIV, which already affects its growth rate. Indeed, one person out of three is believed to be affected by the disease.

1.1.2.2 Economic situation

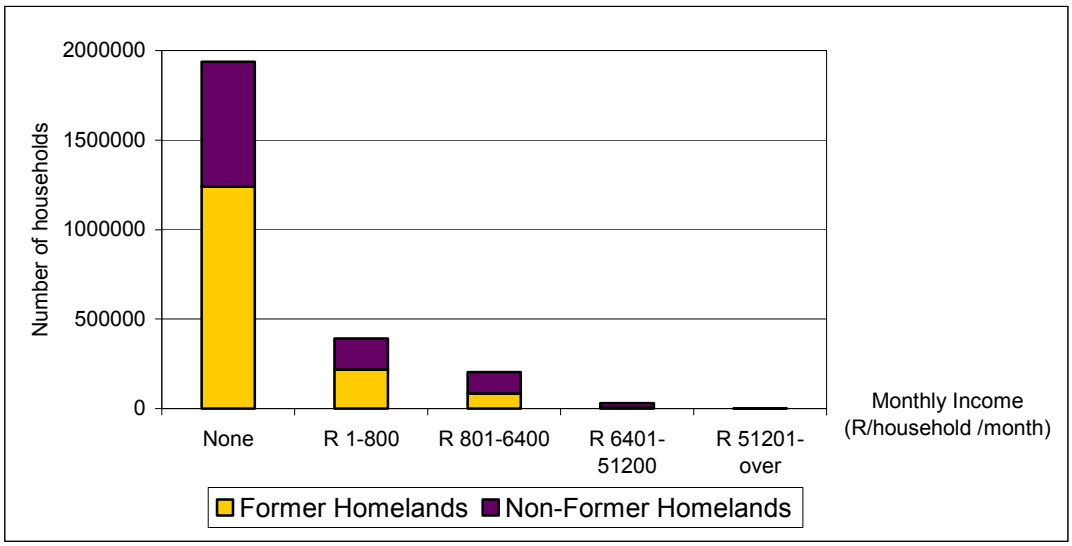
Economic activity in the Olifants River Basin mainly consists of irrigated agriculture, mines and some industry, generally not situated in the former homeland areas. The legacy of the apartheid era is still easy to identify in the Olifants River basin: whites own mines, townhouses and commercial farms,

[6] The term "white area" refers to non-former homelands areas, that is to say locations where only white people were free to live and possess a home during the Apartheid.

whereas townships and the marginal dry rural areas are inhabited by blacks. The former homelands of Lebowa and a part of Kwa-Ndebele occupy a great part of these dry areas.

Income distribution is also unequal. Fig. 4 gives an overview of the monthly income distribution between former homelands[7] and former white areas. According to the 2001Census, more than 74% of the Olifants River Basin population declared having no income. In the areas of Lebowa and Kwa-Ndebele only, this figure grows up to 80%.

Fig. 4- Income distribution according to location within the Olifants River Basin



Source of data: Lefebvre, M. from Stat SA census (2001)

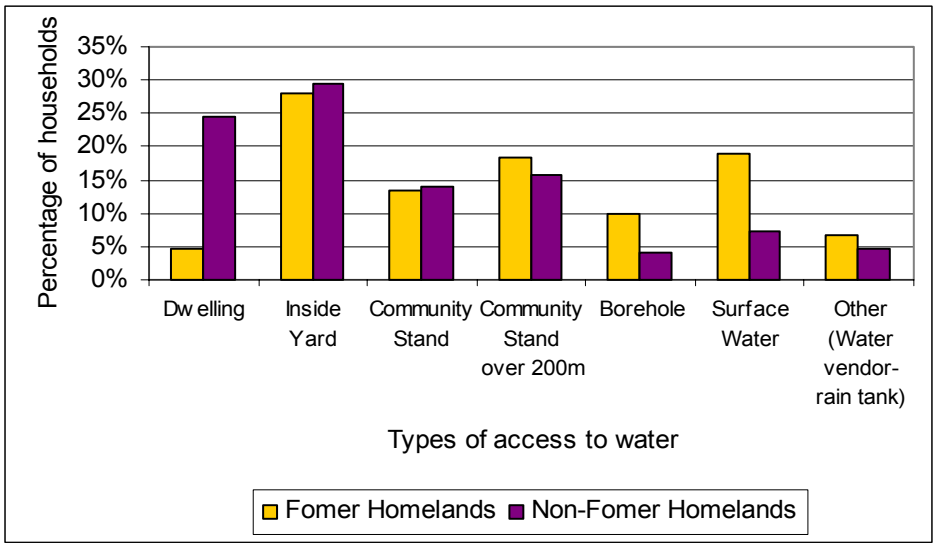
1.1.2.3 Water supply infrastructure

Considering that Limpopo Province is among the poorest provinces of South Africa, and Lebowa and KwaNdebele some of its poorest areas as Apartheid era homelands, their water infrastructure is also one of the weakest and poorest. While water is an unequally distributed resource in the Olifants Basin, the rural areas of Lebowa seem to be very hard hit. Some villages do not have domestic water supply reticulation to rely on, and others do not have the relative luxury of an equipped borehole.

To complete this landscape with figures, the Fig. 5 compares the distribution of the types of access to water for the former-homelands areas and the former-white areas of the Olifants River Basin by percentage of the total households of each area.

[7] The figures take into account all the former homelands of the Olifants Basin (including Gazankulu and Kwangane).

Fig. 5- Distribution of population according to type of water access in former-homeland and former-white-only areas of the Olifants River Basin (percentage of households in each area)



Source of data: Lefebvre, M. from Stat SA census (2001)

"Dwelling" represents an access to water inside the inhabitants' house. "Inside yard" is basically an access (tap) on the property (outside the house in general). Community stand is a typically South African expression. It represents a tap in the street, for the use of all households in the neighbourhood. "Borehole" indicates access to water via borehole. And "Surface water" is access to a river, springs or dams. "Other" represents various accesses like rain tanks and water vendors.

The differences appear largest in the dwelling and surface water categories; the non-former homeland areas being better served with dwelling taps.

1.2 Institutional setting of domestic water services in South Africa

1.2.1 The apartheid era

1.2.1.1 Apartheid history in short

Racial segregation was a part of the social and economic development in South Africa since the seventeenth century. However, no country had gone as far as South Africa in implementing legal segregation.

In 1948, the South African National Party came into power on the policy platform of Apartheid. Its main point was that the different racial groups that made up the population of South Africa should be kept as far apart as possible and should develop separately. To give effect to this policy, institutional structures were created as National States and self-governing territories (called 'Bantustans' or 'Homelands') established for black populations (grand Apartheid), where segregation was institutionalised by comprehensive laws that dictated their every-day life (petty apartheid).

At the beginning of the 1990s, half of the black population of South Africa (more than one third of South African population) was supposedly living in these homelands, which represent only a eighth of South African territory. These territories were characterized by extremely low incomes and high rates of infant mortality, malnutrition and illiteracy and also by a lack of basic infrastructures such as water services and sanitation networks (Post Uiterweer, N. C., 2004).

1.2.1.2 Key principles of the status of water

Until the end of apartheid, rights to use water in the Republic of South Africa, the national States and the self-governing territories were subject to the principles of the South African water law, which had its

roots in the Roman-Dutch law and English law and proposed mixed status for water. Indeed, in the Irrigation and Conservation of Water Act of 1912, water was regarded either as a public good with the state having dominus fluminus[8] over it (Roman-Dutch law) or as a private good with riparian users having an exclusive right to use it (English law) and land-with-water owners owning water located on their land (both English and Roman-Dutch) (Thompson, H. et al., 2001).

1.2.1.3 Water services before 1994

The responsibilities for water services as well as for water resources management were quite scattered. Water was supposed to be managed under the responsibility of 11 departments for Water Affairs and 14 departments for Agriculture, each having a specific organisation. Furthermore, in addition to these departments, various other institutions were responsible for the provision of water services. Regional services councils were established as autonomous authorities to provide services on a regional basis. Those councils consisted of representatives of local authorities and provided services like bulk water supply, bulk electricity supply, sewage works, etc. In towns, town councils could provide domestic water as well (Thompson, H. et al., 2001). Such organisation resulted in disparities and inefficiency of water provision and also in great disparities in term of investments between white areas and homelands, with most funds being in possession of the whites.

Effects of this policy are still felt. According to the Strategic Framework for Water Services (SFWS) (DWAF, 2003), among the 44.8 million people living in South Africa in 2001, 11% had no access to safe water supply, and 41% did not have adequate sanitation services.

1.2.2 Water services sector after the apartheid

In 1994, South Africa experienced its first free elections open to all people. It resulted in a decisive victory for the ANC (African National Congress) and Nelson Mandela became president. This election was a real historical turning point but also in terms of water policy. Just prior to elections in 1994, the various national States and self-governing territories were incorporated back into the Republic of South Africa to form one country.

In former homeland areas where infrastructure and service provision were weak, the national government often shouldered responsibilities for basic services, planning and implementing new infrastructures, while waiting for the local government to build their capacities. This was especially true with water and sanitation services provision with DWAF taking the responsibility. The so-called "transition period" is difficult to date, but is generally considered to be 1994-2003. At the end of the apartheid (and probably a little before its official end), DWAF shouldered the responsibility formerly held by homelands' governments in term of water supply.

1.2.2.1 Key principles of the new water policy

The Bill of Rights of the new South African Constitution (Republic of South Africa, 1996) is the cornerstone of democracy in South Africa. Some statements directly concern water services. Section 27 of the Bill of Rights stipulates that all persons have the right to access to sufficient water. The State must take legislative and other measures to guarantee the progressive implementation of this right.

The National Water Act (Republic of South Africa, 1998) defines water resources as a public good belonging to all people. But recognising inequitable resource allocation (due to geographic characteristics but also to the discriminatory practices of the apartheid period), it insists on the need for an integrated management and strong institutional framework for water services provision in order to be as fair and sustainable as possible and redress inequities from the past.

[8] "*Dominus fluminus*" means that the right to use public water was held by the State and that a person could only use it with the State's authorization.

Since establishment of the Water Services Act (Republic of South Africa, 1997), water and sanitation provision for domestic purpose is recognised as a duty for local governments with the financial and technical help of provincial and national governments. Furthermore, the provision of free basic water and sanitation services for all end-users is compulsory. The Act introduces the notion of basic services, which for water supply means 6 m^3 per household per month available less than 200 meters from the dwelling based on World Health Organisation (WHO) calculations for an average household size of 8 persons. However, in Lebowa and KwaNdebele, the average size of households is 4.5 causing some[9] to consider that the basic amount as proposed by the law is overestimated (and seldom consumed) and that it could be reduced, while National Government is planning to increase it.

Effective provision of a free basic supply is not the only burden local governments bear. The expected water services provision can be defined in these following words: equity, affordability (no exclusion), effectiveness, efficiency (no waste) and sustainability (financial, environmental, social and institutional). Infrastructures and management formerly under DWAF were supposed to be transferred by 2003. Respecting and meeting these objectives will be the challenge of this decade for the newly built municipalities.

1.2.2.2 Main actors of the water services sector

The current water services sector landscape is particularly complex in South Africa, mainly because of new legislation since the end of Apartheid. Drawing the outlines of the water services sector is sometimes difficult in this moving landscape even though the legislative framework traces a clear framework (at least theoretically). In this section, we present this water services framework, at least as theoretically described in legal texts. Although quite descriptive, this section is important because it explains methodological choices presented in section 3.

All levels of governments are well represented in this sector. It is therefore interesting to briefly present the government structure. It can be described as a three-sphere government: national, provincial and local (Thompson, H. et al., 2001). The 1996 Constitution of the Republic states that these spheres are distinctive and interdependent. Provincial and local governments are, therefore, new spheres of government in their own right and no longer depend on the national government. Water Services Authorities, which will be introduced in this section, are central organisations of this new water sector.

a) National departments

Department of Water Affairs and Forestry (DWAF)

DWAF is the national department responsible for both water resources management and water services provision. During the transition period, the Department took over some water networks previously managed by homeland governments. These networks are being transferred to relevant Water Services Authorities (WSAs) according to their location based on an agreement between DWAF and the WSA to appraise the value of transferred infrastructure.

For the future, the Water Services Act provides for DWAF to be a sector leader in policy matters (promotion of good practices, development, setting and implementing national policies, norms and standards, coordination with other departments' policies and international policy management).

DWAF will keep regulatory responsibility (monitoring and regulating interventions according to norms and standards and economic and contract regulations) beside both Water Services Authorities (WSAs) and external Water Services Providers (WSPs).[10] DWAF will not have any direct responsibilities on private WSPs but only on parastatal or private providers acting at a regional scale. Finally, DWAF will technically and financially support local water services.

[9] Consultants more than municipal representatives.

[10] See below for a definition of WSA and WSP.

Department of Provincial and Local Government (DPLG)

The DPLG has overall responsibility for the affairs of local governments (policy, legislation, capacity building, grant allocation and regulation in all aspects of municipal responsibility). DPLG has the following major responsibilities related to water services:

- DPLG regulates contracts between WSAs and Water Services Providers
- DPLG allocates funds to local governments including the Municipal Infrastructure Grant (for more information refer to section 2.3.2 below).
- DPLG regulates municipal affairs and intervenes in cases of non-performing municipalities.

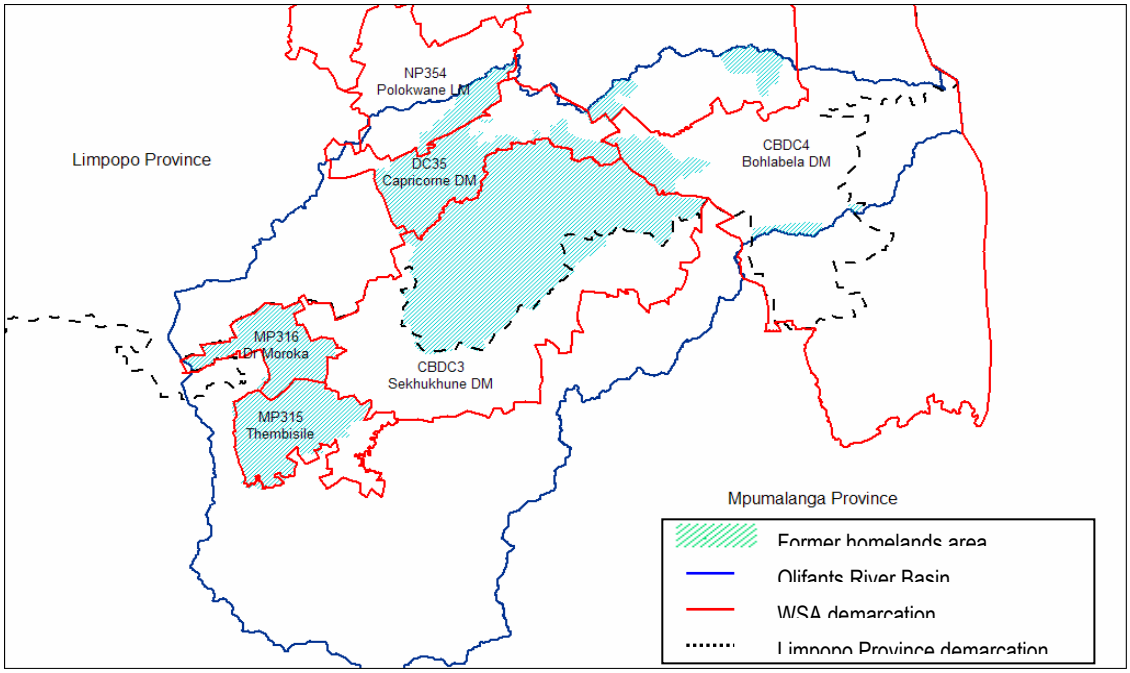
National Treasury

The National Treasury monitors and regulates the finances of all public bodies (Municipal Financial Management Act, (Republic of South Africa, 2004). The National Treasury's primary role with respect to local governments is to manage the impact of local government fiscal activities on national economic policies and to regulate municipal financial management. The National Treasury is directly responsible for the Equitable Share allocation (see section 2.3.2) and it is also supporting DWAF and DPLG in fulfilling their support and regulatory roles when related to fiscal and financial matters.

b) Water Services Authorities (WSAs)

According to the Municipal Structures Act (118 of 1998), a WSA is a municipality that has the executive authority to provide water services and sanitation within its area of jurisdiction. They can be Metropolitan Municipalities (category A), District Municipalities (category C) or authorised Local Municipalities (category B). The determination of which municipality will become a WSA is the subject of agreement being worked-out between DWAF and the municipality, after evaluation by DWAF. The choice of the WSAs seems to have been done according to the level of the municipality's capacity. 170 South African WSAs are currently identified but all agreements are not signed yet. There is 6 WSAs in the research area (see Fig. 6)

Fig. 6- Water Services Authorities in the Olifants River Basin



Source of data: Lefebvre, M. and IWMI database

Each WSA bears the following constitutional responsibilities:

- **Ensuring access** to water and sanitation services for all people living in their jurisdiction (at least basic access). To do so, they may provide themselves these services or/and form a joint-venture with another water services institution to provide water, or contract an external WSP and in this case, ensure the realisation of the right of access to water and sanitation services.
- **Planning**. They must prepare water services development plans (WSDP) to ensure effective, affordable and sustainable access to water and sanitation, and to improve the provided level of water access (what DWAF call "stepping up the ladder").
- **Regulation**. WSAs are also responsible for ensuring that water services providers act within the policy and regulatory framework.
- **Tariffs setting**. The WSA has to build a water pricing policy (water charges for end-users) and to enforce it (particularly in the case where the WSA makes the choice of contracting a WSP, the WSA keeps the responsibility of setting tariffs).
- **Provision** of effective and sustainable water services within their area of jurisdiction.

WSAs must secure licences from DWAF or Catchment Management Agencies when already established, to extract water from and to discharge wastewater into surface water or aquifers. They also have a duty to provide information concerning the provision of water services to consumers and DWAF alike.

As custodian of regulatory responsibility, WSAs must have a clear vision of who provides water in their jurisdiction. For this reason, if the institutional framework established by DWAF (Strategic Framework for Water Services, (DWAF, 2003)) is respected, they are a relevant level of investigation for this study.

c) Water Services Providers (WSPs)

The Strategic Framework for Water Services defines a Water Service Provider as:

- Any person who has a contract with a WSA or another WSP to sell water to and/or to accept wastewater from that authority or provider, these are defined as **bulk water services providers**;
- Any person who has a contract with a WSA to assume operational responsibility for providing water services to one or more consumers (end users) they are defined as **retail water services providers**;
- A Water Services Authority that provides either or both of the above services itself.

A WSP can be either local (WSPs who provide water and/or sanitation to only one water services authority) or regional (WSPs who operate infrastructures crossing water services authorities boundaries). They can be public organisations (municipality, water board), community organisations (such as Community Based Organisations (CBOs[11])), private or mixed organisations.

The current national situation of water service provision is highly fragmented with a high number and various legal statuses of water service institutions acting as WSPs. In some municipalities acting as WSAs, notably in former homelands, domestic water services providers have not been identified yet. This was common within the research area. One of the aims of the water policy since 1997 is precisely to simplify and make this situation clearer. The Strategic Framework for Water Services proposes some simplifications that might not be applied yet:

- A **single consumer interface**: a consumer should deal with one retail water service provider and only one retail sanitation service provider (the best would be one provider for both services).
- A **single contractual interface**: the WSA should have only one contract with one WSP in a specific area within its jurisdiction. Moreover, a contract should be geographically defined and there should not be any overlap between WSPs.

[11] Existing mainly in rural areas, CBOs are public-utility organisations consisting of water users themselves and managing water services networks. CBOs are however not clearly defined by the legislation.

- A **single chain of contracts**: it is important that a single chain of contracts ensure the effective delivery of water from the resource to the consumer, and treatment of wastewater from the consumer to the resource.

As they bear operational responsibility, WSPs also carry out duties, starting with providing water services in accordance with the Water Services Act and by-laws setting by Water Services Authorities:

- Domestic water must be provided in an efficient and effective manner
- WSPs must assume the operational and financial risk related to the provision of water and sanitation services and the collection of fees. Only in a case where CBOs perform water service provision, could WSA assume part of the financial risk related to the provision of services.
- WSPs have to publish a consumer charter approved by the WSA that includes duties and responsibilities of both WSP and consumers.
- Since the SFWS, all WSPs must provide a business plan, which is an annual operational plan including technical, investment, financial and social[12] plans.

According to the Water Services Act, each WSP must give information on the tariffs implemented, the number and socio-economic condition of people they serve and the level of services provided (via the Business Plan for example) to the WSA having jurisdiction in its area of provision, the relevant province, DWAF or any consumer or potential consumer.

d) Water Boards

The Water Services Act made provisions for the establishment of Water Boards, which are considered corporate bodies. They are organs of the State, like extensions of the government and sometimes manage water distribution infrastructure owned by governmental departments.

The primary activity of a Water Board is to provide water services to other water services institutions within its service area (bulk water services providers). A Water Board can also perform other activities providing that these new activities do not limit the primary one. These activities can be (Republic of South Africa, 1997):

- Providing management services, training and other support services to water service institutions
- Providing water services and/or sanitation services directly to end-users (retail water service providers), if approved by the WSA having jurisdiction in the area
- Providing catchment management services to or on behalf of the responsible authorities
- Performing water conservation functions.

All activities (primary or not) must be the subject of written contracts.

Inherited from the apartheid era, their future role and status is not clear. Some water boards in our study area, like Ikangala Water Board may be integrated into the Department of Water Affairs, still others, like Lepelle Northern Water, the most important one in Limpopo Province will probably remain and contract with Water Services Authorities as Water Services Providers.

e) Water services committees

The Water Services Act makes provision for the establishment of water services committees. The Minister of Water Affairs can establish them after consultation of the WSA and the inhabitants of the considered area. These committees are to undertake the tasks of the WSAs where they fail in supplying domestic water and sanitation. Their functions are very similar to those WSAs undertake (setting tariffs, water services planning, water and sanitation provision, etc).

[12] Social plan means to create a human resources development plan addressing employment, gender equity, and HIV/Aids concerns.

According to the SFWS, no water services committees were formed from 1997 to 2002. This provision is qualified as obsolete by the SFWS and should be removed from the relevant legislation. However, even if their status is not well defined, there may still be water committees operating informally in some deprived areas were water services are not well provided by the local government.

f) Ward committees

Wards are sub-division of municipalities and are the lowest level of electoral and administrative areas. Although ward committees are sometimes mentioned as a water services institutional component (Matji, M. P., 2003), the expression "ward committee" or even the word "ward" does not appear in any official documents from DWAF or the Republic of South Africa.

At this point, we can diagram an overview of the theoretical institutional landscape of water services provision in South Africa. The three following figures present a schematisation of the theoretical institutional organisation. Fig. 7 presents the organisation regarding physical fluxes. Fig. 8 diagrams the financial fluxes and

Fig. 9 is more interested in regulation.

Fig. 7- Theoretical institutional organisation of Water Services in South Africa: physical fluxes

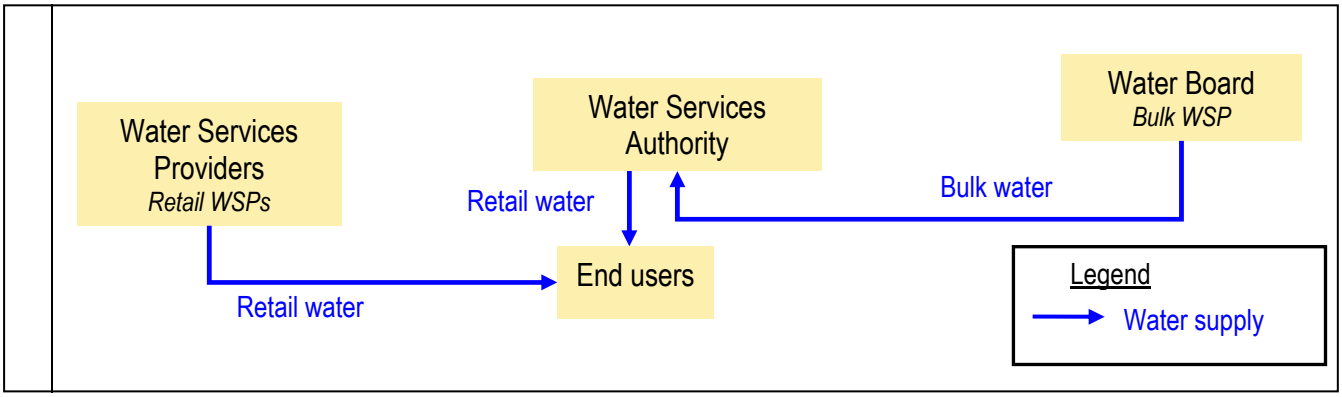


Fig. 8- Theoretical institutional organisation of Water Services in South Africa: financial fluxes

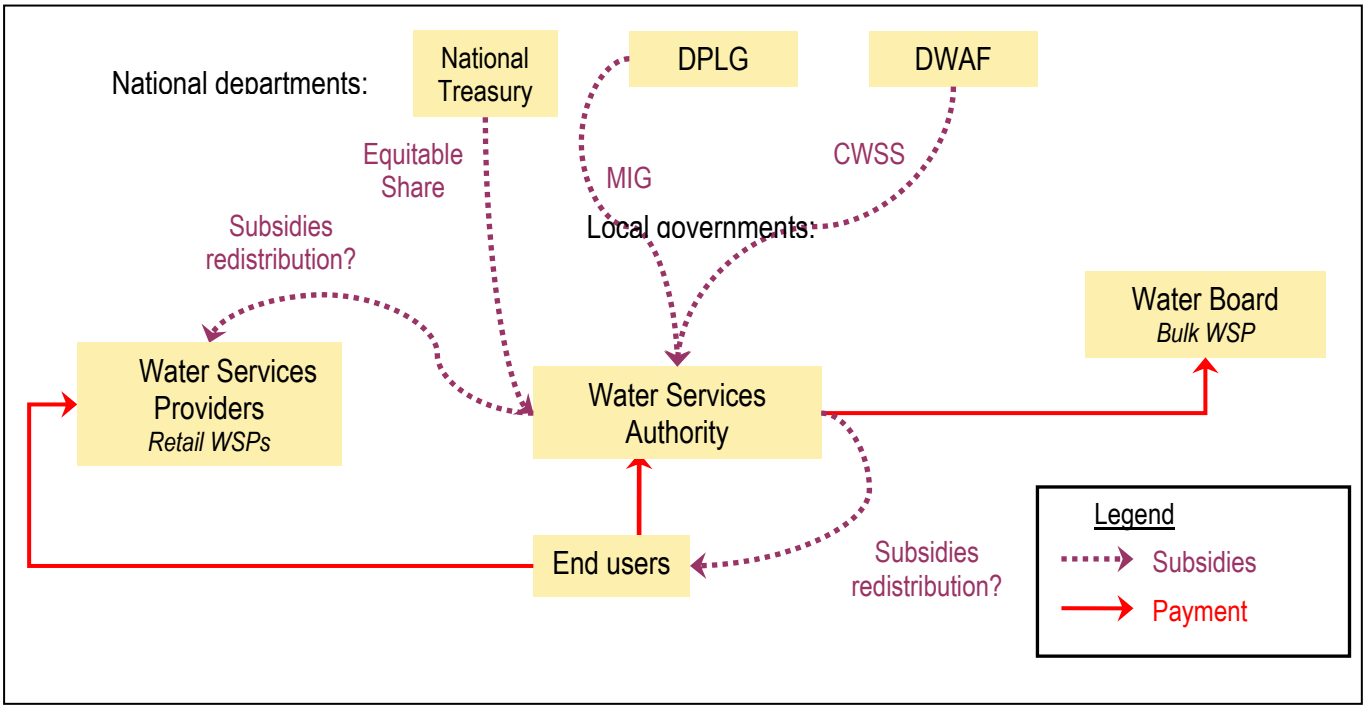
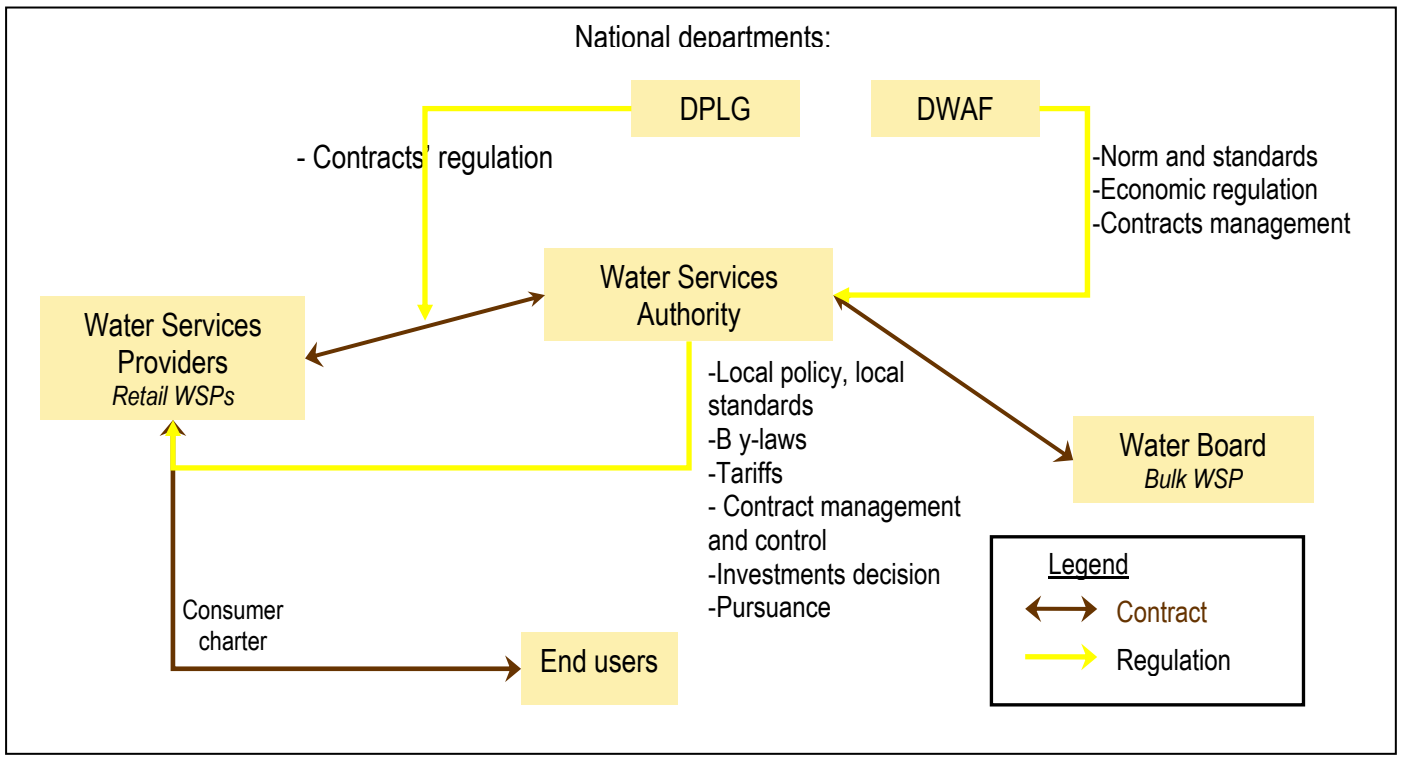


Fig. 9- Theoretical institutional organisation of Water Services in South Africa: regulation fluxes



Question marks indicate assumptions on relationships between various organisations. As we will see in the third section of this report, reality is not yet as simple as this diagram.

The South African landscape is the one of a country in transition, distinguished by great socio-economic gaps due to the inequalities of apartheid, and implementing new public policies, founded on decentralisation and with as main target to reduce backlogs in basic services. This context has been used in the definition of the methodology but also in the analysis of the information gathered.

This issue of poverty plants also the problems the MUS project tries to solve. Indeed, water services in a poor country are a relevant issue for development, and water pricing policies (in its broad sense, that means tariff setting and subsidies option) have a role to play to improve livelihoods. The following section presents the economic setting of problem linked to water pricing policies.

2 Problematic

The Multiple Use Water Supply Systems (MUS) has as primary objective to identify and improve knowledge about water uses. Institutional organisation of water sector and financial issues were identified as ones of the aspects to highlight.

We will not try to analyse the institutional organisation of the water services sector, this could be the subject of socio-politic thesis. This study only presents such an organisation, as it is presented in official texts (previously presented in section 1.2.2) and as it can be encountered in the study area (presented as a result in section 4.1). However, the study will show in this section that various aspects of a water pricing policy (in its broad sense, which mean tariff design and subsidies) can affect livelihood and poverty.

In this section we will present the stakes linked to water pricing policies. As various types of pricing systems and subsidy options exist, and as they have consequences for disadvantaged populations in developing countries, section 2.2 presents the diversity of water tariffs systems and their advantage and drawbacks. The diversity and importance of subsidy options is presented in section 2.3.

As cost-recovery is one of the main objectives in water pricing policy, and as it seems an important goal of the South African water services policy, section 2.4 provides a special highlight on cost-recovery issues in developing countries and more specifically in South Africa.

2.1 Objectives of a water pricing and subsidy system to improve access to water for low-income population

As said earlier, water tariffs are a key water services management tool. Benefits that can be considered are various: accessibility, public health, resource conservation, and socio-economic benefits. It is possible, through water tariffs to pursue a number of objectives, although trade-offs among them are commonly required. The most common objectives are described below, but it should be noted that not all decision-makers embrace all objectives, and some may define individual objectives differently from what follows (Whittington, D. et al., 2002).

- Cost recovery

Cost recovery is an essential objective, which ensures the sustainability of services. From the water supplier's point of view, it is the first purpose of any tariff[13]. Collected tariffs must help to balance the service accounts and ensure its sustainability. Tariff design, then, aims to achieve this target. To a large extent, this consists of setting the various prices and charges in the tariff at a high enough level to ensure sustainability.

- Economic efficiency

An efficient tariff will create incentives that insure, for a fixed water supply cost, that users obtain the largest possible aggregate benefits (welfare maximization). A different, but equivalent statement of this objective is that for a given level of aggregate benefits from water use, the supply cost should be minimized. Generations of economists have insisted on the importance of this objective, and noted that it can be achieved by setting all prices equal to the relevant marginal costs.

[13] Tariff is used here in a broad sense (tariff for users' payment and subsidies). For the water provider, all costs must be covered, either by water tariffs or subsidies.

- Economic affordability

Access to water being a basic right (especially in South Africa), a "social pricing system" is often implemented to permit all users to have an access to water (especially the poorest). To keep the proportion of the household budget spent for water (also called effort rate) below 5% of the total household budget (WHO's reference), the decision-maker can also turn to subsidies.

- Equity and fairness

In public utility tariff design, these terms usually mean that users should pay amounts that are proportionate to the costs they impose on the utility. Equity is thus a quantifiable proposition: invoices must be proportional to generated costs. On the other hand, fairness is wholly subjective. Each participant in a tariff design process may have a different notion of the meaning of fairness. For example, one may think it is fair to charge all customers the same price (even when, because of differences in cost of services, this is not necessarily equitable), while another may believe that fairness requires subsidies to some customers. These two points of view may not be necessarily opposed but complementary. Indeed, the decision-maker can charge all consumers the same rate but decide in the meantime to subsidise some of them. Such a policy would fit both objectives of equity and fairness.

When using this objective to analyse our results, we will consider the equity objective as the way a tariff take into account the level of service. That means two users should not pay a same rate for a private connection and a communal connection away from the residence.

- Resource conservation

Water pricing policies can aim at a more sustainable resource management, an objective that decision-makers often forget. This objective is somehow more difficult to reach because it requires long-term perspective.

Other factors may affect tariff design, although they may be less fundamental and long lasting than the objectives listed above: public and political acceptability, simplicity and transparency (easy to explain and easy to understand), revenue stability for the services provider, and ease of implementation. To this we can add the ability to anticipate users' behaviours regarding the pricing system chosen. All these objectives are not easily reconcilable and choices must be made. Water services providers may come to an agreement on the prevalence of cost-recovery and the sustainability of their services.

2.2 Domestic water pricing systems: diversity, advantages and drawbacks

2.2.1 Types of domestic water pricing

Prevalent pricing structures can be divided into two groups: the one-part structure and the two-part structure.

2.2.1.1 Monomial pricing structures

- Flat rate:

When water charges are independent of the volume consumed, it is called "flat rate". This type of pricing is the simplest and most commonly used when there is no meter. For this reason, it is often implemented in countries where the resource is abundant. However it is not always uniform: it can be indexed on a variety of users' characteristics, such as the number of inhabitants, the size of the house, the number of taps, etc. This pricing system is not the most advisable for reaching efficiency (water users are not incited to save water), but it secures receipts that can cover costs (Montginoul, M., 2005). The equity objective is however difficult to attain, except if "poor" people can have a lower flat rate.

- Volumetric rate (proportional to the volume consumed)

Authorities can choose to price water according only to the quantity of consumed water. This type of pricing does not guarantee cost recovery but it is the most appropriate to reach efficiency and it allows all people to connect (moreover if connections are subsidised, poor users assure themselves of a low water consumption to pay their water). Obviously it requires the implementation of metering systems. Various types of volumetric rates exist (see Fig. 10) (Lemenager, M., 2004)and Montginoul, M., 2004).

Constant volumetric rate

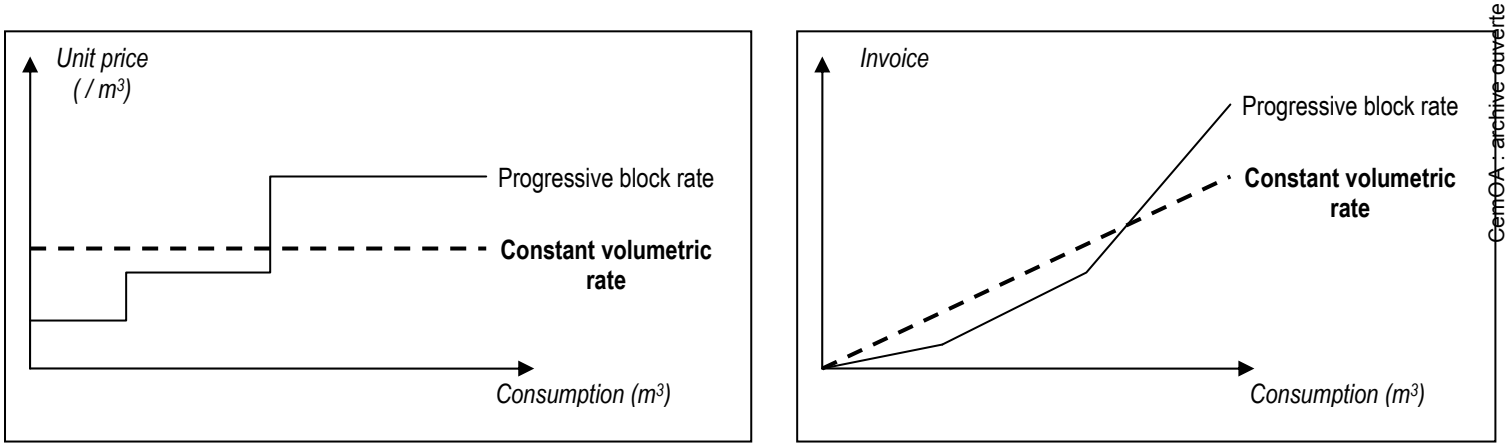
The invoice is proportional to the volume consumed by the user. However, the unit price can vary according to category or level of service (a connection in the house or only in the yard for example).

Block rate

This pricing system is widespread in both OECD countries and developing countries. Block pricing can increase with consumption level (increasing block tariffs- IBT) or decrease (declining block tariffs). It is commonly accepted that the most efficient is the increasing block rate because it can give the signal of water scarcity. Multilateral donors, international financial and engineering consultants, and water sector professionals working in developing countries all commonly presume this system to be the best, and usually promote it. To some extent, this structure is also allows better access for all (the first block can be either not priced or priced at a very low rate). Finally, if associated with cross-subsidies, it can provide equity assuming that a wealthy household will consume more and therefore will be charged more. However, if there are substitutes (like groundwater) for the urban water, the biggest users can escape. It is one of the reasons for implementing declining block rates in some circumstances.

Although very popular for the reasons quoted above, this system sometimes proves to be inefficient, inequitable, unfair and non-reliable for cost-recovery (Boland, J. and D. Whittington), 2000).

Fig. 10- Examples of volumetric rates



2.2.1.2 Two-parts pricing structures

This type of structure combines a fixed and a volumetric element. Flat rates are often nearly the same for all users because they permit recovery of administrative fixed costs (meter reading, billing and cashing). This pricing system can be much more economically effective than the others. Indeed, the volumetric rate controls the consumption of water while the flat rate provides a better and more reliable cost-recovery for the water services provider (Whittington, D. et al., 2002). However, in cases where fixed charges are high, this solution can lead to the paradox of a high average unit price for low consumption.

2.2.1.3 Other types of tariffs

Even if limited and not widespread, some countries or regions use pricing systems where rates vary according to the season (in Chile for example). The low implementation of such a tariff policy can be

explained by its complicated management. Indeed in cases where the seasonal rate depends on the volume consumed, this system involve reading all meters at the en of a season before implementing the new tariff.

2.2.1.4 Connections fees

Connections fees are or should be a real part of any pricing policy. Indeed, for many non-connected people, connection costs are an important barrier. Recently municipalities and countries have launched programs of mass connections where they subsidize connection fees for users and implement loan systems. But these attempts often come up against various factors such as: (1) scattered settlements, which increase the global cost of connection; (2) clandestineness and precariousness of settlements (3) and incapability for the poorest to shoulder a periodic invoice burdened by loan repayments.

The following section illustrates this description of domestic water pricing in the South African context.

2.2.2 Domestic water tariff in South Africa

2.2.2.1 Principles and objectives of water tariff setting in South Africa

As we saw in the section 1.2.2.1, the access to water and to a healthy and non-harmful environment is a basic right in South Africa. In this context, water pricing should not jeopardise this right and should promote access to an adequate amount of clean potable water (Eberhard, R., 1999).

The Strategic Framework for Water Services (DWAF, 2003) defines retail water tariff principles as follows:

- *Tariffs should be applied equitably and fairly (*equity objective*)*
- *The amount individual users pay for services should be in proportion to their use of that service* (which means that it should depend on the level of service and of the volume consumed)
- *Water and sanitation tariffs should seek to ensure that a minimum basic level of water supply and sanitation service is affordable for all households […]* (a principle we can interpret as an affordability objective)
- *Tariffs must reflect all of the costs reasonably associated with rendering the service* (which means the payment from consumers should recover the costs of running the networks, which we can interpret as at least operation and maintenance costs).
- *Tariffs must be set at levels that ensure the financial sustainability of the service, taking into account subsidisation from sources other than the service concerned* (global income -including subsidies, cross-subsidies, loan and water fees- should recover all the financial costs -capital, administrative, replacement, O&M costs and cost of servicing capital-).
- *The economical, efficient and effective use of resources, reduction of leaks and unaccounted-for water, recycling of water, and other appropriate environmental objectives must be encouraged* (this principle is close to the resource conservation objective).
- *A tariff policy may differentiate between different categories of users, debtors, service providers, services, service standards, geographical areas and other matters as long as the differentiation does not amount to unfair discrimination* (all users and providers will not pay or charge the same amount, but only if it is justified -for example in case of different level of services or water scarcity- and does not contradict the previous principles).
- *All forms of subsidies should be transparent and fully disclosed* (this statement aims at preventing corruption; it also implies a clear monitoring of water accounting systems.

We should note that DWAF, in "*Norms and Standards in Respect of Tariffs for Water Services in Terms of Section 10 of the Water Services Act*" (DWAF, 2001), is much more specific. Indeed, this text specifies that any WSA is obliged to differentiate tariffs according to levels of service (communal stand, private controlled water services (taps in dwelling or in the yard with a meter), private uncontrolled water services (taps in dwelling or in the yard without a meter), sanitation connected to a sewer, sanitation non-connected to a sewer).

The same text advises the use of an increasing block tariff of at least 3 blocks, with the lowest block of a maximum consumption of 6m3 with the lowest amount (including a zero amount), and the highest as high enough to discourage water wastage. It also asserts that a connection fee should be charged.

In the SFWS principles we find the objectives stated in the previous section (with the exception of the economic efficiency objective). In the following part of the study, via the survey of Water Services Authorities we will try to estimate to what extent the water pricing policies in the study area attain these objectives.

2.2.2.2 Water tariffs implemented in South Africa

Water tariffs in South Africa vary. The most complicated are generally found in urban areas. In rural areas, pricing systems are often simpler and in some places, especially in former homelands there is no billing yet, cultivating a non-payment culture. Moreover, this non-payment culture was heavily promoted in the last years of apartheid as a means of opposing the government.

It is not possible to give a general description of a rural reference tariff as water pricing practices vary from scheme to scheme, but examples of tariffs can be given.

According to a WRC[14] report (*Cost and tariff model for rural water supply schemes*, (Still, D. et al., 2003)) that surveyed 38 water services projects in South Africa, the flat rate monthly payment system is the most popular water pricing option (employed by 31 projects). For these cases, the mean flat rate was R9.47/household/month, with an interval of R4 to R16. However, another WRC report asserts that a flat rate can lead to inequity and conflict (Marah, L. et al., 2004). Indeed, large family are more likely to use more water than smaller ones. Small families are therefore less inclined to pay diligently. Such inequities were identified as a factor in non-payment by the poor in some case studies (including some in Limpopo Province). In the projects where water rates were being charged at a metered rate, the mean rate was R6.33/m^3, with a standard deviation of R2.36/m^3.

Another WRC study (Ralo, T. et al., 2000) at household level in the rural areas of the Eastern Cape (the poorest province of South Africa) shows that 144 households, nearly half of all respondents consider they cannot afford an average tariff of R8.18 per month. A DWAF report (DWAF, 1998) gives example of rural water tariffs that range from R1.4/household/month to R15/household/month.

Water pricing implementation alone does not constitute a services pricing policy. Compensatory measures (subsidy mechanisms) are also an integral part, especially to meet the affordability objective. The following section will present subsidies' diversity and implications.

2.3 Subsidies: how to choose the right subsidy to reach the right target

2.3.1 Objectives and diversity of subsidies

2.3.1.1 Key objectives of a subsidy system

From the literature on this subject, some specific criteria can determine the design of a subsidy system (Lemenager, M., 2004):

[14] Water Research Commission, South African research centre, operating in terms of the Water Research Act (Act 34 of 1971).

- ***Justified need***: this is quite difficult to assess. The main tools commonly used for this purpose are willingness to pay studies
- ***Precise identification of beneficiaries***: this point is often difficult to reach, because surveys and census design a subsidy system based on one specific moment.
- ***Low administrative costs***: unfortunately, it is generally very expensive to identify the correct beneficiaries of a subsidy.
- ***No perverse incentive***: the injection of subsidies comes into conflict with the objective of economic efficiency. For this, it is better not to deliver the total subsidy to avoid waste and only for a short period and for an amount high enough, in order to avoid a population passivity risk (risk of dependence on a subsidy or poverty trap). Such policies do not incite a community to participate to services costs and sustainability and to their own development.

Secondary objectives can also be quoted. Subsidies should be realistic, adapted to the targeted groups, transparent and regressive in order to permit a switch to a higher tariff.

Subsidies should focus on connection, in order to reduce the initial cost rather than decrease expenses linked to existing users.

2.3.1.2 Types of subsidy mechanisms

Various types of subsidy mechanisms can be identified:

Budget subsidies (from government or external institution). They are "traditional" mechanisms where the subsidy reaches the general operating budget, in order for it to settle tariffs below costs. This system has drawbacks, as it does not permit easy control of the operator's management and does not involve any targeting (all users will benefit from this subsidy).

Direct subsidies. They are injected directly to specific users. They aim at making the poor the same customers as the others (increase their purchasing power to catch up of demand).

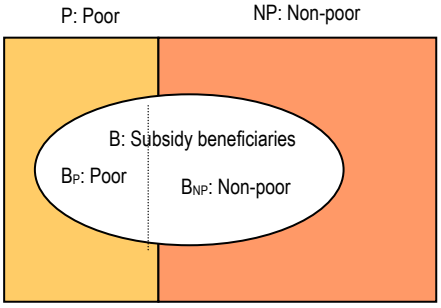
Cross subsidies. They express solidarity between water users. Tariff (IBT) or unifying surtax (1 or 2% of the total invoice) permits this type of subsidy. Their advantages are that they do not appeal to exterior resources (which are sometimes uncertain) and permit a selective targeted distribution. However, a cross-subsidy is only efficient in the case where there is a sufficient proportion of wealthy users.

2.3.1.3 How does one know the good target is reached?

A key consideration in evaluating the efficacy of a subsidy policy is measuring to what extent they succeed in reaching the poorest part of the population (Foster, V. et al., 2003). Analysis of a subsidy targeting system is commonly done according to two standard indicators.

Error of inclusion arises when people who are not poor benefit from the subsidy. The following diagram (Fig. 11) helps to illustrate the meaning of this term. The error is defined as the percentage of the subsidy beneficiaries who are not poor ($EI=B_{NP}/B$). Errors of inclusion are essentially a form of inefficiency, because they represent a leakage of funds.

Fig. 11- Subsidy's population targeting



(Source: (Foster, V. et al., 2003))

Error of exclusion arises when people who are poor do not receive the subsidy. It is defined as the percentage of the poor who do not receive any subsidy $EE=(P-B_P)/P$. This error can be regarded as a more serious problem than the error of inclusion since it indicates that the subsidy policy chosen fails to meet its principal objective.

As we have just seen, wrong targeting can lead to a failure of the whole subsidy policy. But one of the difficulties in targeting the beneficiaries is how to identify them. The issue is choosing indicators that allow the best selection of beneficiaries and that can permit a system that can be implemented at large-scale. Indeed, selecting and subsidising a specific range of population can be too costly to bring any benefit to the society. Moreover, it is important to keep in mind that every targeting method has a potential of perverse effects that can affect the social fabric.

Four main means of targeting beneficiaries exist:

- ***Using the volume of consumed water***

It is one of the simplest ways to target poor people, but is nonetheless a bad indicator of the poverty level, especially for collective connections.

- ***Using geographic zoning***

This means is conceivable for shantytowns or small urban centres, but inefficient in peri-urban areas, which are often heterogeneous. This approach does not take in consideration diffuse poverty.

- ***Using individual indicators***

In this category, household equipment level is frequently used as a way to evaluate poverty (a World bank study in Bangalore used characteristics such as type of dwelling, number of rooms, presence of flush toilets, type of access to water as indicator of poverty (Foster, V. et al., 2003). Though this approach may be the most precise in term of targeting, it generates heavy administrative costs to make the system work.

- ***Using self-selection systems***

With service quality differentiation by the services provider, the users themselves can select the service that best fit their needs and ability to pay.

Knowing users' behaviours and particularly poor households' behaviour often requires studies of water demand. Various methods allow the evaluation of willingness and ability to pay. The contingent valuation method is one of the most widespread.

Subsidies are an important part of the South African water policy. The following section will expose their principal principles and present the main subsidies encountered in the water services sector.

2.3.2 Subsidies in South African water services

2.3.2.1 Subsidy policy principles in South Africa

The Strategic Framework for Water Services (DWAF, 2003) states the main principles for local subsidy policies:

- *Maximising public benefit* (we find here the objective of economic efficiency stated in section 2.1)
- *Targeting the poor* (an objective of beneficiary identification)
- *Equity: the subsidy should be allocated in a way which benefits all consumers in the same circumstances equally*
- *Transparency*
- *Administrative efficiency* (low administrative costs objective).

These principles encompass the objectives of non-perverse incentive and justified need. Therefore, it involves the principle of targeting the poor, a principle that the free basic water policy (FBW policy) does not take into account (the FBW policy it is not a subsidy strictly speaking, but it involves the use of subsidies).

2.3.2.2 Main subsidies encountered in the South-African domestic water sector

With its wish to clear the backlog for all the basic needs and aspects of development (not only water and sanitation but also electricity, health, transport and education), South Africa has subsidies for every

purpose. To simplify a little, we will only present and explain the main subsidies related to water encountered in the research.

Municipal Infrastructure Grant

The Municipal Infrastructure Grant (MIG) is a conditional grant dedicated to municipal infrastructure funding. That means the municipality receiving the grant must comply with some conditions (directing main funds to infrastructure and rehabilitation, respecting its Integrated Development Plan, targeting implementation to benefit the poor). If these conditions are not met, the grant can be reduced. It was approved by the South African Cabinet on 5 March 2003. It replaced all existing capital grants for municipal infrastructure and incorporates seven infrastructure programmes concerning water and sanitation: Consolidated Municipal Infrastructure Programme, Water Services Projects, Community Based Public Works Programme and Local Economic Development Fund.

The MIG is managed by the Department of Provincial and Local Governments (DPLG). DPLG allocates to each type of infrastructure a part of the national amount. The amount allocated for each type of infrastructure is then divided between all municipalities based on an assessment of the backlog of infrastructure development in that municipality. For water supply, the national amount will be divided between municipalities having water services responsibilities (mainly WSA). Municipalities with bigger backlogs in water supply will get more MGI funding. The allocations given to municipalities for each type of infrastructure are therefore calculated each year (DPLG, 2004).

Equitable Share

Equitable share is the portion of nationally raised revenue that is allocated to local governments. It was first introduced in 1998/99. Since then, the initial formula changed to the current system. The current formula looks as following (Sussens, H., 2005):

Equitable Share = S + I + FBS + FBE + R293 + Nodal Allocation

"S" is the basic services grant. It allocates an operating subsidy to municipalities of approximately R86 per month for each household within that municipality earning less than R800 per month (which implies a necessary identification and targeting strategy).

"I" represents the institutional capacity building grant. It is dedicated to building institutional capacity such as hiring buildings, installing computer systems etc. Not all municipalities are eligible. This grant should represent only a small part of the total, the lion's share being dedicated to the free basic needs.

"FBS" and "FBE" are the free basic services and electricity grants. It is only dedicated to the free basic services policy implementation. It is the responsibility of municipalities to establish appropriate targeting mechanisms for passing this subsidy onto the poor.

"R293" is a special grant for small towns lacking capacity. "Nodal Allocation", as "R293" is a transitional grant.

It is worth noting that the current formula is under discussion. A new one should be implemented in the years 2007-2008. Simpler, it will involve a free basic component (BS) for basic services combining the FBS and FBE grants and only supporting households earning less than R 800 per month.

The Community Water Supply and Sanitation Programme

The DWAF's CWSS Programme was initiated in 1994 to achieve the constitutional objective of ensuring that all South Africans have access to sufficient water and sanitation, focusing especially on rural areas.

Government is on target to eradicate the backlog in water infrastructure and sanitation facilities by 2008 and 2010, respectively. Grants within this program are managed by DWAF and dedicated to infrastructure renovation, replacement and installation.

Although South Africa recognises the key objectives of any water services pricing policy, in this post-Apartheid period cost recovery is a priority for many. Indeed, cost recovery is seen as an essential condition to extend basic services to all citizens.

For this reason the following section will highlight the objective of cost recovery firstly with global consideration and then with a focus on the South African case.

2.4 Cost recovery in South Africa

2.4.1 Cost-recovery issue in developing countries

2.4.1.1 Cost recovery: a controversial issue

From a general view of the literature on the subject, cost recovery seems to be a controversial issue among water supply and sanitation professionals (Cardone, R. and C. Fonseca, 2003).

On one side, specialists in water and sanitation services of the World Health Organisation and of UNICEF (followed by numerous developing countries professionals and politicians) argued that health and social benefit improvements justify the use of public and donor funds to deliver basic water and sanitation. However, some of these proponents concede that funds for operation and maintenance should be generated locally to avoid developing a dependence on assistance (a good example of perverse incentive as quoted above). Others insist on the fact that provision of basic services is a necessary requirement to diminish poverty and then bring affordability and willingness to pay.

On the other side, we find World Bank economists, for whom affordability and willingness to pay are preliminary requirements. Delivering water and sanitation services to those unable or unwilling to meet the costs is seen as a recipe for failure. Communities will not value or respect services in which they have no stake. Moreover, not being billed for a better level of supply, the non-served poor are already paying a high proportion of their incomes for poor quality water from water vendors or indirectly in lost productivity spending time to collect water from distant sources. Therefore, these economists argue that such consumers would be willing and able to pay for appropriate low-cost services, if these services are reliable.

South Africa seems to be divided between these two positions. On one hand, its legislation seeks to implement a national free basic water policy, recognising access to reliable water services as a basic right and condition for getting out of poverty. On the other hand, it insists on the importance of recovering the costs of water and sanitation services (at least partly) (section 10 of the Water Services Act (Republic of South Africa, 1997)) and DWAF and the WRC are leading several studies on the subject.[15]

2.4.1.2 How to define cost-recovery?

Another issue related to cost-recovery is how to define it. (Cardone, R. and C. Fonseca, 2003) give a simple definition: *recover all of the costs associated with a water system, programme or service to ensure long-term sustainability*. The problem is then to define sustainability. (Brikké, F., 2002) assumes that a system is sustainable if it is functioning, it delivers an appropriate level of benefits to all, it continues to function over a prolonged period of time, its operation, maintenance, administrative and replacement costs are covered at the local level, it only requires a limited but feasible external support and it does not affect the environment negatively.

In regards to cost recovery, various costs exist: financial costs (operating and maintenance costs, capital costs and cost of servicing capital), economic costs and benefits (lost value of water for other uses, gains from productive use, pollution) and support costs (capacity building, information and

[15] (for example: Effective cost recovery in a changing institutional and policy environment: municipal demarcation, the "free basic water" policy, and financially sustainable service delivery (Marah, L. et al., 2004) and Twelve Successful Cost Recovery Case Studies for Water Services in South Africa (DWAF, 1998)).

monitoring systems, regulation, planning and strategy development). The ways to recover these costs are also diverse: tariffs, subsidies, foreign development assistance, micro-credit, and community funds.

The traditional approach to cost-recovery often considers only the financial costs because they are the most tangible. National policy may then dictate which part of these costs should be recovered from consumers and makes tariff design and billing a crucial element in the recovery of financial costs. South Africa is a good example because the Water Services Act insists on the importance of setting tariffs as a way of making consumers cover a part of the financial costs. Few developing countries consider the economic costs of water services provision, which often leads to economic losses and environmental damages.

2.4.1.3 Major issues concerning cost recovery

Implementing a cost-recovery policy requires a minimum of information and conditions. The Expert Meeting on Cost Recovery[16] held in Delft, in January 2001, and a literature review on the subject, have highlighted a number of major problems concerning cost recovery (Brikké, F. and J. Rojas, 2001):

- Difficulty obtaining good cost data on water supply and sanitation
- Lack of awareness by communities of the costs of safe water and sanitation and who is responsible for meeting them
- Methodological problems with studies on willingness to pay and demand and with the way to derive equitable tariffs from willingness to pay and demand studies
- Tariffs do not (and often cannot) cover all costs (it would lead to tariffs unaffordable for the poorest art of the population).
- Equity objectives are rarely taken into account in existing cost recovery principles
- Regulation and enforcement are often poor
- Monopolies, political interference and cultures of non-payment,
- Poor management capacity of communities
- Misuse of funds.

As we will see in the following sections, we will encounter some of these issues in the water services policies implemented in the Water Services Authorities.

2.4.2 The issue of cost-recovery for water services in South Africa

South African regulations state that any Water Services Authority is obliged to recover all the financial costs linked to water services provision. Although cost recovery in water services is the subject of several studies in South Africa, it appears difficult to find a clear definition and calculation method in official documents. In *Twelve Successful Cost Recovery Case Studies for Water Services in South Africa* (DWAF, 1998), DWAF seems to consider cost recovery as the rate of the amount effectively paid by users of the total amount of payment expected (which corresponds most to a bills-recovery than to a cost-recovery).

A government notice to the Water Services Act (DWAF, 2001) specifies that a WSA must set its tariffs for water services taking into account at least the need to *(a) recover the cost of water purchases; (b) recover overhead, operational and maintenance costs; (c) recover the cost of capital not financed through any grant, subsidy or donation*, which means payments from users must mainly recover O&M costs. Moreover, the Water Supply and Sanitation White Paper (DWAF, 1994) asserts that *communities must pay for their operating and maintenance costs to ensure both equity and sustainability*.

According to these definitions, South African stakeholders of the water services sector consider cost recovery as a global concern. Indeed, difficulties in securing users payments, and a culture of non-payment, which took root in the struggle against Apartheid, considerably lower the payment rate.

[16] Meeting organised by IHE (Institute for Water Education, Delft) and IRC

Studies are currently (or have been) realised to assess what the main factors of cost recovery are. Capacity of local municipalities and water services providers' agents, community involvement, sanctions for non-payment and communication on the need to pay for water are usually identified as way to improve cost-recovery (Marah, L. et al., 2004)).

The following sections will assess to evaluate the cost recovery of the water pricing systems in use in the study area.

According to the information given in Introduction, the research questions underlined to the MUS project's objectives for this study can be sum up in three questions this study tries to answer:

- what is the institutional organisation of the domestic water sector
- what are the water pricing policies employed in the study area
- what are the water services networks conditions in this same area?

Information given in the previous helps to precise the second question. Indeed, we can try to

- evaluate in what extent the water pricing systems encountered in the study area fulfil the key-objectives of any water pricing policy, which mean, what are their position in term of cost-recovery, economic efficiency, affordability, equity, resource conservation, justified need, low administrative costs, identification of beneficiaries and perverse incentive.

The chosen methodology presented in the following section aims at answering these 3 three questions. The answers will be proposed in the final section (section 4).

3 Methodology

The approach chosen was designed in two following steps, the first ones helping building the following. For these reason, the strategy has changed from what it was primarily conceived. However, as it was a part of the study, the initial strategy will be exposed as well in this report.

3.1 First step: meeting with national stakeholders and literature review

The first step of the study was to identify some stakeholders of the domestic water services sector in South Africa. This step had two objectives: a) to increase and specify our knowledge of the institutional framework of domestic water services; b) to assess whether or not the planned following steps of the study were feasible and sensible.

A non-formal type of interview was opted for, meaning that no benchmark questionnaire was created but the purpose of each interview was decided according to the literature recently gathered and the interviews just done before. During these interviews, some information was systemically searched for:

- Their comprehension of the institutional framework of domestic water services in South Africa, and especially in rural areas
- Information known about domestic water pricing and cost-recovery in rural areas and especially in the Olifants River Basin (figures when they knew some or useful literature)
- Key-persons within the South-African domestic water services world the interviewee thought interesting for us to meet
- The role and action of their institution in the domestic water services sector.
- Their opinion about the second step of our research (survey at ward level).

As targets for our interviews we focused on government's departments, especially DWAF, consultants, researchers and NGOs. Results of these interviews are presented in section 4.1.

3.2 Choice of a level of analysis

The national-level interviews and of the first literature review had as outcome to specify and precise the second step of investigation. A ward-level survey was originally planned. It was put aside for a survey at water services authorities' level for the reasons that will be detailed in the section 3.2.2. However, as a large part of my time was dedicated to this first option at the beginning of my internship, it is worth explaining what the first survey consisted in.

3.2.1 The first option: a survey at ward level

To know the water pricing systems and costs of networks, in such a way of getting the more efficient statistical approximation and in order to estimate their distribution of the various types of water pricing policy, we first opted for a mailed questionnaire to a sample of wards (the lowest level of administrative delimitation), selected according to a stratified random sampling procedure.

3.2.1.1 Methodology justification

Choice of the ward as statistical individuals

With the South African census of 2001, wards are the administrative area for which information is available, especially socio-economic data. Moreover, selecting the lowest scale would have permitted to have a precise idea of the diversity of the water-pricing situation in the area.

Least-cost option

A postal survey is commonly considered as less costly both in financial terms and in term of time than a face-to-face or a phone survey. Moreover, the choice of a face-to-face survey would have significantly reduced the number of wards selected and for this reason the statistical meaning of the study.

3.2.1.2 Drawbacks

Responses rate

Every postal survey faces a low-response risk. In South Africa also, and perhaps even more in wards where development has not been reached at a high level and where answering such a questionnaire is overwhelmed by the priority of reaching basic rights. To illustrate this aspect, a survey realized at local municipality level in 2003 to evaluate cost-recovery of water services in South Africa (Marah, L. et al., 2004) can be quoted, where among the 234 municipalities asked to answer a postal survey, only 50 answered.

Problems of understanding

Given a) the low development level in the area targeted; b) the fact that all South African citizens are not obviously English-speaking, that languages spoken in South Africa are various and that sending questionnaire in each language present in the study area was not feasible; c) the fact that all individuals do not have the same comprehension of things, there was no getting away from the risk of misunderstanding, except from doing face-to-face interviews. But the number of wards to investigate (208), even after sampling, would have been too high to consider face-to-face interviews.

Incomplete or contradictory answers

It is also an inherent risk in all postal surveys. To minimise it, a follow-up and callbacks period should have been planned.

3.2.1.3 Principle and construction of the stratified random sampling

This procedure permits to highlight some particular aspects of the sample. To choose criteria for stratification of the ward population, we used two surveys made in France on domestic water pricing ((Agence de l'eau Seine-Normandie, 2003) and (Montginoul, M., 2004)) and the criteria that seems, from the previous literature review, to have an influence on water pricing and domestic water services costs in rural area of South Africa. It is important to notice too, that the number of criteria cannot be multiplied, because this would increase the number of layers in the sample, and therefore the size of the sample. The total number of wards to sample was 208 (wards included totally or partially in the former homelands of Lebowa and KwaNdebele in the Olifants River Basin).

Three criteria seemed of interest:

- Density of population
- The average income of the ward population. However, the census of 2001 does not give this information but the distribution of the total population according to their class of income. This does not make possible the elaboration of an average value. The variable *"ward where more than half of households earn less than R800 per month"* seemed to be interesting (R800/household/month being an indicator of extreme-poverty). But the totality of wards is in this case and therefore the criteria would have not been discriminating at all.
- Type of access to water. The census specifies the number of households that correspond to a specific type of access (tap in the house, tap in the house yard, communal tap, communal tap over 200m, borehole, access via surface water, rain tank,

and water vendor). The problem was to define a general and discriminating value. The percentage of households having a communal tap access and the percentage of households having a private access to water (both in the house and in the house yard) were supposed to influence a water pricing policy.

Finally, only the criteria density of population, percentage of household having a private connection and percentage of household having only access to a communal tap were selected.

However, despite the time spent in building of a stratified sample, this strategy was not applicable to the South African case, at least at the considered scale. The following section explains the main reasons of this change of strategy.

3.2.2 Reasons of a change in methodology

The main reason of this change was the better understanding we got on the institutional framework of domestic water services, through the first literature review, and the first-level interviews. Indeed, it appeared that the wards, although being an administrative demarcation, have very few responsibilities in term of water services. They seem to be more a facilitating demarcation for legislative issues (like a polling station). And though some studies advise to give a higher power (managerial, operational, technical and financial activities) to these decentralized geographical demarcation (Matji, M. P., 2003), the water services linked legislation, like the Water Services Act (Republic of South Africa, 1997) as well as the guidelines produced by DWAF (DWAF, 2003), do not even mention the role of wards in the domestic water services sector. The key-persons met during the first-level interviews confirmed this point of view, adding that, except the census data, very few information are gathered or kept at ward level.

According to the water services legislation , the lowest level of local authorities in term of water services are the Water Services Authorities (WSAs) (Republic of South Africa, 1997). These WSAs are local or district municipalities (see section 1.2.2.3 of the report), and are officially responsible for implementing bylaws in term of water pricing and for providing domestic water to all end-users, by themself or by contracting water services providers. For this reason, a survey at WSA level was chosen, with further investigation afterwards at water services providers level if necessary (that means, if there is any water services provider and if some information can be gathered on them at WSA level).

3.3 A survey at water services authorities level

The type of survey selected was a formal questionnaire to fill in with the interviewee during a face-to-face interview. The number of WSAs in the study area comes to 6, which make the meeting of one WSA responsible in each WSA possible. The questionnaire, quite long, was first sent by e-mail or fax a few days before the interview, to let the interviewee some time to have a look at the information needed. When other sources of information were available (like Water Services Development Plan report or Integrated Development Plan report), the questionnaire was reviewed in order to specify the questions and to shorten the interview (when these sources of information were obtained before the interview) or to complete the answers (in the other cases).

The treatment of answers, as it concerns only a set of 6 individuals, was planned to be qualitative, as it will be shown in section 4.2.

3.3.1 Identification of interviewees

The representatives of the WSA responsible for water services were identified in different way. Some of them were indicated as key-actors during the first step meetings. Some interviewees were identified contacting directly the municipality and asking for the responsible for water and sanitation services.

In some cases, it was also useful to contact the consulting firm responsible for the WSDP writing, sometimes only to have access to the document (it was necessary to explain the objectives of the study, its expected outputs and the nature of the institution to obtain the authorisation of using the document), and sometimes to gather information's complements.

3.3.2 Questionnaire construction

This questionnaire was built partly on the basis of two studies from the Water Research Commission (see Annexe 2). The first one (Marah, L. et al., 2004) aimed at making an assessment of the level of cost recovery in local municipalities and identifying which measures are the most effective in increasing the rate of collection. It used a national survey at local municipalities' level. The objective of second one, less useful than the other, was to determine the factors of costs of stand-alone community supply schemes[17] that ensure a sustainable management (Still, D. et al., 2003)).

The questionnaire was designed in seven sections:

1. ***General information***. This section asks basic information, about total population, served population. It contains also an open question about how the interviewee sees his role as a WSA.

2. ***Institutional arrangements between water services actors***. This section provides a table (question 2.1) that sums up the institutions responsible for the various functions of the domestic water services (extraction, storage, transport and distribution of bulk water, and treatment, quality testing and distribution to end-users of domestic water). For each function, the interviewee is asked to specify the nature of the institution and the evolution of their responsibilities in the next 5 years. This table aims at giving a clear overview of the current institutional framework, and, as the current situation regarding water services is changing, it gives an idea of the future changes (for example, in the case of the networks transfer from DWAF to WSAs or Water Services Providers).

The next question (2.2) requests also some more specified information about Water Services Providers acting in the WSA, such as the type of services they perform, the type of contract signed with the WSA and contact details. This question is asked in the purpose of knowing the relationships between WSA and WSP, especially about subsidies or fund transfers between both institutions.

Questions 2.3 concern the relational aspects of the WSA (persons employed for specific relationships with consumers or WSPs), in order to judge the ability of the WSA to deal with end-users' problems.

3. ***Financing***. The first objective of this section is to inquire about the subsidies (questions 3.1 and 3.2), their amount, source and destination. This information enables to judge the dependency rate of the WSA.

Questions 3.3 deal with water tariffs. They tried to specify who was in charge of tariff setting. Tables are provided to adapt to various possible situations (situation where the pricing structure depends on the networks, or/and on the population targeted). For a given situation, the interviewee is asked to specify whether the current water tariffs are a flat, volumetric or two-part rate.

The free basic policy, as a particularity of the South African water policy, seemed to be worth further explanation about the way this policy is implemented. For this reason, Questions 3.3.3 asked for a definition of the indigent population, an estimated percentage of this population in the WSA, the way water is charged and the mean used for targeting indigent people. Question 3.3.3.3 focuses on the volume of water consumed (the free basic water policy being a free amount of water of 6m^3/household/month for all people living in South Africa). These two questions give a good illustration of the level of statistical knowledge of the WSA on its own population.

[17] Stand-alone schemes are rural communal schemes that basically contain a borehole with a pumping system (this system can be hand-powered) and a reticulation from this borehole to end-users

Question 3.4 concerns expenses due to employment (administrative expenses). A copy of the water service specific section of the municipal account is also asked. If the WSA manages itself some networks, the question of financing of these networks is asked in the following question. Moreover, expenses and income related to such networks should appear in the municipal account.

4. ***Networks characterisation***. This section refers to networks fully or partially situated in former homelands. The interviewee is asked to fill a table with information about the working networks in the WSA. The table gathers technical information on networks in order to have an overview of the level of domestic water networks in place (length of reticulation, storage and treatment capacity, type of distribution, etc).

If the WSA manages some networks itself or if the respondent has precise information on network, he/she is asked to fill a network questionnaire in appendix 2. A network questionnaire corresponds to one network. In order to reduce the length of the interview, the interviewee is asked only for 5 networks of his/her choice. The network questionnaire reproduces in a simpler way the main questionnaire with: 1) some general information, like the location and the number of users; 2) the type of service provided (in-dwelling taps, communal taps, etc) and the global reliability of the network (cuts or breakdowns); 3) technical information (pipes diameter, pumping system, taps, reservoirs and other components) to establish a typology of existing networks; 4) tariffs: in the case where tariffs differ according to networks, this section, quite similar to section 3.3 of the main questionnaire, must be filled in; 5) financing: incomes and expenses related to the network

5. ***Investments***. In this section the WSA representative is asked to describe the main investments realized in the past 5 years. A description of the investment, the location, the number of users concerned, the total costs and the sources of funding are requested. These questions are a way to approach the capital costs of the WSA. Using a depreciation rate, it would permit to get the capital cost for the WSA. Moreover, it gives an overview of the way the WSA invests and of the funds that are used.

6. ***Difficulties in water services management***. This section proposes open-ended questions about the main issues faced by the WSA (non-payment, vandalism, illegal connection or others). It gives a better idea of the current WSA situation and priorities.

7. ***Multiple use of domestic water***. This section is just a tentative to sound out how the idea of multiple uses of water is received in such institutions. It asks for an estimation of the use of domestic water for non-domestic purposes (garden irrigation, small businesses, craft, others) in terms of volume consumed and number of households concerned. The two last questions concern the WSA's policy regarding multiple uses of domestic water and whether or not integration of the non-domestic uses of water is planned in the next years.

3.3.3 Data analysis

As there are only 6 WSAs to interview, a quantitative treatment is not possible. For this reason we chose to treat the answers in a qualitative way, trying to figure out to what extent the systems encountered (water pricing system in general) fulfil the criteria defined in the literature (see sections 1.3.1 and 1.3.3.1).

According to the cases encountered, Water Services Providers contracted by the WSAs would be contacted after the WSA interviews, mostly to gather information on the networks they manage in the study area.

However, the data collected about networks, if sufficient, would be treated in a quantitative way, with the aim of underlining effects of technical and social characteristics on various costs. As the source of information for networks may be diverse, the first work would be to smooth out data collected and convert them to have a homogeneous set.

3.3.4 Methodology justification

Choice of the WSAs

After the first set of interviews and the analysis of grey and academic literature, we chose to target the lowest level of responsibility, where we assumed to find the most comprehensive set of information. The WSAs being responsible for planning domestic water services, it was supposed they have the most relevant data in term of costs and investments.

Face-to-face questionnaires

The number of WSA representatives in the study area being only 6, it makes possible the meeting of all of them. Moreover, the face-to-face interview permits to keep control on the level of answer, to ensure the good comprehension of the questions by the respondent, and that he/she answers all the questions.

3.3.5 Drawbacks

Questionnaire length

The proposed questionnaire is indeed very long (22 pages) and with appendixes. In most cases it was not possible to reduce it because there was no other information available that would have permit to fill in some parts ahead, or the documents were given by WSAs only after the meeting. However, the whole questionnaire was seldom totally filled, not because of its length, but because the WSAs encountered rarely have all the information needed, especially about investments or networks. It usually took half an hour to one hour to fill this questionnaire.

Few individuals in the sample

Indeed, having only six WSAs in the study area do not permit to make any quantitative analysis. Therefore, the qualitative analysis was much more hazardous.

Problem of interpretation

Even a face-to-face interview does not totally prevent interpretation problems. Indeed, the term cost-recovery could be interpreted in two different ways: recovery of bills, and recovery of expenses. In general, each WSA's representative has its way to understand such a notion. This issue will be discussed further in the conclusion.

Results gathered through the interviews and the survey are presented and analysed in the following section.

4 Results

This section presents the main results of this study. However it is worth noting that a part of the results has already been used in section 1 in order to help presenting the context (principally treatments from the Stat SA census and information obtained during the first-step interviews).

The first section presents the organisation of the water services sector in the study area. Information used for this section was obtained during the first step interviews and during interviews at WSA's level.

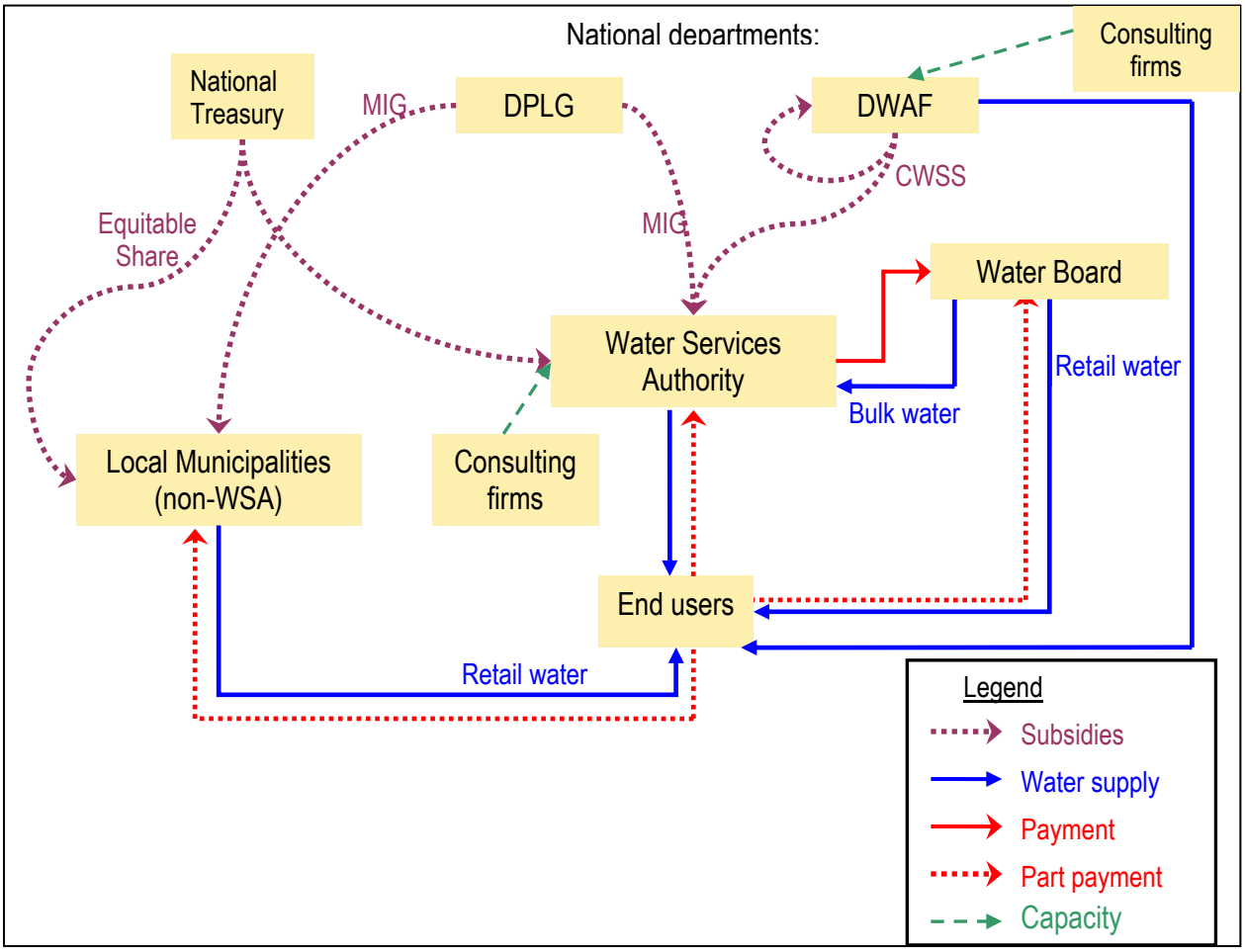
Section 4.2 presents the results and analysis of data obtained with the survey at WSA's level. These data are crossed and complemented by data from the Water Services Development Plans of the surveyed WSAs (when available) and by data from the Stat SA census (2001).

Section 4.3 presents the information on water services networks obtained during the survey at WSA's level and its analysis. In fact, we will see that the only information on this subject concerns networks formerly or still managed by DWAF. The 2003 functional assessment of DWAF is therefore the only source of data.

4.1 The institutional context of domestic water sector: from theory to reality

In the study area the water services sector organisation shows some differences regarding to the organisation proposed by official texts. Fig. 1 below shows the current organisation in the area.

Fig. 12- Institutional organisation of Water Services in the study area



homeland areas where municipal capacity is lacking. They actually play an important part in shaping provincial and local government decisions (Webster, M., 1999). In the study area, these consulting firms carry the elaboration and writing of development plans for water services in most municipalities.

No private Water Services Providers are contracted in the area of interest. DWAF, Water Boards, Local Municipalities or WSAs themselves are mainly responsible for water services provision. Section 4.2.2 in the following part of the report presents the details of this organisation.

4.2 Analysis of the survey at Water Services Authority level analysis

In a first time, we will highlight the diversity of situation encountered. Then, in a second time, information gathered with the survey at WSA level will be analysed in the perspective of the objectives of water pricing-subsidy presented in section2.

The status of the WSA surveyed are diverse: 3 of them are Local Municipalities (LM), whereas the 3 others are District Municipalities (DM). This can make a difference regarding the types of subsidies they receive. Indeed, even if it makes no difference regarding Equitable Share and MIG, District Municipalities receive a regional levy that Local Municipalities do not receive. This regional levy is not specific to water services but can contribute to expenses related to water services. Nonetheless, Local Municipalities often managed water, sanitation, electricity and refuse removal services that District Municipalities do not provide, and therefore earn an income the DM do not have. This situation can also become a source of conflicts when a DM acting as WSA has to dictate a water tariff policy and sign agreement with LMs that already use their own water pricing system.

4.2.1 Socio-economical characteristics of the WSAs

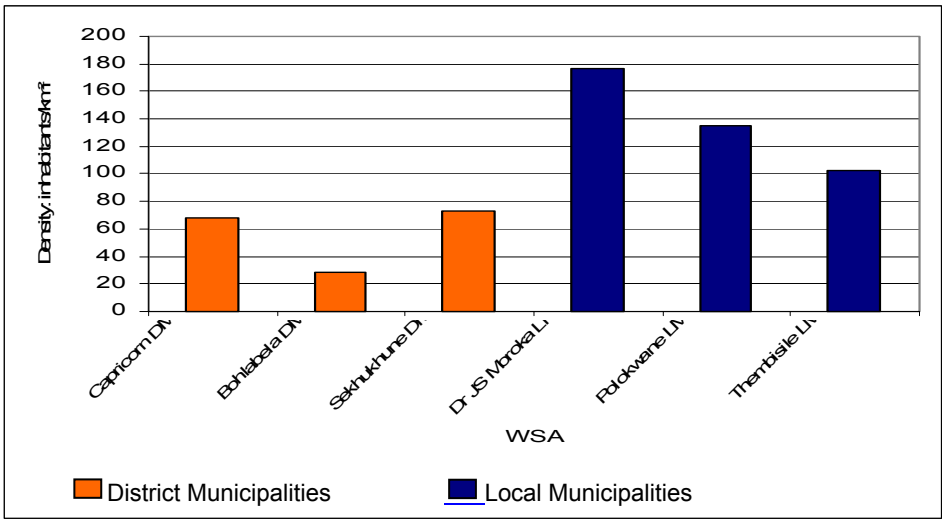
4.2.1.1 Population

As the size of the WSAs surveyed is ranging from 1 375 to 27 108 km², it is difficult to compare their total population. However, it is interesting to have a look at the population densities. The situation here is diverse, and the higher density is found in the local municipalities (see Fig. 13 below). We assume that this situation can be explained by the geographical and historical background of each of these WSAs. Indeed, the district municipality of Bohlabela for example includes a part of the Kruger Park[18]. Mountains (Drakensberg), which cross the Olifants River Basin, also reduce the space available for human settlement, especially in Sekhukhune DM. The high density of population in Thembisile LM and Dr J.S. Moroka LM may be inherited from their former status of homeland (the former homeland of KwaNdebele was exactly situated in the place of Thembisile LM and Dr J. S. Moroka LM). In Polokwane LM, the town of Polokwane, capital of Limpopo province, explains the higher density (see Annexe 3 for location).

To sum up, it can be assumed that the density relatively lower in the DMs results of the juxtaposition of areas densely inhabited (like the LMs met) with empty areas (shown in Fig. 3). For this reason, the general information obtained at WSAs' level do not obviously corresponds to the only zones of our study area.

[18] The Kruger Park is the largest wildlife conservation park in South Africa and attracts a lot of foreign tourists.

Fig. 13- Population's density surveyed WSAs



In its most parts, the study area is rural. All municipalities do not have statistics concerning population in rural areas. While this information is not available for Thembisile LM, figures can nevertheless be given for the other WSAs. The proportion of rural population ranges from 72% (Polokwane) to 94% (Sekhukhune and Bohlabela DM).

The population in these six WSAs is also frighteningly poor. The WSA's representatives gave an estimation of the proportion of indigent in their area of jurisdiction. However, as it will be seen later, all municipalities do not have the same definition of an indigent. Therefore figures must be compared cautiously. Table 1 gives the proportion of indigents in the WSA surveyed with the definition of indigent in use in the WSA.

Table 1- Proportion of indigents and indigent definition according to WSA

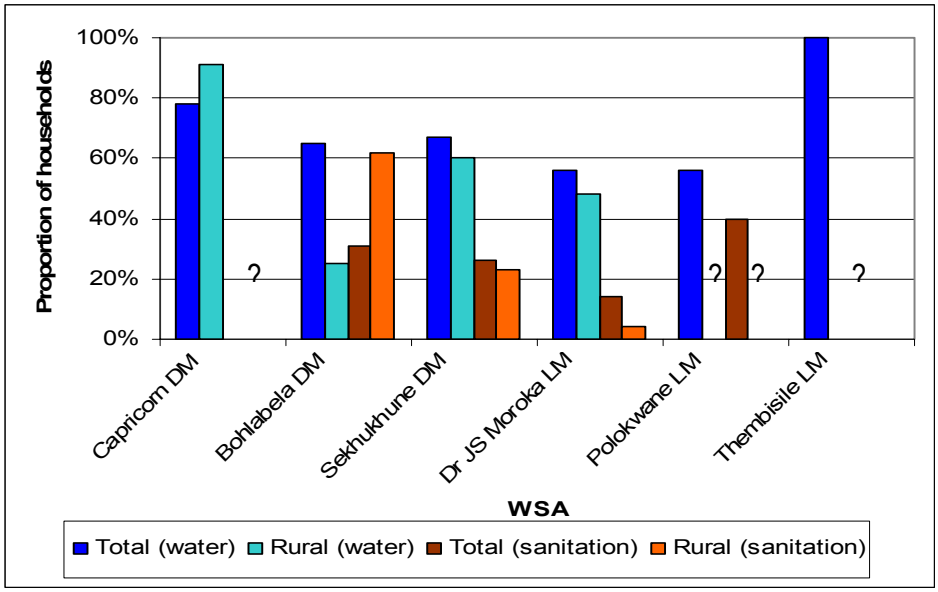
	Definition of indigents	Proportion of indigents
Capricorn DM	Household earning less than R 1100/month	88%
Bohlabela DM	Household earning less than R 1100/month	80%
Sekhukhune DM	Household earning less than R 1100/month	75%
Dr J.S. Moroka LM	Household earning less than R 800/month	65%
Polokwane LM	Household earning less than R 1300/month	70%
Thembisile LM	Household earning less than R1500/month	No data

Dr J.S. Moroka LM shows the lowest value. However, it also has the lowest threshold of income to define indigent household. Polokwane Local Municipality has also a lower proportion of households, which can be explained by the presence of the town of Polokwane, a former "white" town, where it can be assumed that incomes are generally higher than those in rural areas.

4.2.1.2 Access to water & sanitation

The representatives we met were asked about an estimation of the access to water in their area of jurisdiction. The WSDP (when available) gives also the number of households served with water and sometimes with sanitation. Fig. 14 below gives the distribution of the proportion of households served with water and sanitation.

Fig. 14- Proportion of households served with water and sanitation in each WSA



Note: The question marks highlight missing information. The proportion of household served is calculated regarding the total number of households. The proportion of household served in rural area is calculated regarding the number of rural households.

Only the WSA of Thembisile has a full access to water. However, these figures do not specify the type of access to water. A 100% of access is very different if it is 100% of access with a level of at least a community stand at less than 200m from the house (RDP level) or if it is an access via water vendors or a much removed community stand. The only source of information about level of access to water is the 2001 Census (see Annexe 5). However, it can be assumed (and hoped) that the situation has changed since 2001.

The rural population is in general not served as well as the total population (with the exception Capricorn DM). This trend seems to exist for sanitation too. But with only 3 WSAs with data and one with a surprising good access to sanitation (Bohlabela DM), we can only make suppositions.

4.2.2 Institutional organisation of the water sector

This section intends to present the diversity of situations encountered in the study areas (in reality not as diverse as it was thought at the beginning of the study regarding the number of options proposed by the legislation. We can remind here that a WSA has the choice of appointing any institution of any nature to provide water.

Table 2 presents the different arrangements in place in the surveyed WSAs (for details see Annexe 4).

Table 2- Water and sanitation services providers in the surveyed WSA

	Bulk water providers		Retail Water Providers		Sanitation Providers	
	Whole WSA	Study area only	Whole WSA	Study area only	Whole WSA	Study area only
Capricorn DM	Water Board (Lepelle Northern Water) and DWAF		DWAF Local municipalities	Local municipality in town (Lebowakgomo)	DWAF Local municipalities	Local municipality in town (Lebowakgomo)
Bohlabela DM	DWAF		DWAF Town municipality (Hoedspruit)		Town municipality (Hoedspruit)	None
Sekhukhune DM	Water Board (LNW and ERW)	Water Board (LNW)	Water Board (LNW and ERW)	Water Board (LNW)	Water Board (ERW)	None
	Water Users Association (Lebalelo WUA)		DWAF		Local municipalities in towns	
	Local municipalities in towns		Local municipalities in towns			
Dr J.S. Moroka LM	Water Board (Ikangala Water) and DWAF		DWAF & WSA		DWAF & WSA	
Polokwane LM	Water Board (Lepelle Northern Water) and DWAF		DWAF & WSA		WSA	
Thembisile LM	DWAF		DWAF & WSA		DWAF & WSA	

Note: LNW = Lepelle Northern Water and ERW = East Rand Water

There are 4 types of water services providers: a national department DWAF, Water Boards, which are public bodies, Water Services Authorities acting as services providers and Local municipalities (when the WSA is a district municipality). The WSAs involved in the study area do not show example of agreement between WSA and private companies or Community-Based Organisations.

However, it is important to notice that the present situation can change in the next years. Indeed, DWAF is transferring its schemes and responsibilities in term of water and sanitation services provision and should soon retire from the water services sector's as services provider. Moreover, all these WSAs (with the exception of Polokwane LM) are still in the section 78 of the Municipal System Act process (Republic of South Africa, 2000), which means they are still in the process in identifying their future water services providers. It is not clear whether local municipalities performing water services provision in very localised area (in general, towns) will remain water services providers, particularly since some DM WSA see the local municipalities' activities as an encroachment on their responsibilities.

The situation is also complex for Water Boards (for a map of Water Boards, see Annexe 6). Three Water Boards play a part in our study area (or at least two, as East Rand Water provides water only in former white towns), and it seems that their development may differ. Indeed, Lepelle Northern Water will probably become part of a public-private agreement with WSAs (Sekhukhune DM probably). Ikangala Water Board, according to one of the WSA representative met, would be progressively integrated in DWAF (but this statement, which could not be checked, is to be taken cautiously).

4.2.3 Domestic water pricing policy diversity

For this part again, the situation shows a range of complexity level regarding to the water pricing policy implemented.

4.2.3.1 Subsidies

Two main sources of subsidies can be identified: the Equitable Share (ES) (National Treasury) and the Municipal Infrastructure Grant (MIG) (DPLG). According to the WSDP for Bohlabela DM (Tumber Fourie Consulting Engineers, 2003), at the time the WSDP was written, the District received a Community Water Supply and Sanitation grant from DWAF, which was directly used by DWAF for infrastructure implementation.

Information also lacks for Polokwane LM and for Thembisile LM, where only a total amount of subsidies for water is available. Nevertheless, the Municipal Demarcation Board website[19] of Stat SA gives the amount of subsidies received for each municipality (local and district) and for each type of subsidies. Both municipalities receive ES and MIG but we do not know in what extent they are used for water and sanitation services.

Table 3 presents the subsidies and the proportion used for water services.

Table 3- Subsidies used in the surveyed WSAs for water and sanitation services

	Benchmark year	Subsidies for water and sanitation	Amount used for water	Proportion of the total subsidies for water	Total amount	Proportion of the total subsidy paid to the WSA
Bohlabela DM	2002-2003	- MIG - ES - CWSS	R 28 000 000 R 32 200 000 R 28 000 000	32% 37% 32%	R 70 875 315 R 88 674 696 R 28 000 000	40% 36% 100%
Capricorn DM	2004-2005	- MIG - ES	R 37 440 000 R 5 760 000	87% 13%	R 103 264 606 R 135 207 187	36% 4%
Sekhukhune DM	2004-2005	- MIG - ES	R 144 000 000 R 16 400 000	90% 10%	R 157 882 591 R 119 515 161	91% 14%
Dr J.S. Moroka LM	2004-2005	- MIG - ES	R 20 950 000 R 650 000	97% 3%	*No data* R 10 784 917	*No data* 6%
Polokwane LM	2004-2005	- MIG - ES	*No data*	*No data*	R 26 313 801 R 28 369 910	*No data*
Thembisile LM	2004-2005	- MIG - ES	R 169 000 000	*No data*	*No data* R 11 923 181	*No data*

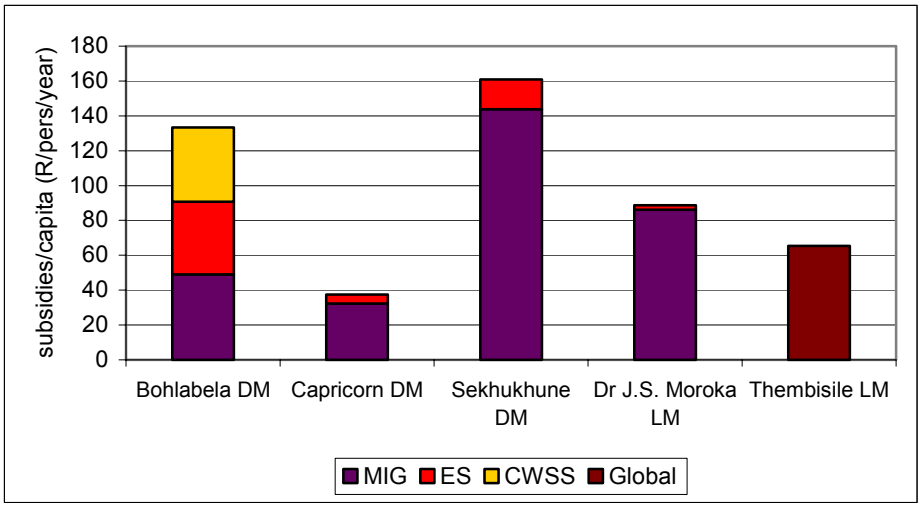
Source: Demarcation Board for total amount of subsidies, WSDPs and survey beside WSAs

The ES represents only a little part of the total subsidies (37% at most), which is surprising given that the ES is one of the only sources of income for the municipality in term of O&M (the three DM do not apply any water tariff). The WSAs are free to use the ES as they want. Though, a very small part of it seems to go to water services provision. One of the WSA representatives qualified as a “struggle” the negotiations about the sharing of the global ES among different services.

When plot against the number of inhabitants, the amount of subsidies received by WSAs shows a large variability, as shown in Fig. 15.

[19] http://www.demarcation.org.za/municprofiles2003/index.asp. The information comes from the DPLG and the Department of Finance.

Fig. 15- Subsidies for water services per capita in surveyed WSAs[20]



Source: Demarcation Board for total amount of subsidies, WSDPs and survey beside WSAs

The amount for water for Capricorn DM is particularly low, probably because a too high part of the Equitable Share is used for another purpose than water. The MIG amount could probably be overestimated.

4.2.3.2 Water tariffs

Almost each WSA has its own water pricing policy from the most complicated (a block tariff with location conditions) to the simplest (no tariffs at all because not implemented yet or too expensive to implement). Nonetheless, it is worth noting that all the WSAs are not at the same stage of implementation of the legislation. Some are still drawing and submitting to their council their water services pricing policy. For this reason we present not only the current tariffs but also the planned ones (when available) (see Table 4).

[20] Note that for Bohlabela the reference year is 2002/2003, and 2004/2005 for the others.

Table 4- Diversity of water tariff applied in the WSAs of the study area

	Current water tariff	Future tariff to be implemented
Capricorn DM	*No tariff*	*Increasing Block Tariff*: At least 2 blocks with the first step from 0 to 6 m^3/month for free
Bohlabela DM	*No tariff* (except Hoedspruit)	*No tariff*
Sekhukhune DM	*No tariff* except a pre-paid tariff applied by Lepelle Northern Water and some Local Municipalities (Greater Goblersdal, Greater Marble Hall and Greater Tubatse LM, in former White areas)	Under discussion
Dr J.S. Moroka LM	No tariff, except for 17% of the population in the town of Siyabuswa, who are charged a global amount of R 50/month for water, electricity and refuse removal	Probable implementation of *meters*
Polokwane LM	*Complex Increasing Block Tariff*: - First step consumption < 5 m^3/month: R 2.07/m^3/month - Second Step consumption between 5 m^3 and 100 m^3: - If urban: R 4.5/m^3/month - If semi-urban: R 3.8/m^3/month - If rural: R 3.2/m^3/month - Third Step: consumption over 100 m^3: R 5.82/m^3/month	Probable simplification of system but still a block tariff structure.
Thembisile LM	*Flat rate*: R25/month/household	No change planned

It is also interesting to note that, while the WSA is responsible for implementing tariffs in its area of jurisdiction, some local municipalities (when the WSA is a DM) apply their own tariffs in very localised areas (in general small former white towns, with the exception of Lebowakgomo in Lepelle-Nkumpi, which is a town located in the former homeland of Lebowakgomo). Lepelle-Northern Water too, has implemented in rural area a pre-paid system specific for each village (mostly in Sekhukhune DM).

What to say about this presented water-pricing systems? Before analysing them, it is important to realize that it remains difficult to compare tariffs when you do not know to what type of access it corresponds. Therefore, in our analysis, some assumptions must be made.

A no tariff system

The most surprising is probably the "no tariff" system. It is obviously the less costly in term of cost of implementation, and knowing that according to consultant studies, the average amount of water consumed by household is far below 6m^3/month[21], it certainly respects the free basic policy.

But this strategy is indeed worrying in term of cost-recovery. Moreover, knowing that in some areas depending on specific water providers, water users are charged (Sekhukhune DM), it raises the question of equity within a same WSA. However, in this case too, it depends on the level of service provided: a relevant and efficient service may justify a payment from users. A study led on the Steelpoort river basin (in Sekhukhune DM WSA) and using contingent valuation to assess consumers' willingness to pay (Banda, B. M. et al., 2004) estimates at 22.3 R/month/household the willingness to pay for a higher quantity of water in rural areas (where most of households have access to water via communal stands).

[21]BKS (PTY) LTD (2005): "Sekhukhune District: Regional Strategy and Infrastructure Plan, *Draft Report*," 77p. recommends a basic amount of water of 3m^3/month/household, according to the average consumption and the size of households

Flat rates

The two examples of flat rate[22] encountered seemed rather high compared to examples taken from the existing literature on this subject. Indeed in the study that analyses twelve successful cost recovery systems (DWAF, 1998), the flat rates presented for rural communities case studies (throughout South Africa) ranged from R1.4 to R15/month/household.

In this case again, the tariff does not take into account the level of services. For Thembisile Local Municipality (the only WSA that has a flat rate for the whole population), the 2001 Census data clearly show that different accesses to water exist, (see Annexe 5). Indeed, if 66% of the population is served with an inside yard access, 4% receive water directly in their house, and the last 28% receive water from communal stand or even have no access at all (only 2% yet).

Polokwane LM's pricing system

The tariff implemented by Polokwane LM seems to be the fairest among the 6 WSAs, even if it does not directly take into account the different levels of services, it at least differentiates the tariffs according to the volume consumed. However, a study of water demand (Banda, B. M. et al., 2004) shows that even if in urban areas the better is the access to water, the more users consume, it do not seem to be the case for rural consumption. Moreover, it is difficult to give an evaluation on its efficiency to prevent water wastage without doing a study of demand.

This water pricing system also differentiates between the localization, rural tariffs being lower than urban tariffs. At first sight, providing water in rural area (especially in scattered settlements) could be assumed to be more expensive than in urban area where settlement are more grouped. However, it can also be assumed than the level of access in rural and urban areas is not the same (the access being better in urban areas). Unfortunately, the distribution of the type of access according to the location (urban or rural) necessary to prove this assumption is not available from the Stat SA Census or other source. The distribution of water access for the whole municipality however shows that at least 49% of the population does not have any private access to water (see Annexe 5).

4.2.3.3 Free Basic Water policy

The Free Basic Water policy (FBW) is the responsibility for all WSAs to provide a free amount of water of 6 m^3 per household and per month available at less than 200m of the dwelling (with an average household size of 8 persons). This policy applies to every resident in South Africa. Knowing that, this policy does not reach the objective of targeting the beneficiaries since all South Africans are eligible (making the assumption that every WSA and WSP respect and apply the FBW policy). This "strategy" is indeed the least expensive in term of administrative costs.

However, the reality seems more complex than the theoretical framework. Each municipality in our study area has its own interpretation of the FBW policy. Table 5 shows the various strategies encountered.

[22] For Dr J.S. Moroka, we only have a global rate. The proportion going to water & sanitation is not known as the whole fee goes to the infrastructure budget. We assume it at least represents the half.

Table 5- Implementation of the Free Basic Water policy in the studied WSAs

	Current FBW Policy	Planned FBW policy
Capricorn DM	None (however, we can assume the free basic amount spread beyond the 6m^3 and that therefore, the FBW policy is respected)	- Water from community stand free - Private connection free but installation of meter and same pricing structure as above (see Table 4) (with the first 6m^3 free)
Bohlabela DM	Water free (except Hoedspruit)	/
Sekhukhune DM	Diesel & electricity paid by the WSA (to supply an average of 4 m^3/month/hh) - except when specific WSP (LM, Lepelle Northern Water)	Installation of pre-paid meters
Dr J.S. Moroka LM	None (Water free, except for 9000 households)	Installation of pre-paid meters
Polokwane LM	All indigent households receive a R100 grant for all services (including electricity…)	/
Thembisile LM	None	Not specified yet

The sign "/" means the municipality does not intend to implement a new FBW policy.

Some WSAs being still young, they do not have implemented any FBW policy yet (Thembisile, Dr J.S. Moroka, Sekhukhune and Capricorn). Bohlabela DM has a clear intention not to implement any policy, its water tariff being a zero rate.

The Local Municipality of Polokwane takes some liberties with the free basic policy. Indeed, only households registered as indigent receive a grant that can balance their budget for water. Moreover, this grant does not ensure the amount consumed for free is only 6m^3/household/month and depends on the amount spent on electricity and refuse removal. For information, according to Polokwane LM's tariffs, the consumption of 6 m^3/household/month costs 14.85 R/month to a household in urban areas, 14.15 R/household/month in semi-urban areas and 13.55 R/household/month in rural areas.

4.2.3.4 Investments and conclusion on financial information

We did not succeed in gathering information about investments. The reasons are diverse: economic appraisal may often not exist (there is only technical feasibility report) or not be available, or a municipality has a hundred of scattered investments, which are difficult to list. Only Bohlabela DM was able to give us a list of infrastructure investments.

To finish this section, we can insist on the fact that lots of financial information is missing or difficult to find out. Yet it is not only a difficulty for researcher (or trainee) but also for decision-makers and water services managers. As it will be seen in section 4.2.5, insufficient or inadequate level of information can turn out to be an obstacle to design an appropriate water tariffs or Free Basic Water policy. Financial information is necessary for planning investments and setting tariff. Studies of demand would also be needed to ensure that the level of services and the way they are priced respond to the expectations of users.

It is also interesting to note that some other sources of income may have been missed out. Indeed, the district municipalities receive their own fund from regional levies. An amount of this fund can be used for water and sanitation services (this seems to be the case for Capricorn DM even if the figure is not known). However, if this income from regional levies appears in the financial information of the Municipal Demarcation Board, it does not appear in the WSDP and was only quoted once during the survey.

The last point that can be observed is that none of the surveyed WSA seems to use any loan for investing in new and improved water services. As I do not know well enough the financing system of local government, I am not able to make any conclusion. Indeed, it is possible that DMs or LMs do not have access to any loan, whatever the type of investment. This could be the subject of another study.

4.2.4 General issues

4.2.4.1 Difficulties in domestic water services management

The WSA representatives were asked to point out the main difficulties they face in the management of domestic water services. Some of them, who have already implemented a billing system, see non-payment as a major issue, since it prevents the WSA to balance its expenses with its incomes, whether they come from users' fees or subsidies.

Some WSAs face also vandalism problems (2 out of 6), which can be interpreted either as a refusal to pay for water or as the expression of users' discontent regarding the quality of services or the heritage of past behaviour. Illegal connections (or non-formal connections) are also a concern in the majority of the surveyed WSAs, because it is a service the contraveners do not pay, because it leads to loss of water in a region where water is scarce and moreover because it disrupts the normal functioning of the network (pressure drop). Scarcity of the resource is also an issue for some of the WSAs, where the amount of water easy to mobilize is not sufficient compared to users requirements. The general decay of present infrastructures and for some of them the deficiency of capacity of staff are the last difficulties encountered by WSAs in the provision of domestic water.

4.2.4.2 Multiple-use of domestic water

In order to test whether or not the problem of the use of domestic water for a non-domestic purpose was known or not by decision-makers, few questions were asked. All WSA's representatives recognize the use of domestic water for non-domestic purpose mainly for gardening and small businesses (car washing, and small cafés). Reactions towards these uses are various. For the most part, decision-makers recognize these uses as a problem, essentially because of the scarcity of water, but they do not consider their regulation as a priority. However, they plan to take measure to regulate such behaviour (in general, a registration with a specific tariff).

4.2.5 Water policies relevance regarding key-objectives

In this section, we try to synthesise the information about water pricing and subsidy policies of the surveyed WSAs, and to rate them using the criteria presented in section 1.3 of the report. To remind them, these criteria were cost-recovery, economic efficiency, affordability, equity, justified need, low administrative costs, precise identification of beneficiaries and no perverse incentive. For each WSA, the level of each criterion (low, average and high) is assessed. Synthetic results are presented in Fig. 16 in the section 4.2.5.2. Given the lack of financial information on water services, this analysis should only be considered as a first attempt to assess water-pricing policies in the study area.

4.2.5.1 Water pricing policies regarding the key-objectives

Global objectives

Here are the objectives regarding global domestic water pricing policies.

- Cost recovery

As shown in section 1.3.4.2 of the report, cost recovery can be considered from different ways. The South African literature on this subject seems to consider cost-recovery from its financial point of view

(expenses must be recovered by incomes). Furthermore, it seems to prioritise the recovery of operating and maintenance costs by the income from users.

Considering that WSAs often do not have any accounting system, it is difficult to assess the effective recovery. It is also difficult as part of the water services is not directly provided by the WSA but by other institutions (DWAF, Lepelle Nothern Water, Local Municipality). For this reason we will try to estimate a cost recovery (recovery of O&M costs from users and global financial cost recovery) from data available in the WSDP and WSAs' representatives' interviews.

The cost recovery was calculated as the percentage of the expenses considered (O&M or total expenses) with regard to the income considered (water fees collected or total incomes).

The formulas below explain the cost recovery calculation.

$$\text{Cost recovery 1} = \frac{\text{Water fees collected}}{\text{O \& M expenses}} \times 100$$

$$\text{Cost recovery 2} = \frac{\text{Total incomes}}{\text{Total expenses}} \times 100$$

Table 6 below presents the two rates of cost recovery for the surveyed WSAs (figures used for the calculation and additional information about them are shown in Annexe 7).

Table 6- Cost recovery in the six WSAs of the study area

	Cost recovery 1	Cost recovery 2
Bohlabela DM	0%	39%
Capricorn DM	0%	25%
Sekhukhune DM	0%	?
Dr J.S. Moroka LM	0.005%	24%
Polokwane LM	8%	33%
Thembisile LM	?	?

As we can see, as some information is missing (especially expenses from a specific accounting system for water and sanitation services), some rates cannot be calculated. The operation and maintenance expenses for Thembisile would particularly be interesting to give an idea of the cost-recovery rate 1. According to the representative for Thembisile, the municipality does not recover all operating costs with the payment from users. For this reason its cost recovery rate (1) can be qualified as low or average.

Cost recovery 1 is globally low, even in Polokwane LM. However, for Polokwane the figure is based on estimation of the municipality's water services expenses (done in Polokwane's WSDP), and therefore the O&M costs may be overestimated. For the three district municipalities, the no-tariff policy is clearly responsible for the absence of cost-recovery.

Even if one takes into account the total income and expenses, the WSAs do not reach the full cost recovery (at least for the WSAs for which information is available).

- Economic efficiency

Without any analysis of demand, and of effects of water pricing policies, it is impossible to judge the water pricing policies of the surveyed WSAs on this criterion.

- Affordability

Evaluate affordability requires an analysis of the households' budget (refer to section 2.1). This would involve a survey of water demand at household level (which we did not have the time to do during

this research). However, the 2001 Census data can be used to extract an estimate of households' income[23] in the municipality. In any case an income can be considered as a budget (a part of the income is levied for taxes for example and cannot be considered as the total amount of money a household can really spend) but it may permit to have an idea of the value represented by water compared to income.

Affordability is of course easier to evaluate for WSAs that do not apply any tariff (Sekhukhune, Capricorn and Bohlabela DM). A zero tariff cannot be an economical obstacle to fetch water. These three municipalities can be evaluated as good for this objective.

If the WHO criterion, according to which water tariff should represent less than 5% of a household budget (see section 1.3.1) is considered, the tariffs implemented in Thembisile and Dr J.S. Moroka LM seem too high for a part of the population. . According to the 2001 Census in Thembisile 40% of the households earn less than R 400/month, and 44% in Dr J.S. Moroka (see Annexe 8). 5% of R400 represents R 20. The tariff proposed by Thembisile LM is over these 20R/month/households. For the few households charged for water in Dr J.S. Moroka LM, affordability of water services is more difficult to assess because households pay a global rate for several basic services, including water. However, if only half of this amount is dedicated to water, it goes beyond 5% of the income of 44% of the households. Nevertheless, due to the census approximation[24], it is appropriate to moderate our assumption.

For Polokwane LM, a household consuming 6 m^3 per month in urban area pays R14.85 and R13.55 in rural area, which represents less than 5% of an income of R400/month (23% of the households earn less than 400R/month).

- Equity

Equity is difficult to assess due to its various definitions. However, information given in section 4.2.3.2 about pricing systems can give us some pieces of answers. The fact that all users are not charged the same way can be seen as inequitable (especially when some of the users are not charged at all). But as it has been said, a different level of service can justify this. Keeping this idea of a different level of service, applying a flat rate whatever the access to water is highly inequitable (this is the case for example for Thembisile LM).

Polokwane LM's water pricing policy seems to be the most equitable, as all users are charged the same rate. It is also fair since indigent people receive a grant to cover charges linked to basic needs.

The four last objectives concern more specifically subsidies policies.

Subsidies' objectives

- Justified need

As presented in section 1.3.3.1, this objective is difficult to evaluate, and would require an analysis of users' demand. However, considering that, in the study area, more than half of the households live with an income below R800/month, subsidies received for domestic water can be considered as justified, at least for this part of the population in most of the cases encountered.

Considering that during all the apartheid period virtually no investments were made in water services in the homelands areas, these subsidies are also justified in a political point of view. These subsidies are necessary to made up the important backlogs regarding the "white" areas, which had benefit from subsidies in the past.

[23] The 2001Census 2001 considers the gross income (income from investments, private business, income from the sale of home-grown produce or home-brewed beer or cattle (informal) and payments from a person working or living elsewhere) before tax.

[24] These data must again be interpreted cautiously. Indeed, Stat SA warns the users about the relevance of income data: "*Census 2001 collected income information […] without probing about informal income, enterprise profits or income in kind. As a result, the census income is understated for most of the population.*"

- Low administrative costs

The WSAs that have not implemented any free basic water policy or that only apply a zero rate have certainly the lowest administrative cost (Sekhukhune, Capricorn and Bohlabela DM and Dr J.S. Moroka and Thembisile LM).

However, Polokwane LM because its grant targets a specific category of people, has certainly higher administrative costs. However, it is impossible to evaluate the part of administrative costs due to the administration of the grant, with the available information.

- Precise identification of beneficiaries

By definition, the free basic water policy is a non-conditional policy, which means that all residents in South Africa can benefit from it. Polokwane LM, which interpret differently the FBW policy, apply however a more precise identification of beneficiaries.

- No perverse incentives

The no-tariff policy, and more generally the FBW policy are particular concerns regarding this objective. Indeed, both policies (which are linked) bear the risk of increasing the non-payment culture. Indeed, some places are heavily marked by the apartheid period when not pay for water was used as an act of pressure on the government, and they still refuse to pay for water (it seems to be a problem in Dr J.S. Moroka LM). Modifying users' attitude will probably require communication campaign to explain and promote the need to pay for water.

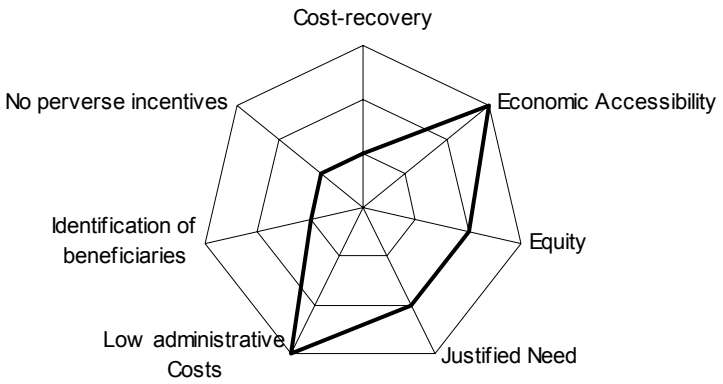
With its increasing block tariff, the water pricing policy of Polokwane LM is probably the policy that meets the best this objective. But on this point too, a study of domestic water demand would confirm the positive or negative effect of such a pricing policy on users' behaviour.

4.2.5.2 Global assessment of the water pricing policies in surveyed WSAs

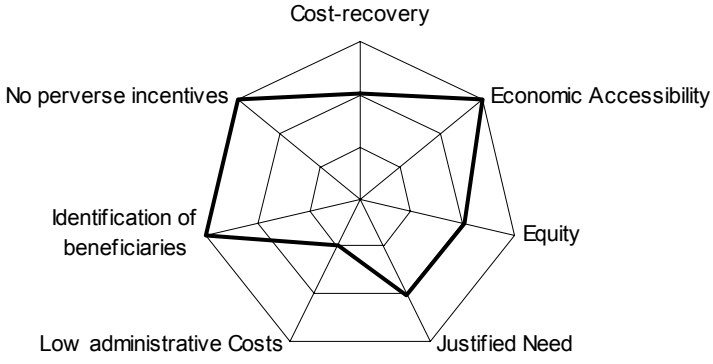
The information gathered and interpreted in the previous section permit to draw up an assessment of the water services policies encountered in the study area. Annexe 9 sums up this evaluation in a table used to build the diagrams presented in Fig. 16. The objective "economic efficiency" has not been represented. For some objectives, as a quantitative evaluation was not possible, the analysis is only based on qualitative assessment.

Fig. 16- Evaluation of water services pricing and subsidy policies in the surveyed WSAs

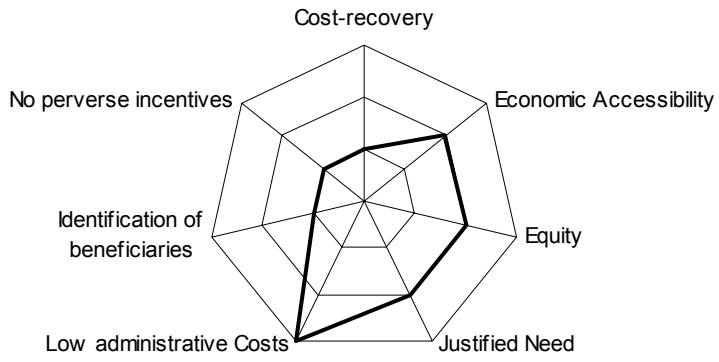
Bohlabela, Capricorn and Sekhukhune DM



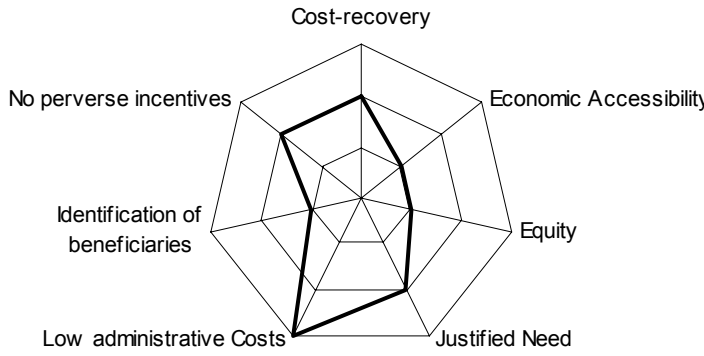
Polokwane LM



Dr J.S. Moroka LM



Thembisile LM



To simplify we can assume that there are three types of water pricing policies in the study area. The most common is the one used in Bohlabela, Sekhukhune and Capricorn DM and Dr JS Moroka, which is very near. It prioritises the simplicity of the policy and the objectives of affordability and low administrative costs probably to the detriment of economic efficiency and of durability. For this reason, it may create problems in the future if this policy is pursued.

Thembisile LM's policy tries to reach the best cost-recovery but to the detriment of equity and affordability for all its inhabitants.

Polokwane LM's policy is the most successful in reconcile the various objectives and would probably worth a more elaborate analysis at long-term to evaluate its effect on demand and durability.

Water pricing policies used in the study area are not optimal (insofar as applying an optimal water pricing policy is possible). Anyhow, even for decision-makers, lack of data, especially financial data, makes difficult any evaluation and planning of water pricing policies. As the following section will expose, information about networks was also difficult to gather.

4.3 Information on networks

Before starting the interviews, we were not sure of the diversity of networks management. It appears that DWAF was one of the main water services providers in the study area. Even though some local municipalities or town manage some networks, financial and especially technical information weren't available, unless you spend days registering information from old out-dated technical maps. Regarding the former[25] DWAF schemes however, some information was available, not exactly those wanted or in the wanted shape but sufficient to make a typology of networks and to analyse their diversity.

4.3.1 Networks presentation

In terms of the Constitution promulgated in 1996, and the Water Services Act (Republic of South Africa, 1997), municipalities have the legislative responsibility to supply water in their areas of jurisdiction. The Department of Water Affairs (DWAF), who managed domestic water schemes during the transition period after the apartheid has initiated processes where schemes falling within the jurisdictional boundaries of capable water services authorities are being transferred to these local authorities. Note that the majority of the schemes managed by DWAF are in Northern Province, which has an operating budget of about R350 million in 2002, 1% of cost recovery for the same year and approximately 8 000 people running the schemes (Mvula Trust, 2002).

[25] The adjective « former » is not exactly right. Indeed, as it will be explained later, all DAWF schemes are in the process of being transferred to WSAs and for this reason do not belong to DWAF anymore but are not fully managed by the WSAs yet.

In order to prepare this transfer, DWAF has launched a national process of inventory and value assessment of all assets of its domestic water services network. This process is known as the DWAF functional assessment. The task of gathering data was entrusted to various consulting firms according to standards given by DWAF. In 2003, DWAF took stocks of the process situation and edited reports. It is from these reports where the information detailed and analysed here come from.

Before presenting and analysing these data, it is important to keep in mind that this survey is a "moving inventory", meaning that it can be considered as picture of the existing domestic water services schemes at a particular time (in this case, the time is the beginning of 2003).

After selection of the schemes located in the research area (two main former homelands of the Olifants River Basin), the set of data is composed of 66 schemes, among them 18 are considered as "rudimentary schemes", which means stand-alone system without reticulation.

Information sources are not the same for all schemes. Some schemes are well described by a summary scheme report when some others are only registered in an Excel database with less information. We can therefore consider that only 44 schemes have a complete set of data..

The data available for each scheme can be separated in two categories: technical and financial characteristics. In the following part we will describe some of these characteristics and therefore the diversity of the networks in use in the study area.

4.3.1.1 Age of schemes

The functional assessment gives the average age of all schemes in 2003 using the date of implementation of all assets. The average age of schemes managed ranges from 23 to 5 years. However, 55% of the schemes are between 9 and 12 years old, what nearly corresponds to the end of the apartheid (1994).

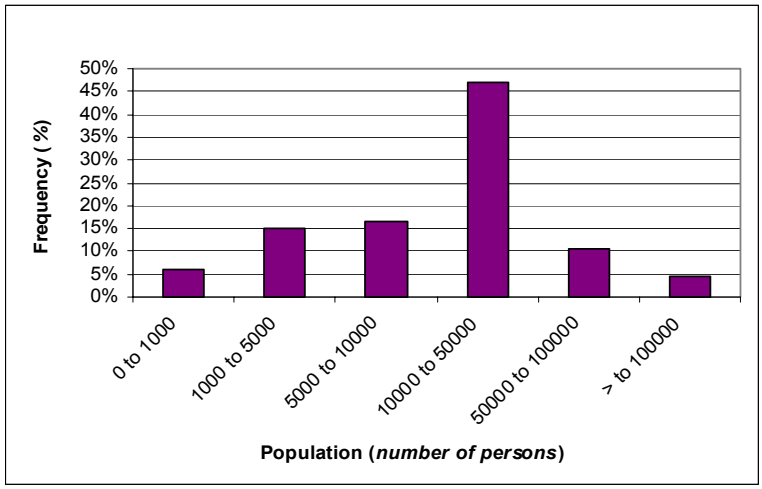
4.3.1.2 Population-related information

Population served

The functional assessment gives the number of persons assessed as users for one given scheme. In the absence of other physical data such as length of reticulation system, the best way to evaluate the size of a scheme is to refer to its population. An information about the area covered by the scheme would also have been very interesting to give an idea of the density of population and therefore of the type of settlement. However, such information is not available in the database and it was not possible to cross with other sources of information because of discrepancies in demarcation (the Functional Assessment database is not based on the administrative ward demarcation as it is the case for Census for example).

The population served by one single scheme varies from 137 persons to 379 362, with an average of 33 995. Indeed, in the first case the scheme involves only one ward (the 7th in the local municipality of Fetakgomo, 17.9 km^2), when in the second case it includes an entire local municipality (Dr JS Moroka local municipality, 1 374 km^2). The following figure (Fig. 17) show the distribution of schemes according to their population.

Fig. 17- Distribution of schemes according to population size (66 schemes)



Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

More than 45% of schemes (precisely 31) have a population between 50000 and 100000 inhabitants.

It is advisable to be cautious with these data. Indeed, some of the figures reported by the functional assessment are higher than those given by the 2001 census. For example, the two schemes including the local municipalities of Dr JS Moroka and Thembisile, show respectively a population 379 362 in the functional assessment for 258 873 in the 2001 census and 335 214 for 243 313. This may be explained by a better evaluation of the non-official population (Mozambican migrants), or by the difference of two years between the census and the assessment.

Indigent households

For some schemes (only 22) an approximation of the number of household considered as "indigent" is available. Indigent household are determined according to the Reconstruction and Development Plan (RDP) standard of households earning less than R 1 500/month). The proportion of indigent household can vary from 1 to 59% with an average of 30% of the total number of households.

Communities

The database also provides the number of community concerned by each scheme. This number varies also according schemes. It ranges from 1 to 66, with an average of 11. The number of community in one scheme is linked with the size of total population but this does not mean it increases proportionally.

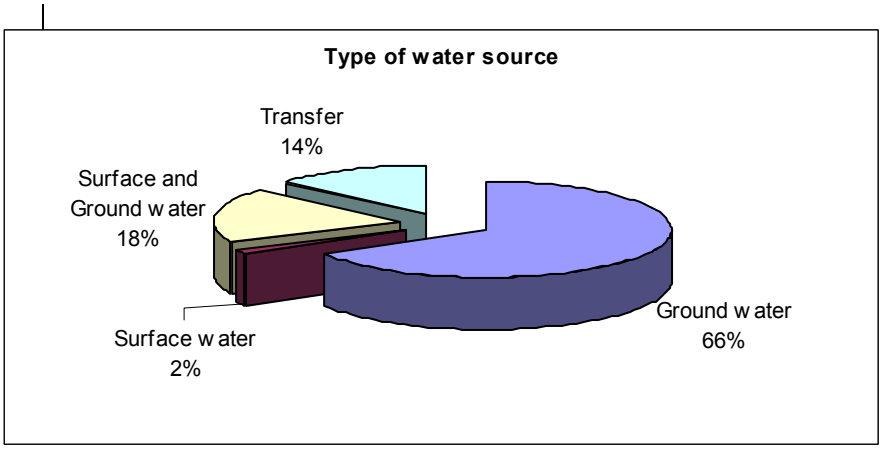
Water consumption

For 44 schemes, the functional assessment gives an estimation of the water consumed. This estimation seems to take into account the water lost during delivery (from leakage for example). Therefore it is not an estimation of the amount really consumed by users. This information shows again a great variability. The average consumption is 36 L/person/day, which means a little higher regarding the free basic standard of 25 L/person/day. However, the maximum of consumption is 124 L/person/day and the minimum 10 L/person/day for a standard-deviation of 30 L/person/day.

4.3.1.3 Source of water

Types of water sources

Fig. 18- Distribution of schemes according to the type of water source



The source of water supplied to end-users in the study area also varies. Water can be extracted from groundwater (most of schemes), surface water or both, or can be transferred from another scheme. The following pie chart (Fig. 18) gives the distribution of schemes according to the type of water resource.

Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

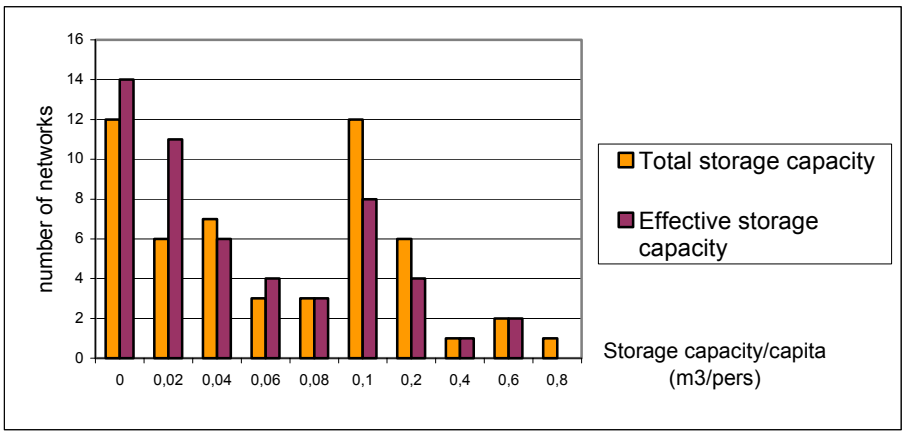
Capacity

For each type of resource (groundwater or surface water), the functional assessment gives an estimation of its capacity in m^3/day. Here again we have a large range of capacity (from 17 to 1800 m^3/day for groundwater and from 5 to 38 000 m^3/day for surface water). In the following section, it may be interesting to compare costs for each type of water source.

4.3.1.4 Storage capacity

The functional assessment gives also the storage capacity (m^3). This does not include the water hold in dam, which is considered as surface water (because the dams can be used for different purposes), but only water in "small" reservoirs. The storage capacity varies from 0 to 0,843 m^3/capita, with an average of 0.132 m^3/capita, that is to say a total capacity of 549 456 m3 for the whole study area. For some schemes, the effective storage capacity is also given via a percentage of the total capacity. To compare the two figures we can convert this data in m^3/capita. The figure below (Fig. 19) shows the dispersion of the storage capacity per capita.

Fig. 19- Distribution of schemes according to storage capacity (53 schemes)



Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

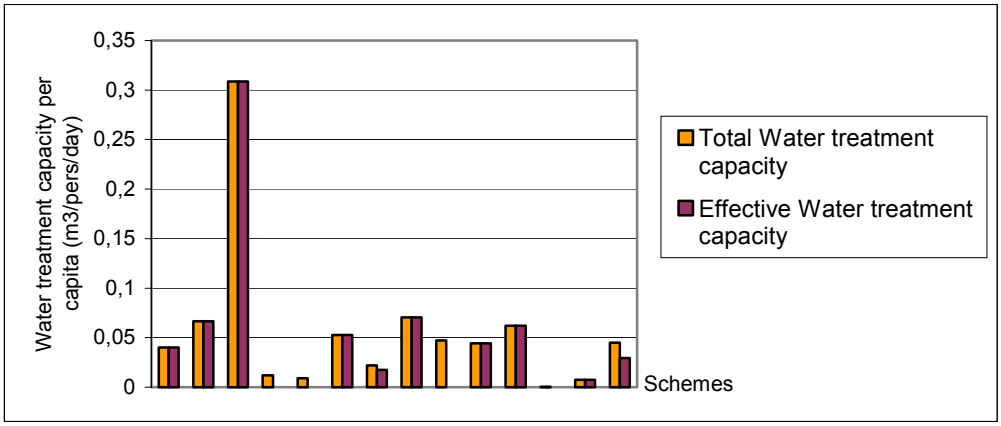
However, before reading this diagram, it is important to notice that the information “effective storage capacity” is not available for all schemes (only 53 on 66). Therefore it is not possible to have a perfect comparison between the two variables.

The non-used storage capacity varies from 0 to 64% with an average of 27% of the total storage capacity. This gap can be explained by the reservoirs condition. Indeed, the lack of maintenance can lead to filling of the reservoirs by sediments. More, a number of them may not be in good condition enough to avoid leaks and losses. But the reason can be quite different: the amount of water necessary to fill in the reservoirs may be not sufficient to mobilize.

4.3.1.5 Water treatment work and sewage treatment work

Some schemes are equipped with water treatment system or sewage treatment system. Only 16 networks have a water treatment work, with only one rudimentary scheme among them, which implies that in the other schemes, domestic water is not treated before distribution. Information provided comprises the number of work (0, 1 or 2), the total capacity in m^3/day and the effective capacity. It is worth noticing that although some schemes have a water treatment work, the effective capacity is almost nil (NL1 for example, see Fig. 20). This gap can again be explained by the poor condition of the water treatment work.

Fig. 20- Total and Efficient water treatment capacity dispersion (14 schemes)



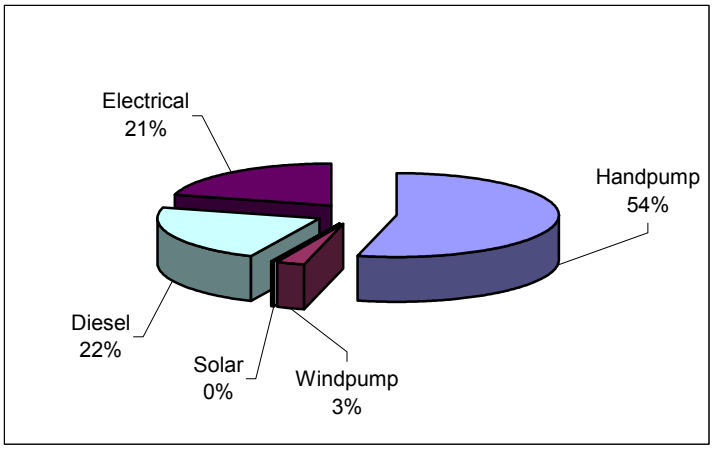
Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

The number of schemes having a sewage treatment work is even smaller: only 10 schemes equipped with to a sewage treatment work. The functional assessment does not give any other information about any existing sewage system. We can only suppose that the small number of schemes having a sewage treatment work is due to the small number of scheme having a sewage system.

4.3.1.6 Boreholes

The functional assessment gives the number of boreholes used for each scheme. For some schemes, the type of borehole is also given (hand-powered, wind-powered, solar, electrical or diesel). The diagram below (Fig. 21) gives an idea of the distribution of boreholes according to the type of boreholes.

Fig. 21- Distribution of boreholes according to the type of borehole



Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

The main type of borehole used is hand-powered borehole. It can be noted that in general one scheme uses different types of boreholes, and rarely only one type. It can be interesting to analyse the effect of the type on costs, we will see this in the following section.

4.3.1.7 Financial data

Costs

DWAF functional assessment also provides financial information. Indeed, for each scheme is given an estimation of present value, replacement costs, refurbishment costs, maintenance costs and operating costs. Maintenance and operating costs are annual costs. Present value can be interpreted as the capital cost (annual cost). It represents in average 90% of the total annual costs. Replacement cost is the cost estimated if the manager would decide to replace the entire installation (it is basically the value of the same installation but new). Refurbishment cost is the costs of making the installation work as new. We can read this data as the depreciated value of the scheme.

In this case again, this information should be used with caution. Indeed, calculation methods used to estimate these costs are not well known, especially the discounting rates used to evaluate the value of the scheme.

For each cost we can study their relationships with the other technical variables. Spad software executes means' comparison for each variable. The higher the test-value linked to this test is, the more the modality is characteristic of the cost. We consider 2 as the critical test-value threshold for a significativity threshold of 5%. Annexe 10 presents the significant modalities for each cost. The results show that all costs are higher when the schemes contain a sewage treatment or a water treatment. Costs seem also to be higher for schemes with groundwater and surface water as water source.

Billing system

The type of billing system is also specified (meters, flat rate, pre-paid or none, the amount is not specified). However, the total income given by the assessment is always equal to zero. And moreover, parts of the schemes are situated in WSAs like Sekhukhune, Capricorn or Bohlabela DM, WSAs were we know water is not charged to users. More, during the period when it managed these schemes, DWAF did not charge its users for water. Therefore this information (which would have been greatly useful for our research) can be considered not relevant.

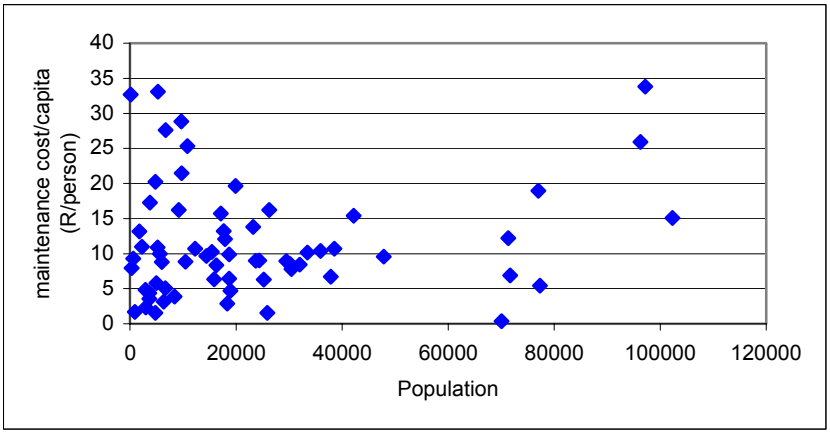
4.3.2 Data analysis

4.3.2.1 Heterogeneous set of data

The networks on which we have information are indeed highly heterogeneous. It is therefore difficult to highlight any trends between socio-technical characteristics and costs.

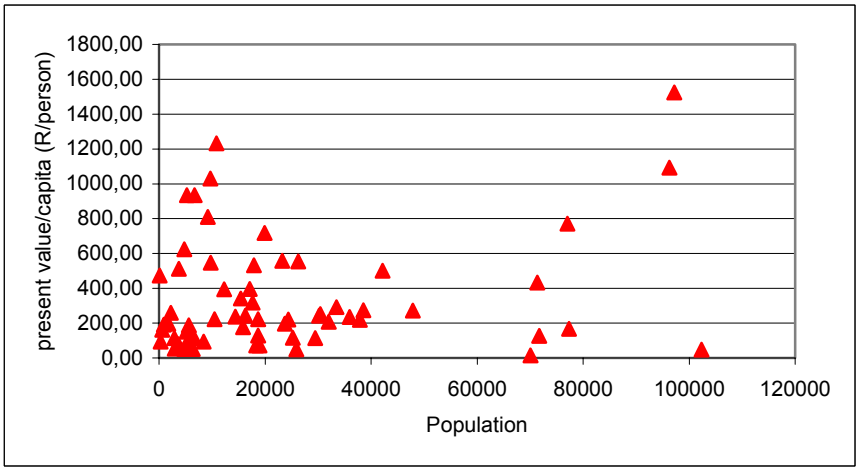
For example, the repartition of the costs per capita regarding to the number of people served does not present any trend. The two graphs below give examples for maintenance cost and present value.

Fig. 22- Distribution of maintenance costs regarding the population served



Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

Fig. 23- Distribution of present value regarding the population served



Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

These diagrams clearly show the absence of economy of scale if we consider the whole group of networks. This can be due to the heterogeneity of the group. To observe trends of to have relevant descriptive information, we think to disintegrate the group into smaller ones. We hope to find more homogeneous groups and in the same way obtain a typology of the networks present in the study area. The second step will be to compare descriptive analysis of each group and to study in what extent trends between technical and financial characteristics appear.

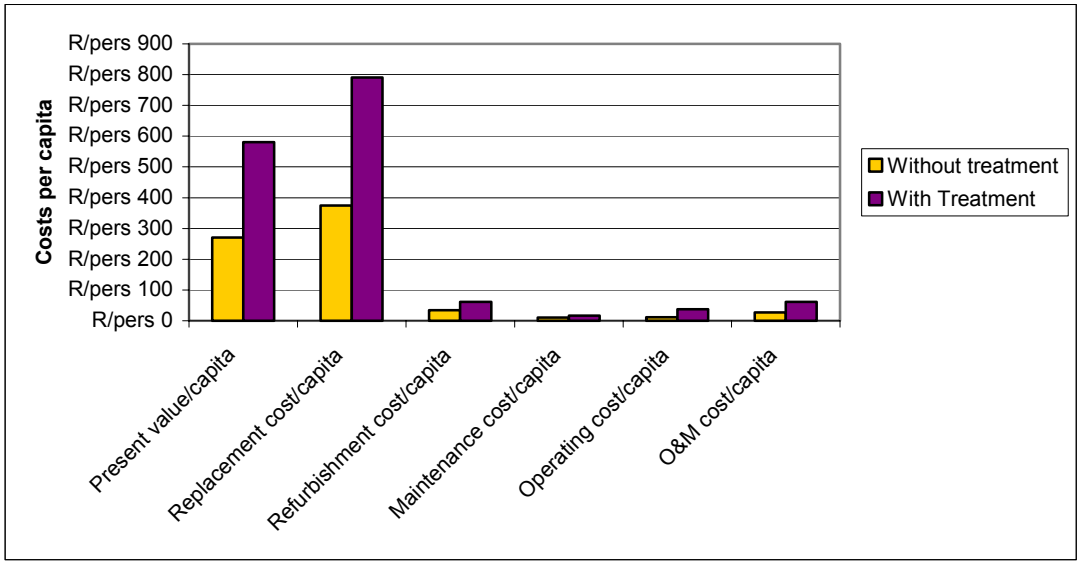
4.3.2.2 Building a typology

Various ways to build a typology exist. Generally speaking, we can consider using technical characteristics to build these groups.

Manual typology

In a first time, we try to separate individuals regarding specific technical characteristics, for example, separating the schemes regarding water treatment. The separation in two groups (one with water treatment and one without any water treatment works) highlights differences in term of costs. Fig. 24 below presents the mean costs for each group.

Fig. 24- Distribution of mean costs according to water treatment



Source: DWAF functional assessment, 2003 (data) and Lefebvre, M.

These observed differences of mean costs between the two groups may not be significant. To evaluate their relevance, we can apply a T-test (Student's test) between the means of the two groups for each cost.

The test is made with Excel for each cost at a level of confidence of 5%. The following hypotheses are posed:

- H_0: $\mu_O - \mu_I = 0$
- H_1: $\mu_O - \mu_I \neq 0$

Excel calculates a calculated t value using the following formula:

$$t_{calc} = \frac{|\mu_1 - \mu_2|}{\sqrt{\frac{SSD_1 + SSD_2}{n_1 + n_2 - 2} * (1/n_1 + 1/n_2)}}$$

SSD is the Sum of squared deviation, n_1+n_2-2 the degree of liberty and μ_1 and μ_2 the two means to compare. To accept the H_0 hypothesis, t_{calc} must smaller than the critical t value (in absolute value). Excel applies a standardized normal distribution to calculate the critical value (critical t value).

Table 7 gives the obtained results.

Table 7- t-test results for means comparison

	Present value	Replacement costs	Refurbishment costs	Maintenance costs	Operating costs
Calculated t value	-3.098	-4.107	-1.597	-3.307	-4.470
Degree of freedom	20	24	18	27	17
Critical t value	2.086	2.064	2.101	2.052	2.110
Difference between means	Significant	Significant	Non significant	Significant	Significant

Source: DWAF functional assessment, 2003 (data), Spad and Lefebvre, M.

All calculated t values are above the critical t value (in absolute value), escept for the refurbishment cost. The refurbishment cost is the only non-relevant cost. For the others, we van positively state a difference of costs exist between schemes having a water treatment work and the others.

This typology shows differences of costs, but only take into account the treatment characteristic. It may be interesting to use more than one technical characteristic to build a typology. The Principal Component Analysis (PCA) helps to build such a typology.

Principal Component Analysis

PCA apply on data set constructed as a two dimensions table crossing individuals and quantitative variables. It is a technique of statistical description of data set. It also permits to reduce the dimensionality of this set. PCA can be used as an explanation tool for variables and individuals. Indeed, it has two objectives:

- building a typology of individuals evaluating their resemblance
- estimating links between variables.

Before starting the analysis, active variables should be chosen. Indeed, numerous variables are available. The analysis can be conducted with all these variables but the results would be more difficult to interpret.

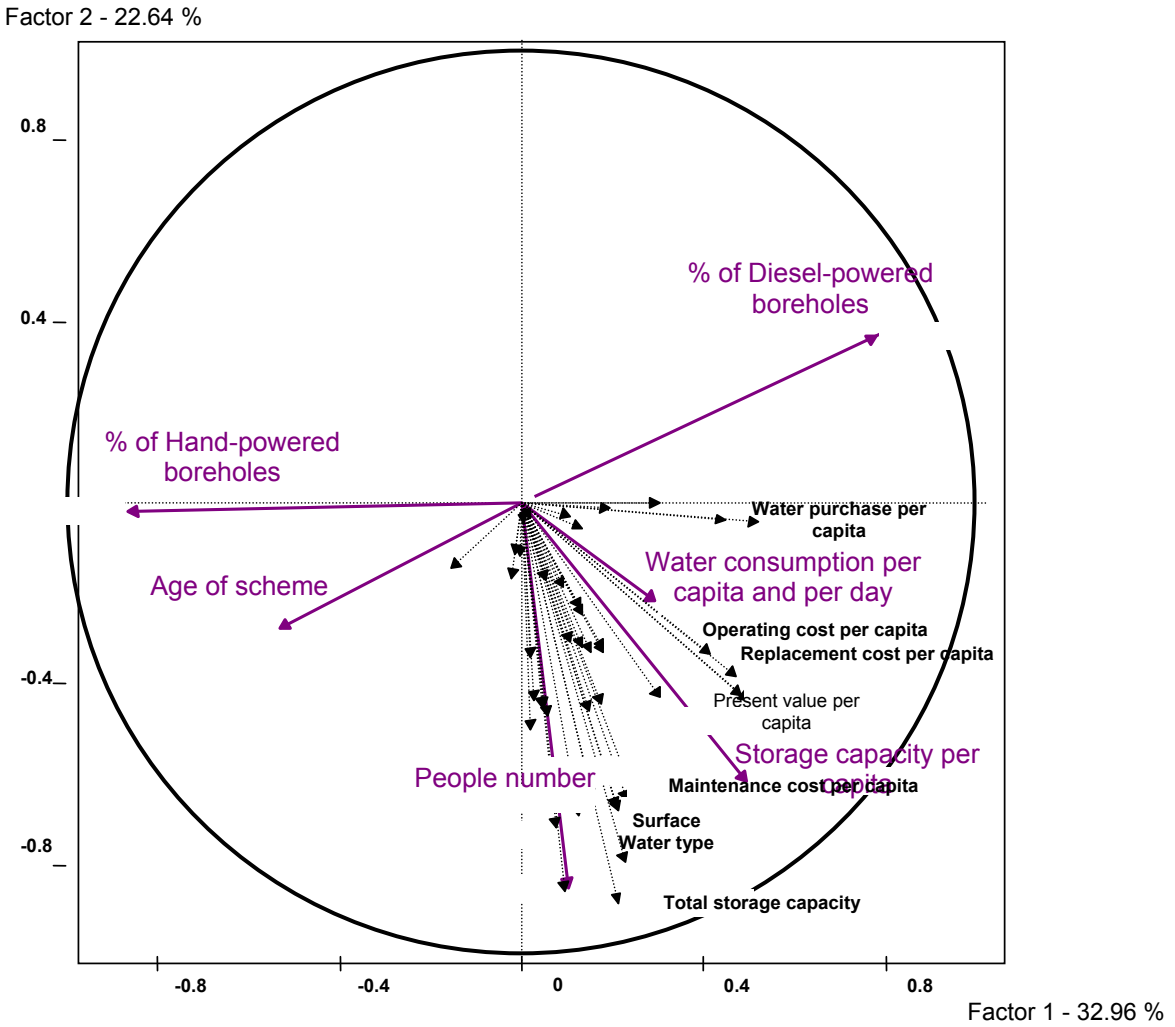
We chose as active variables technical characteristics assumed to have an impact on costs. Six variables were selected: the number of people (PeopleNb) served to have an estimation of the network's size, the average age (SchemeAge), the storage capacity per capita (StorCapPerHead), the percentage of hand-powered boreholes regarding to the total number of borehole in a scheme (Handpump%), the percentage of diesel-powered boreholes (Diesel%) and the estimated consumption of water per person and per day (WConsDayCapit). The other variables were kept as illustrative variables.

The PCA was effectuated with the statistical software Spad. Therefore the analysis gives two type of information.

- Relationship between active variables

PCA represents the dispersion of the variables in a several-dimension plane. In the present analysis, the cloud of variables is situated in a six-dimension plane. Spad gives a representation of the two main axes of representation (Fig. 25).

Fig. 25- Factorial plan, representation of axes 1 and 2 (source: Spad, data: DWAF functional assessment, 2003)



Vectors representing age of scheme, proportion of hand pumps and of diesel pump, size of population and storage capacity are close to the correlation circle. We can therefore consider as well represented by the two first axes. The two vectors representing diesel pumps and scheme age are opposed, showing a negative correlation between these two variables. Angle between population size's vector and storage capacity's vector measures less than 90°, which indicates a positive correlation between these two variables. A positive correlation is also observable between the percentage of hand-powered boreholes and the age of schemes.

Spad completes this information presenting a matrix of test-value for each correlation. The following table presents this matrix.

Table 8- Test-values' correlation matrix

	PeopleNb	SchemeAge	StorCapPerHead	Handpump%	Diesel%	WConsDayCapit
PeopleNb	99.99					
SchemeAge	1.27	99.99				
StorCapPerHead	2.89	-1.52	99.99			
Handpump%	-0.98	1.78	-1.72	99.99		
Diesel%	-0.99	-1.86	0.88	-5.67	99.99	
WconsDayCapit	0.06	-0.62	1.00	-1.37	-0.13	99.99

Source: DWAF functional assessment, 2003 (data), Spad and Lefebvre, M.

The test-value calculated for each coefficient of correlation help to answer whether or not this link between two variables is significant. The higher the test-value is, the stronger is the link between two variables. The critical value imposed by Spad for its test-value is 2. As we can see, only 2 correlations are judge significant: correlation between the population size and the storage capacity and between the proportion of diesel-powered boreholes and the proportion of hand-powered boreholes. These two coefficients of correlation are respectively 0.34 and – 0.67. Storage capacity is therefore positively linked to the size of the scheme (in term of population), while hand-powered and diesel-powered boreholes are negatively linked.

- Classification of individuals

PCA draws also a hierarchical branching diagram of the individuals classifying these individuals. The closer individuals are in the diagram, the more similar are their characteristics. Spad cut the axe to make optimal classification in groups. Classifications in 4, 6 and 7 groups were estimated as optimal by the software. In order not to have too few individuals in a group, the four-group classification was chosen.

The tables below present the distinctive continuous variables of each group. Annexe 11 presents characteristic modalities of each group, which means the characteristics of the variables that distinguish the group.

Table 9- Distinctive continuous variables of the four groups (source: DWAF functional assessment, 2003 and Spad)

GROUP 1 / 4 (Weight = 2.00 Size = 2)

Characteristic variables	Mean in the group	General mean	Standard deviation in the group	General standard deviation	Test-value
PeopleNb	357288.000	33994.800	22074.000	62508.600	7.37
HousehNb	79397.500	7861.270	4905.500	13918.600	7.33
TotStorageCap	135872.000	8325.100	5123.000	25617.700	7.10
BulkDPipeHour	2085.000	170.453	415.000	473.587	5.76
PumpstatNb	9.000	1.076	6.000	2.445	4.62
SewTreatNb	2.000	0.212	1.000	0.564	4.51
SurfaceW	10.000	0.637	10.000	2.980	4.48
CommunityNb	48.500	10.818	17.500	13.656	3.93

GROUP 2 / 4 (Weight = 15.00 Size = 15)

Characteristic variables	Mean in the group	General mean	Standard deviation in the group	General standard deviation	Test-value
WpurchasePerHead	18.897	8.917	10.218	8.962	4.87
Diesel%	0.507	0.261	0.247	0.250	4.53
ReplacCostHead	835.800	475.651	429.440	377.332	4.17
PresValueHead	648.333	345.591	383.025	317.485	4.17
OperatCostHead	34.067	17.894	25.441	18.387	3.85
MaintCostHead	18.533	11.682	7.932	7.890	3.80
StorCapPerHead	0.281	0.132	0.256	0.178	3.65
WconsDayCapit	51.800	36.386	28.058	21.342	3.41
CalcO&Mhead	55.667	37.533	32.875	26.412	3.22
Handpump%	0.187	0.510	0.205	0.335	-4.42

GROUP 3 / 4 (Weight = 10.00 Size = 10)

Characteristic variables	Mean in the group	General mean	Standard deviation in the group	General standard deviation	Test-value
SchemeAge	18.230	10.957	2.304	3.606	6.88
Handpump%	0.831	0.510	0.218	0.335	2.71
PercentEffectStorCap	0.359	0.615	0.392	0.309	-2.53

GROUP 4 / 4 (Weight = 39.00 Size = 39)

Characteristic variables	Mean in the group	General mean	Standard deviation in the group	General standard deviation	Test-value
Handpump%	0.629	0.510	0.251	0.335	2.61
PresValueHead	268.487	345.591	238.069	317.485	-2.35
ReplacCostHead	379.359	475.651	284.831	377.332	-2.47
CalcO&Mhead	28.360	37.533	15.362	26.412	-2.58
WconsDayCapit	29.040	36.386	10.433	21.342	-2.59
StorCapPerHead	0.081	0.132	0.100	0.178	-2.77
SchemeAge	9.400	10.957	1.268	3.606	-4.10

Only characteristic variables with a test-value superior to 2 are represented. Therefore, all characteristics represented here are significant.

- Typology interpretation

- Group 1:

Group 1 contains only 2 schemes. It is characterised by a high size of population (the group's mean is above the mean of the totality of the data set. Bulk distribution capacity, storage capacity per capita, number of pump stations and of sewage treatment infrastructures are above the general mean. Moreover, the type of water source, surface water, also identifies it.

We can therefore interpret these two schemes as great size schemes. Indeed, they each involve a whole local municipality (Thembisile and Dr J.S. Moroka).

- Group 2

Group 2 contains 15 schemes. It is distinguished by financial characteristics. Indeed, replacement, refurbishment and maintenance cost per capita and present value per capita are above the general means. It is therefore a group of schemes that generate higher costs. This could be due to the technology used. Indeed, the proportion of diesel-powered boreholes is also above the general mean and is a distinctive and relevant characteristic. Moreover, it is probably a group in which consumption of water is above the mean (water consumption per person and per day and water purchase per capita are both above the mean). This higher consumption may be explained by a better service (much more diesel boreholes than hand-powered boreholes), which would generate higher costs, or by a higher number of leakages and breakdowns (which would also generate more costs). However, the average age of group 2's networks, despite not being characteristic, is near 9.5. Group 2 is the younger group of the classification. Because of this, we can assume the higher costs are due to the level of service rather than breakdowns.

- Group 3

This group contains 10 schemes. The age of schemes and the proportion of hand-powered boreholes, both above the general mean, distinguish group 3. As for the percentage of effective storage capacity, it is below the general mean. For this group we deal with older schemes with a more basic technology. The schemes of this group also generate fewer costs. Indeed, we see in Annexe 11 that the group is distinguished by low modalities for present value and maintenance cost (from 14 to 112 R/person for present value and from 0 to 5 R/person for maintenance cost).

- Group 4

Group 4 is the biggest (39 schemes). It is characterised by a high proportion of hand-powered boreholes and lower costs and consumption per capita. These schemes are also younger than the average. We can interpret this as simpler networks built just at the end of the apartheid to serve people with water the sooner as possible.

These 4 groups could show 3 different phases of implementation. Indeed we can assume the first implementation phase involve older and simpler schemes, before the end of apartheid, the second one at the end of the apartheid has as main goal to serve disadvantaged communities with water, and the last one nearly in the same period but involves a better technology for a better access.

Conclusion

Results

Three main conclusions can be drawn from this study. In the first place, the survey at local level shows a water sector organisation still centralised, but with a decentralisation in progress. Indeed, in most of the research area, WSAs do not I have the plain control of the water services delivery and have not taken all decisions yet in their area of jurisdiction. Secondly, three main types of domestic water pricing can be identified. The most common prioritises the simplicity, affordability for the users and low administrative costs to the detriment of economic efficiency and of durability. One other try to reach the best cost-recovery but to the detriment of equity and affordability for users. One most successful reconcile the various water pricing objectives. At least, the analysis of networks shows a great heterogeneity. When trying to build a typology, the four groups obtained can be interpreted as three stages of networks implementation. The older one, before the end of the Apartheid is distinguished by a simple technology, with low costs. The second one, more recent involves networks with a more complex technology (diesel pumps), more costly, which probably allow a better access to the resource (and with a higher water consumption). The third one presents simpler and cheaper technologies, with probably have as main goal to deliver water to communities with no services yet.

It could have been interesting to complement the networks' analysis with further an investigation at local level. Indeed, these propositions of interpretation could have been submit to various stakeholders. Moreover, to confirm or infirm this hypothesis, a sample of networks of each group could be surveyed at a more local level (meeting with managers and users of this scheme). Generally speaking, a study of demand at household level would be very useful to complete the present study (especially the evaluations of water pricing policies in term of economic efficiency).

Limits

Generally speaking, this study has two main limits. Firstly, the lack and reliability of data are a main limit. Indeed, sources of information are various, calculation methods of financial data are often unknown or imprecise and operators responsible for gathering data and calculating costs, expenses and incomes are often various (for example various consulting firms were responsible of the functional assessment, which lead to a higher error rate and a higher heterogeneity of information). This obviously prejudices the reliability of this study and only makes assumptions possible.

Secondly, the use of some economic objectives can be exposed to misinterpretations. Indeed, the cost-recovery notion, for example, could have been interpreted differently by the interviewees. For example, some could have interpreted it as the proportion of water fees paid regarding the total amount of payment the provider should receive for water while other could have considered cost recovery as the proportion of expenses paid by users. For the same values, the cost-recovery will obviously be higher with the first definition than with the second. Taking in consideration the first definition would also have heavily modified our water policies' evaluation. Indeed, municipalities that do not apply any tariff do not expect any payment and then any cost-recovery. In this case, should we consider this as a zero cost recovery or a 100%? It would have been necessary to specify our definition of cost-recovery in the questionnaire. A definition could also have been asked to the first-step interviewees.

Further explorations

This study introduces the question of decentralisation in developing countries. The concept of distribution of financial, administrative and decision power to local governments is often put forward by international institutions such as the World Bank as a tool of development. More than everywhere else, decentralisation has a heavily politic background in South Africa and aims at empowering communities disadvantaged during the apartheid period. However, the eagerness to transfer responsibilities to local authorities has slowed down in front of the lack of capacity of these authorities. Indeed, since the end of

the apartheid, public services have not reached yet the level expected by users. The government seems now willing to reverse this trend and to left more power of control to national departments.

The free basic water policy is also a debatable point. Indeed, in one hand it allows an access to water for the poorest (but also for the richest). But in the other hand, this policy may lead to an equipments deficiency, a non-reliable domestic water services and custom of non-payment of users. Paying water is still a controversial and heavily politicised subject in a country where not paying services was used as a weapon against the apartheid government.

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List of annexes

Annexe 1- Short presentation of the International Water Management Institute

IWMI is a non-profit scientific organisation concentrates on water and related land management challenges faced by poor rural communities. The challenges are those that affect their nutrition, livelihoods and health, as well as the integrity of environmental services on which these depend. IWMI works through collaborative research with partners in the North and South, to develop tools and practices to help developing countries eradicate poverty and better manage their water and land resources. The immediate target groups of IWMI's research include the scientific community, policy makers, project implementers and individual farmers.

IWMI is a member of the Future Harvest group of agricultural and environmental research centers. It receives its principal funding from governments, private foundations, and international and regional organisations known as the Consultative Group on International Agricultural Research (CGIAR).

Objectives of IWMI's work

- Identify the larger issues related to water management and food security that need to be understood and addressed by governments and policymakers
- Develop, test and promote management practices and tools that can be used by governments and institutions to manage water and land resources more effectively, and address water scarcity issues.
- Clarify the link between poverty and access to water and to help governments and the research community better understand the specific water-related problems of poor people.
- Help developing countries build their research capacities to deal with water scarcity and related food security issues.

Research Themes

To better reflect the broader water-food-environment challenges, IWMI has organized its research around four main activities:

- Basin Water Management
- Land, Water and Livelihoods
- Agriculture, Water and Cities
- Water Management and Environment

Location and research team

IWMI has research projects running in 21 countries in Asia and Africa. Work is coordinated through regional offices located in India, Pakistan, South Africa, Sri Lanka and Thailand. The Institute has subregional offices in Ethiopia, Ghana, Nepal, Uzbekistan, China, and Laos.

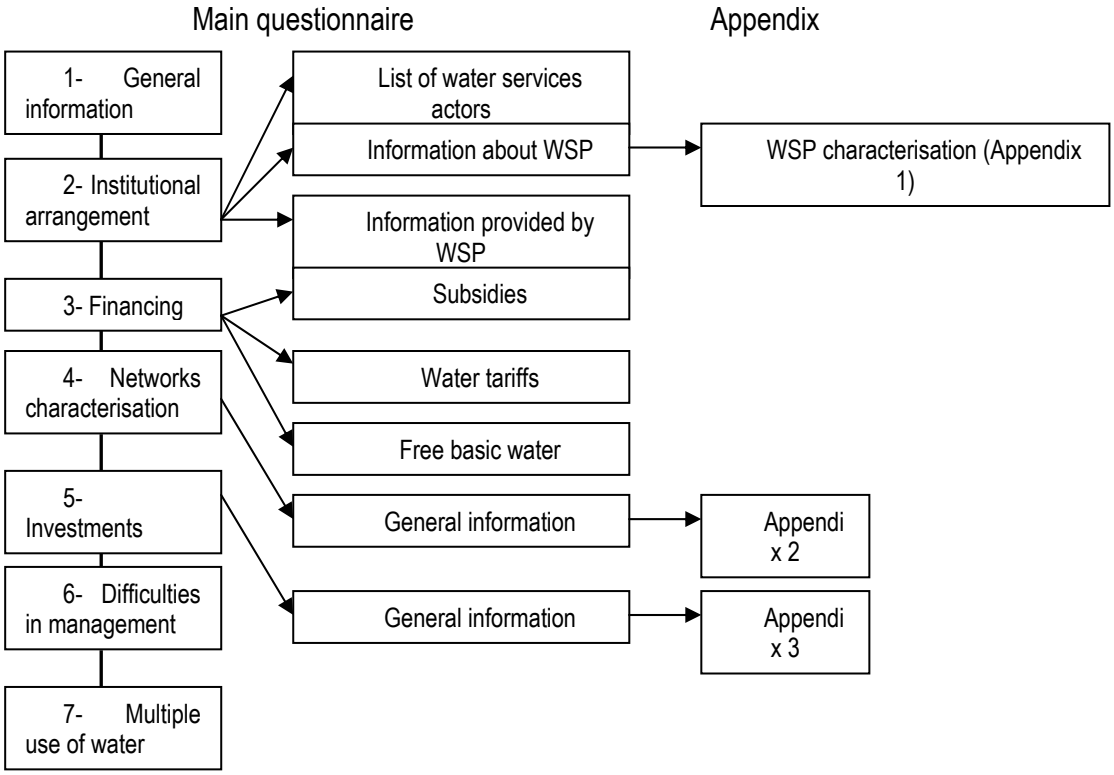
The Institute has a multidisciplinary approach to water management research. Most of IWMI's research combines the expertise of economists, agronomists, hydrologists, engineers, sociologists, management specialists and health researchers. The research team is composed of approximately 100 scientists from 16 different countries.

Questionnaire for Water Services Authorities

Note: the data collected here can be kept anonymous

Name of the Water Services Authority (WSA):……
Name of respondent: ……
Function of respondent: ……
Tel: …… E-mail: ……

Structure of this questionnaire:



1 General information:

1.1 Date of implementation of the WSA ……
1.2 Number of inhabitants ……inhabitants
1.3 Size of area of jurisdiction ……Km²
1.4 Total population served (water) ……..households
1.5 How would you describe your role as a WSA?

……
……
……

2 Institutional arrangement of water services agents

2.1 What are the institutions involved in water and sanitation supply, especially in former homelands (*please fill in the table below*)

Functions		Institution(s) in charge (*Use more than one line if more than one institution*)	Type of institution (*Specify: private company, Water Boards, Local government, Community-based organisation, WSA, Others*)	Planned evolution for the next 5 years
Bulk water	- Extraction	- - -		
	- Storage	- - -		
	- Transport	- - -		
	- Distribution to retail WSPs	- - -		
Domestic water	- Purification	- - -		
	- Quality testing	- - -		
	- Distribution to end-users (WSP)	- - -		

2.2 WSP characterisation

This section tries to specify Water Services Providers (retail and bulk water supplier). Please refer to ***appendix 1*** *and fill in one sub-section for each WSP operating in the former homeland area in the WSA's jurisdiction area.*

2.3 Relationship with WSP

2.3.1 Is (are) there WSA or municipality staff member(s) responsible for relationship between the WSA and WSP(s)?

- ❑ Yes: Number of persons ……..……....person
  Annual cost R/year..……..
- ❑ No

2.3.2 Is (are) there WSA or municipality staff member(s) responsible for relationship between the WSA and water users?

❑ Yes: Number of persons ……..……....persons
Annual cost R/year..……..

❑ No

2.3.3 What information does a WSP provide to the WSA?

- Number of households served ❑No ❑Yes →*provide a copy of this information*
- Volume of water supplied ❑No ❑Yes →*provide a copy of this information*
- Expenses and incomes (account) ❑No ❑Yes →*provide a copy of this information*
- Water tariffs ❑No ❑Yes →*provide a copy of this information*

2.3.4 What documents must a WSP provide to the WSA?

- Business Plan ❑No ❑Yes →*provide a copy*

Other (*specify the name and availability to public*)……..

3 Financing

3.1 General financing situation

Please fill in table below

Source of funding	Amount (*For the last financial year*)
Subsidies	R/year
Water fees	R/year
Loans	R/year

3.2 If the WSA receives subsidies for water services, please fill in the table below

Name of the subsidy	Source (*National government -specify department, multinational or bilateral donors, NGOs, Other*)	Total amount	Amount used for water	Destination (*Investment, O&M, capacity building, other-specify*)
		R/year	R/year	
		R/year	R/year	
		R/year	R/year	
		R/year	R/year	

3.3 Water tariffs

3.3.1 Who define tariffs, especially in former homelands?

❑ WSP defines and propose tariffs and WSA approves them
❑ WSA imposes them
❑ Negotiations between WSA and WSP

3.3.2 Current water tariffs

3.3.2.1 Do you (or the WSP) apply the same pricing structure for all networks in the whole former homelands?

- ❑ Yes (*please answer question 3.3.2.2*)
- ❑ No (*please go straight to question 3.3.3 and answer section 4 in network questionnaire -**appendix 2***)

3.3.2.2 Is this pricing structure the same for all water users?

- ❑ Yes (*please fill in table below and go to question 3.3.3*)
- ❑ No (*please answer question 3.3.2.3 and 3.3.2.4*)

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
Or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
Or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate: ❑ Constant:				R/m3
	❑ Per blocks: (*Specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3

3.3.2.3 Users category definition (*fill in table below*)

Category	Criteria	Number of users in this category
1		Households
2		Households
3		Households
4		Households

3.3.2.4 For each category, please fill one pricing structure table below.

- Category 1:

Type of pricing structure						Tariff(s)
❑ Flat rate:						R/month
Or						
❑ Volumetric rate	❑Constant:					R/m3
	❑Per blocks: (*Specify corresponding volume for each block*)	From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
or						
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:					R/month
	Volumetric rate: ❑ Constant:					R/m3
	Volumetric rate: ❑ Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3

- Category 2:

Type of pricing structure						Tariff(s)
❑ Flat rate:						R/month
or						
❑ Volumetric rate	❑Constant:					R/m3
	❑Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
or						
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:					R/month
	Volumetric rate: ❑ Constant:					R/m3
	Volumetric rate: ❑ Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3

- Category 3:

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate: ❑ Constant:				R/m3
	Volumetric rate: ❑ Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3

- Category 4:

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate: ❑ Constant:				R/m3
	Volumetric rate: ❑ Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3

3.3.3 Free basic water policy

3.3.3.1 How do you define “indigent” or “poor” users?

……

3.3.3.2 Percentage of "indigent" households in former homelands

…..……..% of total household in former homelands

3.3.3.3 Percentage of households consuming less than 6000 L/month in former homelands

……..% of total household in former homelands

3.3.3.4 How much are indigent users charged for water in your municipality?

- ❑ The same rate as other users
- ❑ A subsidized or a flat rate lower than the rate paid by non-indigent consumers (please answer question 3.3.3.5
- ❑ No charges

3.3.3.5 How do you target indigent users?

……

3.4 Expenses

3.4.1 Estimate full time equivalent of the number of people employed by the WSA in:

- Administration ……
- Operation and maintenance of water distribution networks……
- Other ……

3.4.2 Please, if possible, provide a copy of the water services specific section of the municipal account

4 Networks characterisation

All questions in this section refer to networks fully or partially situated in former homelands.

4.1 Total number of water networks ……networks

4.2 Number of running water networks ……networks

4.3 Please fill in the network characterisation in the table below.

4.4 If the WSA manages some networks itself, please answer one networks questionnaire for each network managed in **Appendix 2**)

4.5 Are there some other networks about which you have information?

- ❑ Yes (*Please answer one networks questionnaire for each network known in **Appendix 2***)
- ❑ No

4.6 If details about more than 5 networks can be specified, please choose the most representative of the diversity of existing networks (size of served population, technology, type of water resource, type of distribution, power, storage…).

5 Investments

5.1 Who is responsible of water services investment in WSA' jurisdiction area, and especially in former homelands?

……

5.2 Describe investments implemented during the last 5 years and in former homelands areas (*fill in table below, if more than 4 investments, fill in table in **appendix 3***)

5.3 Were there economic appraisal studies before investment installation?

- ❑ Yes (if possible, please provide a copy of the document(s)
- ❑ No

5.4 What are IDP's objectives regarding water services?

……

Networks	Location (*specify wards fully or partially covered*)	Year of first use	Managing institution	If networks formerly managed by DWAF, specify effective or planned date of transfer	Water resource (*river, groundwater, dam, water harvesting, other*)	Distance between extraction site and reticulation system (*total length of main piping*)	Total length of reticulation system	Power supply (*electric, diesel, hand, other*)	Water storage (*specify ward of location and volume*)	Water treatment (*specify type*)	Type of distribution (*in dwelling tap, yard tap, communal tap, reservoir tap*)	Number of households served
10												
11												
12												
13												
14												
15												
16												
17												

Investments	Description (*Type of schemes, if extension of the schemes, specified length added*)	Location (*Specify wards concerned*)	Number of households concerned	Date construction started	Date construction completed	Total cost of schemes	Source of funding and amount received	
1						R	- Own capital - Private loans -Government grant (specify name) -Government loan -DBSA loan -Others	R R R R R R
2						R	- Own capital - Private loans -Government grant (specify name) -Government loan -DBSA loan -Others	R R R R R R
3						R	- Own capital - Private loans -Government grant (specify name) -Government loan -DBSA loan -Others - Private loans -Government grant (specify name) -Government loan -DBSA loan -Others	R R R R R R R R R R R

6 Difficulties in water services management

6.1 Do you face difficulties in water services management (if yes please specify importance and policy implemented to remedy them)

- Non-payment

……

- Vandalism

……

- Illegal connection

……

- Other

……

7 Multiple use of domestic water

7.1 Are there users who use domestic water in a non-domestic purpose (see example of non-domestic use below)?

7.1.2 Garden irrigation

❑ Yes: Number of household concerned…….households
Water volume concerned……..……...m^3

❑ No

7.1.3 Small businesses

❑ Yes: Number of household concerned…….households
Water volume concerned..……..m^3

❑ No

7.1.4 Craft

❑ Yes: Number of household concerned…….households
Water volume concerned……..m^3

❑ No

7.1.5 Other non-domestic use of water

……

7.2 What is WSA's policy regarding these behaviours?

❑ Tolerance

❑ Use of different water pricing system for non-domestic use of water (please specify)……..

❑ Sanction (please specify)……...

❑ Deterring actions (specify)……..

7.3 In the next years, do you planned to integrate non-domestic uses in your domestic water management?

……

Appendix 1
WSP characterisation

WSP #

A- Global information

-Name: ……

-Address: ……..

-Operating area (specify wards involved, and if possible use the attached map):

……

-Services performed: ❑ Bulk water supply ❑ Retail water supply ❑ Both

B- Type of water resource

- ❑ Ground water
- ❑ River (name:……..)
- ❑ Dam (name:……..)
- ❑ Transfer from other basin (basin name:……..)

C- Contract with the WSA

C-1 Does the WSA pay the WSP

- ❑ No
- ❑ Yes: -Amount R/year……..
  -How is this amount calculated……...….
  -Funding source for this payment: ❑ Equitable Share
  ❑ Other (specify)

……

……

C-2 Were there some preliminary costs studies to define the contract?

- ❑ Yes (*please join a copy of these studies*)
- ❑ No: on which bases was the contract negotiated?

……

……

Appendix 2
Network questionnaire

Only answer for networks fully or partially in former homelands

Network #

1 General information

1.1 Name of the network ……...
1.2 Location (main village and ward covered) ……...
1.3 Number of users ……..Households
1.4 Year of first use ……...

2 Type of service provided

2.1 Type of service provided (number of households)

- ❑ In dwelling taps ……households
- ❑ Inside yard taps ……..…….households
- ❑ Communal taps ……..…….households
- ❑ Communal taps over 200m ……..…….households
- ❑ Reservoir taps ……..…….households

2.2 Reliability of water supply

- ❑ No cut
- ❑ Service running only per period (*specify hour/day or days/weeks for example*)

……

3 Technical information

3.1 Total network length ……m

3.2 Pipes diameter (*fill in table below*):

	Length	Diameter	Unit price (*specify at time of implementation or in 2005*)	Have the pipes been changed since the first use of the network? (*if yes, fill the blank with the year*)
Pipes	m	m	R/m	
	m	m	R/m	
	m	m	R/m	

3.3 Pumping system:

	Type of pump	Pump head at duty point	Power	Year of first use	Unit price (*specify at time of implementation or in 2005*)
Pumps		m	kW		R/Pump
		m	kW		R/Pump
		m	kW		R/Pump
		m	kW		R/Pump

3.4 Taps:

3.4.1 Number of taps ……..*taps*

3.4.2 Unit cost (specify at time of implementation or in 2005):

R/tap……..

3.5 Reservoir/tank:

Type of reservoir (*plastic, concrete tank, etc*)	Number of tanks	Unit volume	Year of first use	Unit cost
		m^3		R
		m^3		R
		m^3		R
		m^3		R

3.6 Other important component of the network (for example water treatment: specify type and costs…)

……..……

4 Tariffs

4.1 If the pricing structure for this network is different from the one applied in the WSA's jurisdiction area fill in questions below

4.1.1 Is this pricing structure the same for all water users?

- ❑ Yes (*fill in table below and go to question 4.2)*
- ❑ No (*answer question 4.1.2 and 4.1.3*)

Type of pricing structure						Tariff(s)
❑ Flat rate:						R/month
Or						
❑ Volumetric rate	❑Constant:					R/m3
	❑Per blocks:	From	to	m^3 :		R/m3
	(*specify corresponding volume for each block*)	From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
		From	to	m^3 :		R/m3
or						
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:					R/month
	Volumetric rate:	❑ Constant:				R/m3
		❑ Per blocks:	From	to	m^3 :	R/m3
			From	to	m^3 :	R/m3
		(*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
			From	to	m^3 :	R/m3

4.1.2 Users category definition (fill in table below)

Category	Criteria	Number of users in this category
1		Households
2		Households
3		Households
4		Households

4.1.3 For each category, fill one pricing structure table below

- Category 1:

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks:	From	to	m^3 :	R/m3
	(*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate:	❑ Constant:			R/m3
		❑ Per blocks:	From	to	m^3 : R/m3
		(*specify corresponding volume for each block*)	From	to	m^3 : R/m3
			From	to	m^3 : R/m3
			From	to	m^3 : R/m3

- Category 2:

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks:	From	to	m^3 :	R/m3
	(*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate:	❑ Constant:			R/m3
		❑ Per blocks:	From	to	m^3 : R/m3
			From	to	m^3 : R/m3
		(*specify corresponding volume for each block*)	From	to	m^3 : R/m3
			From	to	m^3 : R/m3

- Category 3:

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks:	From	to	m^3 :	R/m3
	(*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate:	❑ Constant:			R/m3
		❑ Per blocks:	From	to	m^3 : R/m3
			From	to	m^3 : R/m3
		(*specify corresponding volume for each block*)	From	to	m^3 : R/m3
			From	to	m^3 : R/m3

- Category 4:

Type of pricing structure					Tariff(s)
❑ Flat rate:					R/month
or					
❑ Volumetric rate	❑Constant:				R/m3
	❑Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
or					
❑ Two part rate (fixed rate + volumetric rate)	Fixed rate:				R/month
	Volumetric rate: ❑ Constant:				R/m3
	Volumetric rate: ❑ Per blocks: (*specify corresponding volume for each block*)	From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3
		From	to	m^3 :	R/m3

4.2 Connection and re-connection fees

Fill in table below

Type of services	Connection fees	Reconnection fees
In dwelling tap	R/connection	R/reconnection
Inside Yard tap	R/connection	R/reconnection
Communal tap	R/connection	R/reconnection
Reservoir tap	R/connection	R/reconnection

4.3 Number of billed users

……households

4.4 Percentage of billed users who pay their account on time……% of billed users

4.5 Total debt amount for the last financial year

R/year……

5 Financing

The following section requires account information for the last four financial years.

5.1 Income

Fill in table below

	Last financial year (specify first month of the year)
Water fees:	
- In dwelling	R/year
- Inside yard	R/year
- Communal tap	R/year
- Reservoir tap	R/year
- Other	R/year
Total	**R/year**
Connection fees	R/year
Reconnection fees	R/year
Total	**R/year**
Subsidies	
Total	**R/year**
Other income ……	R/year
Total	**R/month**

5.2 Expenses

5.2.1 Fill in table below

		Last financial year (specify first month of the year)
Operation & Maintenance expenses		
Technical expenses	- Purchase of water	R/year
	- Diesel/electricity purchase	R/year
	- Operator wages	R/year
	- Repairs	R/year
	- Other general expenses	R/year
Administrative expenses	- Office staff wages	R/year
	- Field staff wages	R/year
	- Office overhead expenses	R/year
	- Transport expenses	R/year
	-Other	R/year
Total		R/year
Infrastructure		
	- Loan repayment	R/year
	- Interest	R/year
Total		R/year
Catchment's Management fees		R/year
TOTAL		**R/year**

5.2.2 Do you make provision for replacement of infrastructure and/or main maintenance?

- ❑ Yes: Amount……..R
- ❑ No

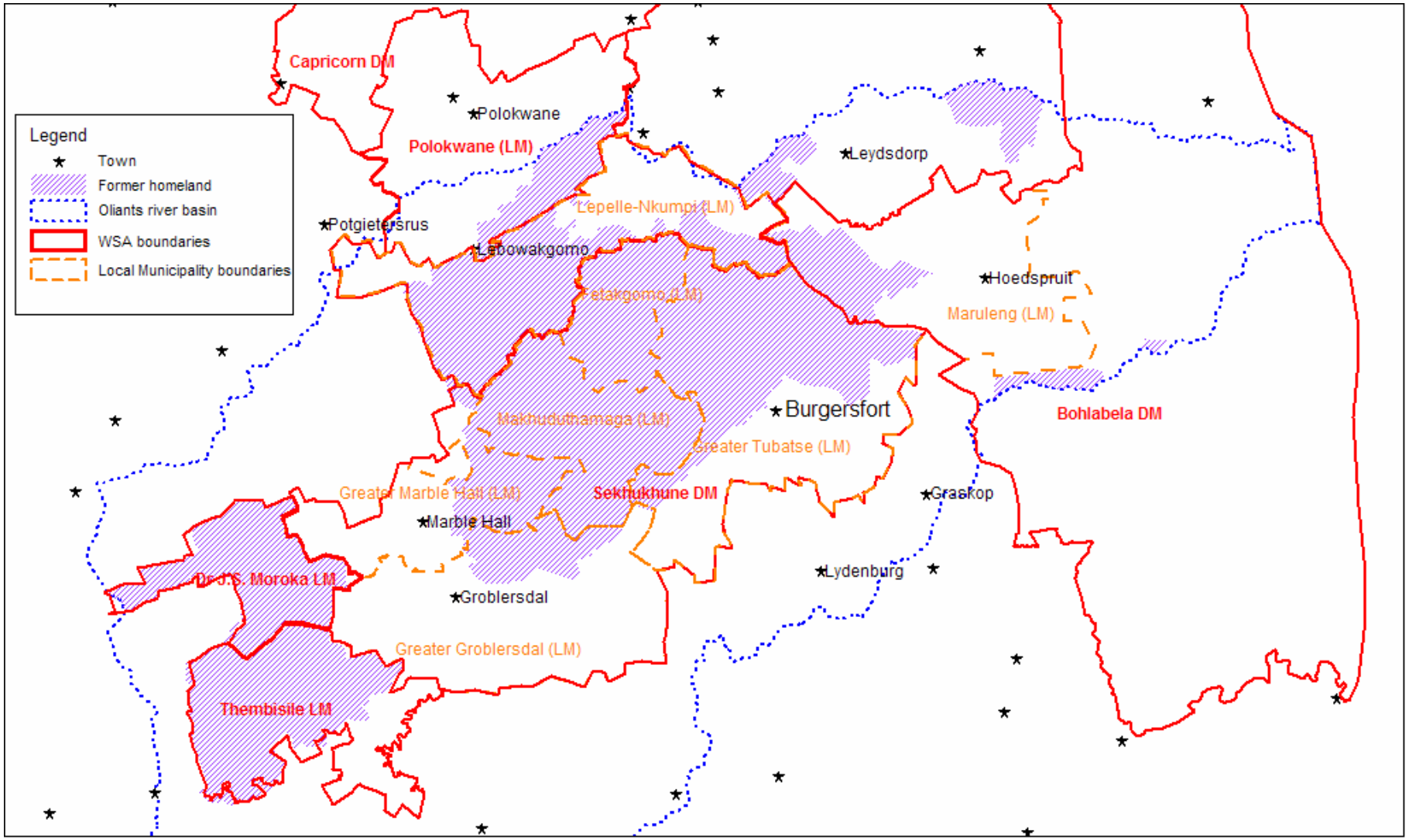
5.2.3 Estimated full time of the number of people employed in administration

……..……

5.2.4 Estimated full time of the number of people employed in 0&M

……

Annexe 3- Main towns and WSAs in the study area



Source: IWMI South Africa Database

Annexe 4- Detailed presentation of the WSAs' level survey (each results are given by WSA)

✓ Capricorn District Municipality

Information concerning its WSA was gathered from the face-to-face interview with one of its representative but also from the 2004 draft of the Water Services Development Plan (WSDP) (excel version) and a draft Regional Strategy and Infrastructure Plan (RSIP) (BKS (Pty) Ltd, 2004).

- Global information

The WSA is implemented since February 2003. The municipality has 1 154 692 inhabitants (what corresponds to 245 351 households) for a surface of 16 970 km^2, that is to say a density of 68 hab/km^2. The main part (80%) of the population in the WSA is rural. Only the local municipality of Lepelle-Nkumpi is in our area of interest. According to the WSA representative met, 92% of the population is served with water. According to the WSDP, 91% of the rural population is served. However, the access to a sanitation service is not known.

- Institutional arrangement of water services agents

Lepelle Northern Water (Water Board) and DWAF are both responsible for the provision of bulk water. Lepelle Northern Water is especially responsible for water purification and quality testing of water for a domestic purpose. The distribution of retail-water to end-users is still problematical. Indeed, the WSA as just signed a transfer agreement with DWAF, and the municipality can now be considered as the owner and manager of the schemes. However, it is still DWAF employees lent by DWAF and paid by DWAF who support the Operation and Maintenance of the schemes. The municipality is currently in the section 78 of the Municipal System Act process (Republic of South Africa, 2000), which means it is planning arrangement for its water services provision.

Moreover, some local municipalities are managing their own schemes. In our area of interest, the local municipality of Lepelle-Nkumpi is providing water to the town of Lebowakgomo, with the help the town. But they seldom manage schemes in rural area.

- Financing

For the financial year 2004-2005, the municipality received a total amount of R 43 200 000 for water, which corresponds to R 37 per inhabitants. Among this amount, only 13% (R 5 760 000) comes from the Equitable Share (usually dedicated to Operation and Maintenance (O&M)), whereas 87% comes from the Municipal Infrastructure Grant, mainly dedicated to infrastructure implementation. The municipality has no income from water fees collection or loans. The municipality has also its own revenue from the regional services levies but it is a general one, not obviously dedicated to Water & sanitation, and its use is not clear (the amount dedicated to water for example is not known).

The WSA is responsible for setting water tariffs. However, it has not implemented a formal water pricing system yet, the municipal council is currently approving the policy. For the moment, no end-user is charged for water except in some towns were the local municipality or the town is providing water (for example in Lebowakgomo, where users pay a flat rate of R 2.6/month/household). A block tariff will be implemented, with the first step from 0 to 6 m^3 free of charge. The other steps are currently discussed.

The WSA considered as indigent households who earn less than R 1 100 per month, which corresponds to 90 to 95% of the population. The free basic water policy will soon be implemented and should be as following: as 90% of the population is rural, the WSA assumes this part consume less than 6 m^3/month and for those who have access to water through communal stand, the access will be free (RDP level). For those willing to have a yard connection, the WSA will install the connection freely and a meter in the mean time. Then, the user will be charged according to the block tariff described above.

The municipality do not still have a specific accounting system for water and sanitation services. For this reason figures about administrative expenses are not available. The WSA employs 4 persons for administration, and 6 persons for O&M. 720 persons are lent by DWAF for the O&M, which corresponds

to an expenses of R 72 millions. We can here assess that the current income of the WSA does not seem sufficient to compensate for this expense.

- Network characterisation

The district municipality do not run networks itself. DWAF is still the manager (or at least its staff). All information about networks therefore comes from the DWAF functional assessment.

- Investments

The WSA is responsible for investments in term of water and sanitation services supply since its implementation. The municipality do not systematically ask for an economic appraisal study before each investment but only for technical project feasibility.

- Difficulties in water services management

For the WSA representative, the main difficulty is the indigent status of the WSA, which make difficult (or impossible) any cost-recovery. The age and poor condition of the WSA's infrastructure is also worrying.

- Multiple Use of water

Capricorn municipality knows also some example of use of domestic water for non-domestic purpose, like gardening (particularly in this rural municipality), small cafés and craft in Lepelle-Nkumpi. However, it is far from a priority.

✓ Bohlabela District Municipality

Information concerning its WSA was gathered from the face-to-face interview with one of its representative but also from the 2003 draft of the WSDP (Tumber Fourie Consulting Engineers, 2003).

- Global information

The WSA was implemented in 2003. The municipality has 773 923 inhabitants (what corresponds to 170 949 households) for a surface of 27 108 km^2, that is to say a density of 28 hab/km^2. However, the district involves a great part of the Kruger National Park whereas the study area only concerns the western part of Maruleng Local Municipality, one of the 3 local municipalities included in the WSA. For Maruleng only, the population is 51 300 inhabitants. The rural population represents 93% of the total population[26]. The WSA representative we met supposes that the real population may be far higher than the official one (probably near 1 million), due to the Mozambican immigrants population.

According to the WSDP, 65% of the population is served with water, and 31% for sanitation. This figures becomes 62% and 25% in rural areas only.

The WSA representative sees the main role of its municipality has providing basic needs to all of its inhabitants.

- Institutional arrangement of water services agents

DWAF is the only responsible for the provision of bulk and retail water, and for extraction, storage and treatment of water. The transfer of schemes is not achieved at all and still in negotiation between DWAF and the WSA. In Maruleng local municipality, only the town of Hoedspruit[27] provides water and sanitation itself.

- Financing

According to the WSDP, for the financial year 2004-2005, the municipality received a total amount of R 88 200 000 for water, which corresponds to R 114 per inhabitants. Among this amount, 32% comes from the Municipal Infrastructure Grant, (for infrastructure), 32% from the funds of the Community Water

[26] Percentage calculated for the whole District

[27] Hoedspruit is situated in a former white area and therefore is not in our area of interest

and Sanitation Services and 37% from the Equitable Share. The municipality has no income from water fees collection or loans.

Except in small towns like Hoespruit[28], no water tariff is implemented in Bohlabela, which explain the nil income.

The legislation defines indigents as households earning less than R 1 100 per month. However, the municipality has not defined its definition of an indigent user yet. The representative met estimates the number of indigents at 80% of the total population. The municipality judges too expensive the implementation of meters; furthermore, it assumes the average consumption of water in its area of jurisdiction less than 6 m^3/month/households. For these reason it does not plan to implement a free basic water policy other than a global free rate.

The municipality do not have a specific accounting system for water and sanitation services. For this reason figures about administrative expenses are not available. The WSA employs nearly 1.5 persons for administration, and 1.5 persons for O&M.

- Network characterisation

The municipality do not have any technical and financial description of its networks. As DWAF was the main owner and manager, we assumed that (and it was confirmed by the WSA representative) the main information we can obtain was from the DWAF functional assessment.

- Investments

Both DWAF and the WSA are responsible for investments in term of water and sanitation services provision. No Business Plans or economic appraisal study are realized before starting the project. However, a list of all the infrastructure projects realized or in progress for the last financial year is available.

- Difficulties in water services management

The non-payment of users is seen as a serious issue in term of cost recovery. Indeed, the district has currently no cost-recovery at all, and no water pricing policy implementation planned, because of its cost. The WSA faces also serious trouble of vandalism. Non-formal[29] connection is also an issue in this WSA mainly because it leads to wastage while the municipality's situation regarding to the scarce situation of water. The other difficulty given by the WSA representative is the lack of capacity in the district to handle the WSA responsibilities.

- Multiple Use of water

The use of domestic water for non-domestic purpose is known although not measured in term of population and volume of water. It is also regarded as an issue by the WSA representative met, mainly because of the water scarcity. The main use identified is car washing and small gardening. The users of domestic water for a non-domestic purpose are supposed to register to the municipality and to pay a flat rate of R 3.5 per m^3. In reality there is no control on the use of water and this rule is not applied.

✓ Dr J.S. Moroka Local Municipality

Information concerning its WSA was gathered from the face-to-face interview with one of its representative but also from the 2004 draft of the WSDP (WBH Consultants, 2004).

- Global information

The WSA was implemented in the first of July 2003. The municipality has 243 354 inhabitants (what corresponds to 54 382 households) for a surface of 1 374 km^2, that is to say a density of 177 hab/km^2. The total of rural population is not known. The whole municipality is in our area of interest. According to

[28] Hoedspruit water users pay a flat rate of 5.5 R/m^3.

[29] The WSA representative met preferred this term as the term "illegal" connection.

the WSDP, 30 565 households are served with water, that means 56% of the population. Still according to the same source, only 14% of the population has access to a basic sanitation services.

When asked about his view of the role of his municipality as a WSA, the representative we met has insisted on the word “authority”. The WSA has a duty to provide bylaws and to make sure they are applied.

- Institutional arrangement of water services agents

Ikangala Water (Water Board) and DWAF are both responsible for the provision of bulk water, which means extraction, storage, transport and distribution. A purification plant, managed by the Water Board treats 40 to 55% of the water abstract from the Ireland River (the main source of water in the municipality with ground water). The distribution of retail-water to end-users is still problematical. Indeed, the WSA as just signed a transfer agreement with DWAF, and the municipality can now be considered as the owner and manager of the schemes. However, it is still DWAF employees lent by DWAF and paid by DWAF who support the Operation and Maintenance of the schemes.

The municipality is now thinking of a private-public agreement to provide domestic water.

- Financing

For the financial year 2004-2005, the municipality received a total amount of R 21 600 000 for water, which corresponds to R 89 per inhabitants. Among this amount, only 3% (R 650 000) comes from the Equitable Share (for O&M), whereas 97% comes from the Municipal Infrastructure Grant, (for infrastructure). The low amount from Equitable Share may be explained by the fact that this subsidy is intended to basic needs in general and sometimes misappropriated to other purposes. The municipality earns only R 1 434 via water fees.

Since July 2003, the WSA is responsible for setting water tariffs. However, it has not implemented a formal water pricing system. No end-user is charged for water except nearly 9000 households in Siyabuswa (the main town) who pay a flat rate of 50 R/month for a set of municipal services (water but also sewage and refuse removal). Crossing the figure for water fees given above (1434), we can already see at this point that, the cost recovery is very weak, even with a part for water of 1 R on the total flat rate (which would at least give an amount of R9000).

As the majority of end-users do not pay their water, it can be considered as an implementation of the free basic water policy. The municipality defines indigents as households earning less than R800 per month. The representative met estimates the number of indigents at 65% of the total population (according to the 2001 census). The municipality currently projects to implement pre-paid meters with an amount of 6 m^3 free of charge, joined with a survey at household level to identified indigents, which may begin in 2006.

The municipality do not have a specific accounting system for water and sanitation services. For this reason figures about administrative expenses are not available. The purchase of water for the financial year 2004-2005 totals R 2 000 000. The WSA employs 3 persons for administration, 230 persons are lent by DWAF for the O&M. The municipality and DWAF are currently on the process of drawing agreements for the transfer of this staff to the municipality.

- Network characterisation

The municipality do not have any technical and financial description of its networks. As DWAF was the main owner and manager, we assumed that (and it was confirmed by the WSA representative) the main information we can obtain was from the DWAF functional assessment.

- Investments

The WSA is responsible for investments in term of water and sanitation services supply since its implementation. Business Plans are currently realized before starting the project. However, these business plans are not available.

- Difficulties in water services management

The WSA representative feels non-payment as an issue. Indeed, the cost-recovery is only 7% where water is supposed to be paid. This implies that a communication campaign may be done before implementing any water pricing policy. Illegal connection is also an issue in this WSA mainly because it leads to wastage while the municipality's situation regarding to the resource is not far from the shortage. Another difficulty is the condition of infrastructure, very old, especially in Siyabuswa where it seems to date from the apartheid period.

- Multiple Use of water

The use of domestic water for non-domestic purpose is known although not measured in term of population and volume of water. It is also regarded as an issue by the WSA representative met, mainly because of the water scarcity. Various uses are identified: small gardening and car washing. Currently the WSA has not implemented any specific policy, but the idea of the implementation of special tariffs for special bylaw and bylaws restricting the use of domestic water is currently discussed.

✓ Polokwane Local Municipality

Information concerning its WSA was gathered from the face-to-face interview with one of its representative but also from the WSDP (EVN Africa, 2005).

- Global information

The WSA was implemented in December 2002. The municipality had 507 924 inhabitants in 2002 (what corresponds to 97 866 households) for a surface of 3 776 km^2, that is to say a density of 135 hab/km^2. Although the city of Polokwane includes a great part of this population, the rural population represents 72% of the total. Only the southern part[30] of the municipality is a former homeland area. The exact population for this part is not known. According to the WSDP, 65% of the population is served with water and 40% of the population has access to a basic sanitation services. The proportion of the rural population served is not known.

- Institutional arrangement of water services agents

Lepelle Northern Water and DWAF are both responsible for the provision of bulk water, which means extraction, storage, transport and distribution. Regarding retail water provision, the local municipality used to provide services in urban area. The schemes usually managed by DWAF in rural area were already transferred to the local municipality. The municipality is therefore providing water and sanitation in the whole municipality. It is also responsible for treating of water before distribution.

- Financing

The municipality receives a global amount of subsidies to fulfil all its duty. The amount precisely used for water and sanitation services is not known. Neither the responsible for water & sanitation nor the responsible for water financing were able to give a figure. However, the WSDP gives an estimation of the total income of the municipality: R 113 584 350. As the municipality received an income of 20 541 930 for the financial year 2004-2005, we can deduce that the global amount for subsidies is near R93 042 420. It is worth to be cautious with this figure, as the figures from the WSDP are estimations.

The municipality applied a complex tariff, which may change next year. It can be describe as a block tariff with categories:

- First step for consumption under 5m^3/month, the user pays a volumetric rate of R 2.07 / m^3.

[30] That involves the wards 3 and 4 as a whole and a part of the wards 1,2,5,26,28 and 29.

- Second step: for the interval of consumption 5 to 100 m^3/month and according to the location (urban, semi-urban or rural), the user pays a volumetric rate of R 4.5 / m^3 for urban area, R 3.8/ m^3 for semi-urban area and R 3.2/m^3 for rural area.
- Last step: over a consumption of 100 m^3/month, the users pays a volumetric rate of R 8.52 / m^3.

According to the WSDP, the municipality considers as indigent any households earning less than R 1 300/month, which leads to 70% the proportion of indigent in the municipality. People willing to apply as indigent must declare their income to the municipality. Indigent are charged the same rate as explained above but receive a R100 grant per month for all services (not only water and sanitation but also electricity).

The municipality do not have a specific accounting system for water and sanitation services. However, WSDP gives estimations of the costs for the year 2004/2005. The estimation for capital costs is R69 200 000 and for operating costs (in its broader sense: expenses for water purchase, operation, maintenance, wages, etc) is R 255 400 000.

- Network characterisation

The municipality managed all the networks in its area of jurisdiction. In our area of interest, the networks in place are all former DWAF owned, and the better level of information concerning these schemes can be find in the functional assessment of DWAF.

- Investments

The WSA with the agreement of DWAF is responsible for investments in term of water and sanitation services supply since its implementation. Economic appraisal studies are currently realized before starting the project. However, they are not available.

- Difficulties in water services management

Vandalism and non-payment are not issues in this WSA. A few non-formal connections are sometimes encountered but not considered as a major problem.

- Multiple Use of water

The use of domestic water for non-domestic purpose is known although not measured in term of population and volume of water. Small gardening is the main use identified. The WSA has implemented bylaws that restricted the access to domestic water for this purpose.

✓ Sekhukhune District Municipality

Information concerning its WSA was gathered from the face-to-face interview with one of its representative but also from the 2005 final WSDP(Vikna, 2005).

- Global information

The WSA was implemented in December 2000. The municipality has 967 165 inhabitants (what corresponds to 204 744 households) with a density of 73 hab/km^2. The main part of the district is involved in our area of jurisdiction: only the Southern parts of Greater Groblersdal and Greater Tubatse and the Eastern part of Greater Marble Hall[31] were former white areas. The rural population represents 94% of the total population[32].

According to the WSDP, 67% of the population is served with water, and 26% for sanitation. These figures becomes 66% and 23% in only rural areas.

- Institutional arrangement of water services agents

[31] All this three municipalities are local municipalities part of the Sekhukhune District.

[32] It is difficult to isolate only the parts of the WSA included in our study area. For this reason, all the figures for Sekhukhune DM are for the whole district.

The situation in term of Water Services Providers is here again complicated. Lepelle Northern Water is the main responsible for bulk water provision. Lebalelo Water Users Association (WUA) also provides bulk water in a specific area. East Rand Water (water board) and various Local Municipalities (Marble Hall, Tubatse and Groblersdal) provide bulk water in small towns situated outside of our study area (in former white areas). The same institutions, except Lebalelo WUA, provide also retail water to the same locations as indicated. In rural area of the former homelands DWAF and Lepelle Northern Water are the main providers. Only local municipalities provide sanitation in small former white towns. The WSA is currently in the section 78 progress of the Municipal System Act (Republic of South Africa, 2000), that is to say in drawing and writing agreement between WSPs and the WSA

- Financing

According to the WSDP, for the financial year 2004-2005, the municipality received a total amount of R 160 400 000 for water, which corresponds to R 166 per inhabitants. Among this amount, 90% comes from the Municipal Infrastructure Grant, (for infrastructure) and the other from the funds of the Equitable Share. It is interesting to note that the total amount due to the Equitable Share (not only for water) is R119 515 161, which means that only 14% is used for water. The municipality has no income from water fees collection or loans.

No tariffs are implemented by the WSA. Only local municipalities apply a tariff in the small town where they provide water. Lepelle Northern Water too is implementing an interesting water pricing systems, especially in the Arabie area (in former homelands). This will be the subject of a specific part of the report. The rest of the district (a main part of the former rural and former homeland area) is not charged for water.

As the legislation, the municipality defines indigents as households earning less than R 1 100 per month. The representative met estimates the number of indigents at 75% of the total population. The current free basic policy was a subsidising of diesel and electricity by the district to supply 4m^3/household/month free. The municipality is currently implementing[33] a pre-paid meters system for indigent use only. To apply as indigent, the households have to register beside the district municipality.

The WSA do not have a specific accounting system for water and sanitation services. Nonetheless, the WSA employs nearly 6 persons for administration, and 22 persons for O&M.

- Network characterisation

Even if DWAF is not necessary the main provider anymore, in our research area, we can assume that (and it was confirmed by the WSA representative) the main information we can obtain was from the DWAF functional assessment.

- Investments

Both DWAF and the WSA are responsible for investments in term of water and sanitation services provision. Business Plans must be realized before starting the project. More than a hundred of investments in infrastructure were made in the last financial year, especially for reticulation implementation. R98.5 millions was dedicated to investments for 2004-2005.

- Difficulties in water services management

The non-payment of users is not seen yet as a problem since any billing system is implemented yet. The main current concerns for the district municipality are the huge backlogs in term of basic supply. The WSA representative met estimates to R2.5 million to reach the RDP standards. Water scarcity is also an issue, especially in term of quality of the underground water.

- Multiple Use of water

[33] Process started in May 2004.

The WSA representative met recognises some use of domestic water for non-domestic purpose, as small businesses or gardening. Bylaws and tariffs should be implemented to regulate them, but the council has not approved them yet.

✓ Thembisile Local Municipality

Information concerning its WSA was gathered from the face-to-face interview with one of its representative. The WSDP is not written yet

- Global information

The WSA is implemented since the first of July 2004. The municipality has 258 875 inhabitants and a density of 102 hab/km^2. The proportion of rural population is not known. The whole municipality is in our area of interest. According to the WSA representative met, 100% of the population is served with water.

- Institutional arrangement of water services agents

The municipality is currently inherited the former DWAF owned schemes (70% of networks belong to the WSA). DWAF is still responsible for bulk provision and is still assisting the municipality regarding retail water provision.

- Financing

For the financial year 2004-2005, the municipality received a total amount of R 16 900 000 for water, which corresponds to R 65 per inhabitants. The source of its total amount is not clearly known (the whole comes from the Division of Revenue Act (Republic of South Africa, 2005), which means it can be as MIG as Equitable Share. It is dedicated to infrastructure implementation and capacity building. It should be dedicated too to basic needs. The WSA also collects water fees for an amount of R8 111 290 for the last financial year (2004/2005).

The WSA is responsible for setting water tariffs. The tariff implemented is a flat rate of 25R/month/household.

The WSA considered as indigent households who earn less than R 1 500 per month. The number of indigent in the WSA is not known yet. People are currently applying to be considered as indigent beside the WSA.

The free basic water policy is not yet implemented. For the moment, all users are charged the same fee. It will probably be a free amount of water for household identified as indigent.

The municipality do not still have a specific accounting system for water and sanitation services. Income and expenses are considered for the whole technical department. For information, the salaries wages for the department is R 4 473 192. Still for the whole department, the WSA employs 3 persons for administration and 40 persons for O&M but as assistant (the full-time equivalent is not known).

- Network characterisation

A part of the existing networks in the area is former DWAF owned (in its functional assessment, DWAF actually considers one global scheme). For this one, financial and technical information is available via the functional assessment. For the schemes owned by the local municipality however, such information is not available.

- Investments

The WSA is responsible for investments in term of water and sanitation services supply since its implementation. The municipality do not systematically ask for an economic appraisal study before each investment.

- Difficulties in water services management

The WSA faces some problem of non-payment, mostly because of a lack of pay points and resources for collecting fees. Vandalism and illegal connections are also an important problem

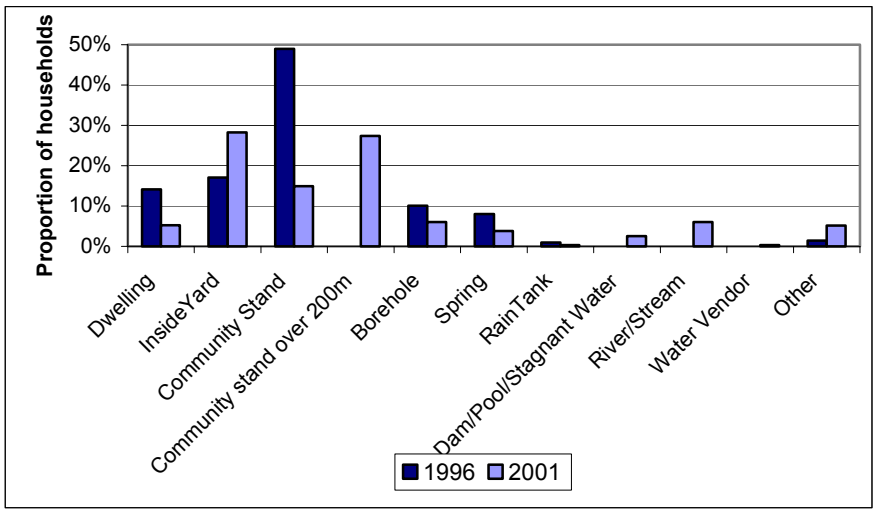
encountered in the municipality. The WSA faces also a shortage of water, with not enough bulk water for all end-users.

- Multiple Use of water

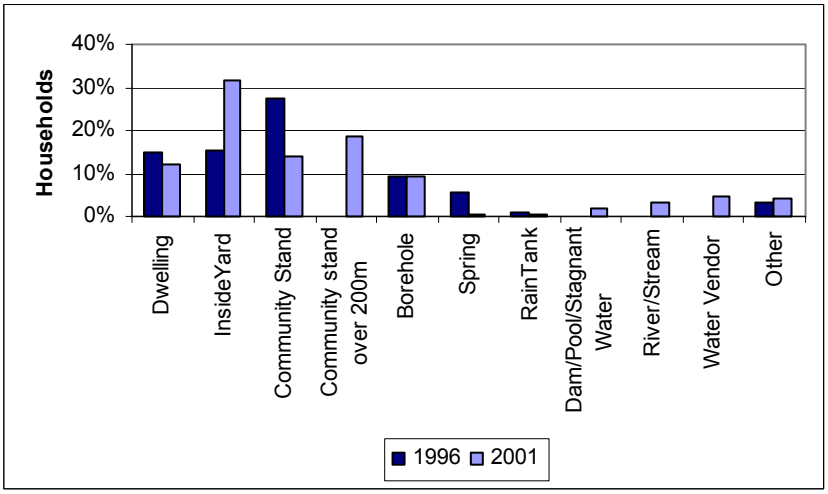
Thembisile Municipality also knows some examples of use of domestic water for non-domestic purposes. Garden irrigation and small businesses are the main examples. However, as no statistics of meters system are in place, it stays difficult to measure the importance of this multiple use of water. No bylaws are yet implemented, but the municipality think of implementing specific tariffs and communication campaign about use of water.

Annexe 5- Water services access according to the Stat SA Census (2001)

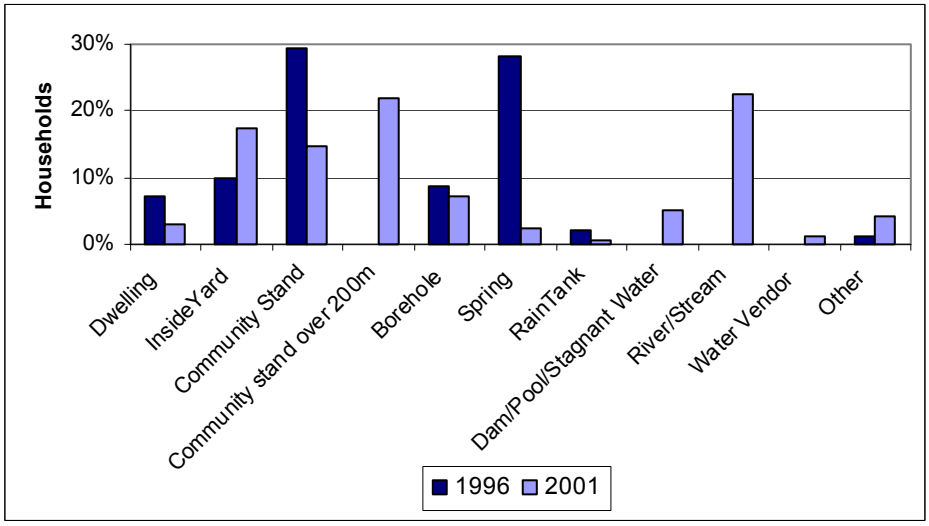
✓ Bohlabela District Municipality



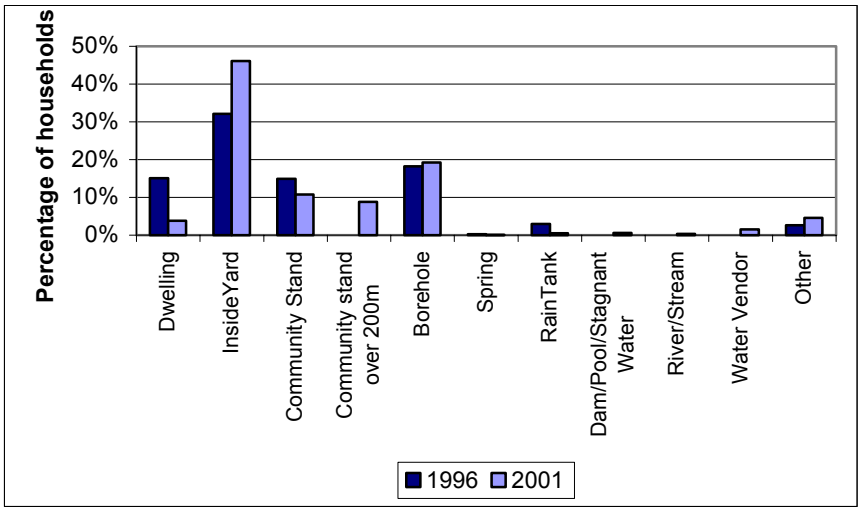
✓ Capricorn District Municipality



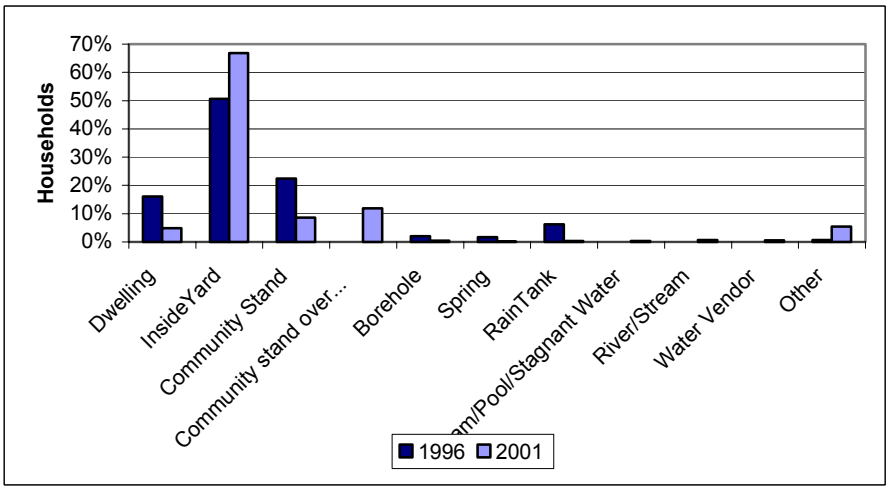
✓ Sekhukhune District Municipality



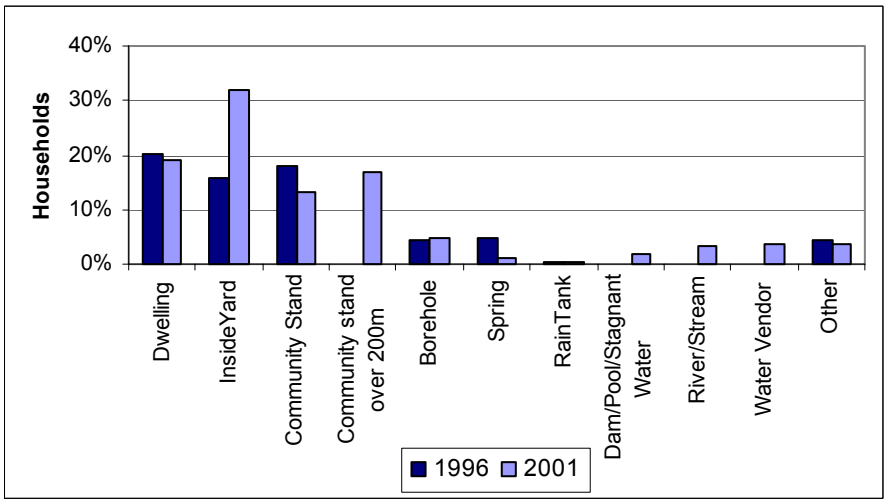
✓ Dr J.S. Moroka Local Municipality



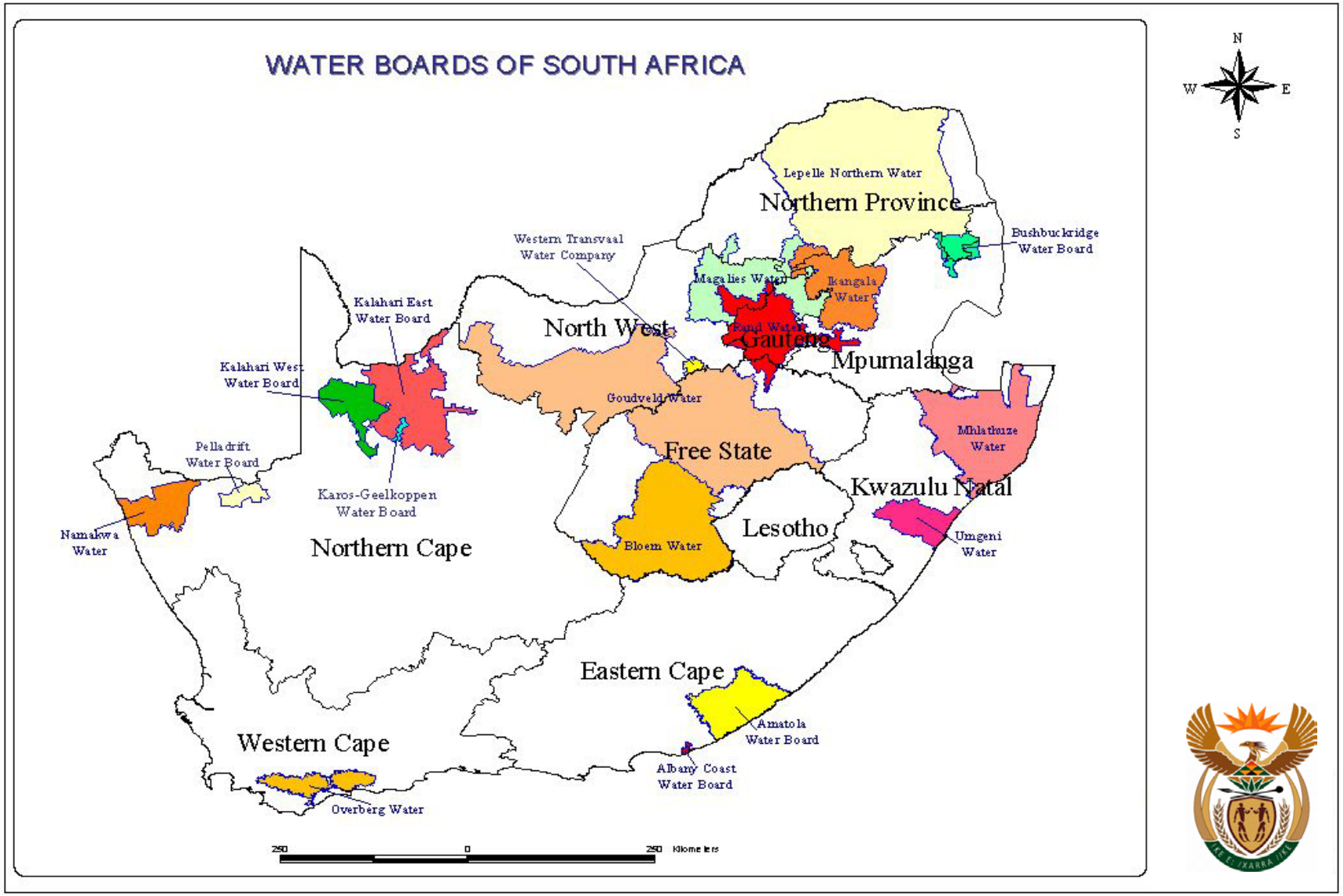
✓ Thembisile Local Municipality



✓ Polokwane Local Municipality



Annexe 6- Map of Water Boards in South Africa



Source : DWAF website : www. dwaf.gov.za

Annexe 7 - Cost recovery in the surveyed WSAs, figures and results

	Bohlabela DM	Capricorn DM	Sekhukhune DM	Dr J.S. Moroka LM	Polokwane LM	Thembisile LM
Operating costs	R 46 000 000	R 26 448 700	?	R 30 970 000	R 255 400 000	?
Capital costs	R 179 000 000	R 142 997 000	?	R 58 200 000	R 86 900 000	?
Total costs	R 225 000 000	R 169 445 700	?	R 89 170 000	R 342 300 000	?
Water fees	R 0	R 0	R 0	R 1 434	R 20 541 930	R 8 111 290
Total income	R 88 200 000	R 43 200 000	R 160 400 000	R 21 601 434	?	R 25 011 290
Cost recovery 1	0%	0%	0%	0%	9%	33%
Cost recovery 2	39%	25%	?	24%	?	?

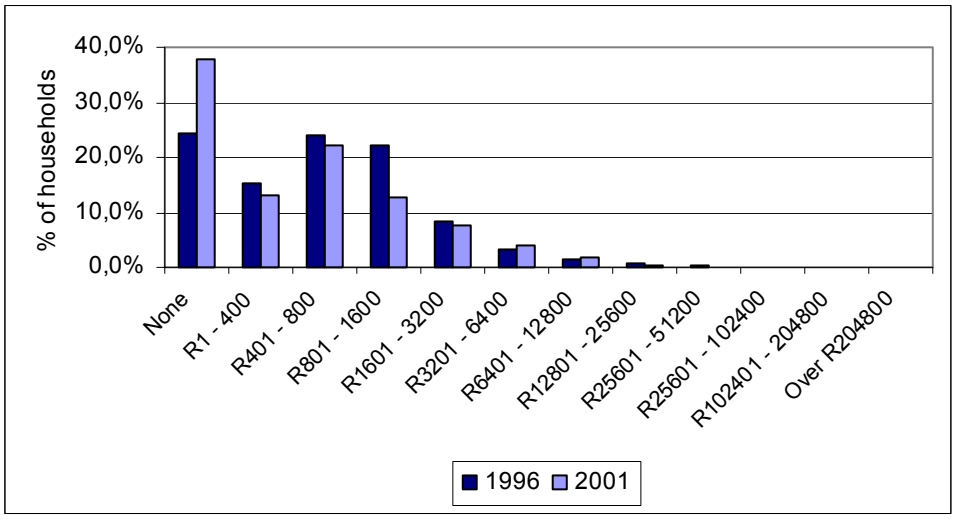
Sources: WSDPs and interviews

Notes:

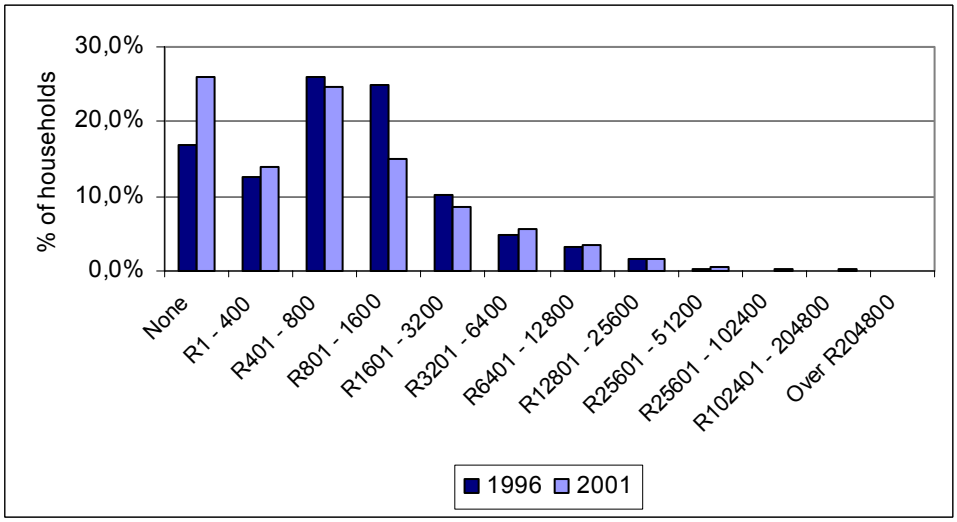
- The Operating and Maintenance costs for Bohlabela DM that were taken into account for the calculation of cost recovery rates are probably underestimated. Indeed, they do not include the O&M expenses borne by DWAF (whose figure is not specified).

Annexe 8- Monthly income per household distribution, according to Stat SA' census (1996 and 2001)

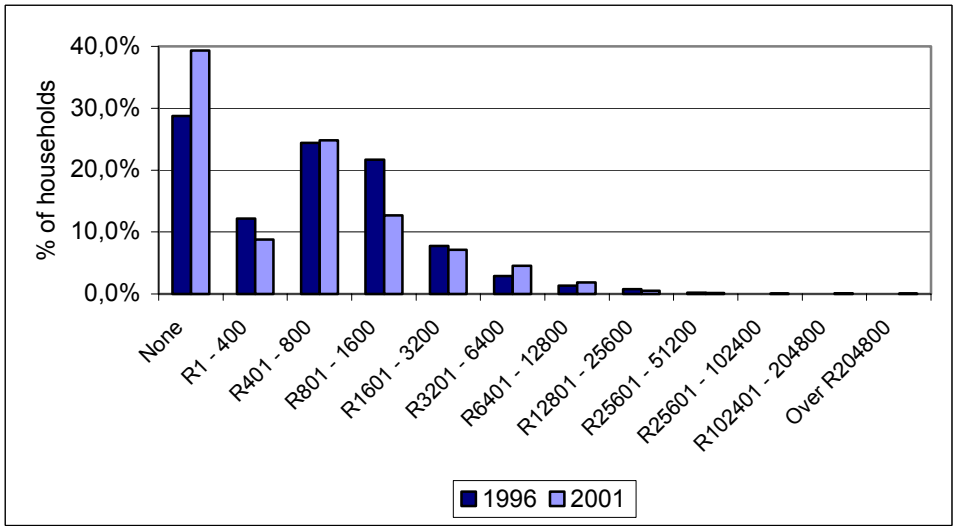
✓ Bohlabela District Municipality



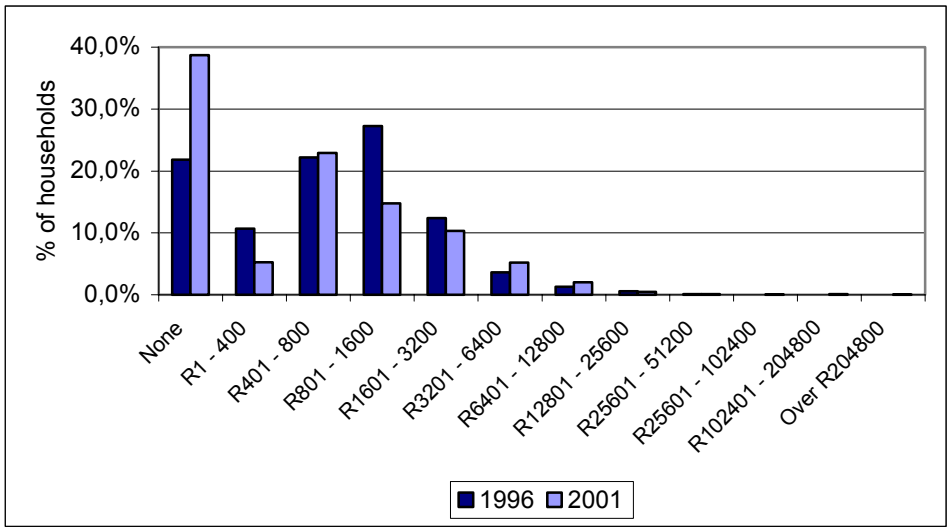
✓ Capricorn District Municipality



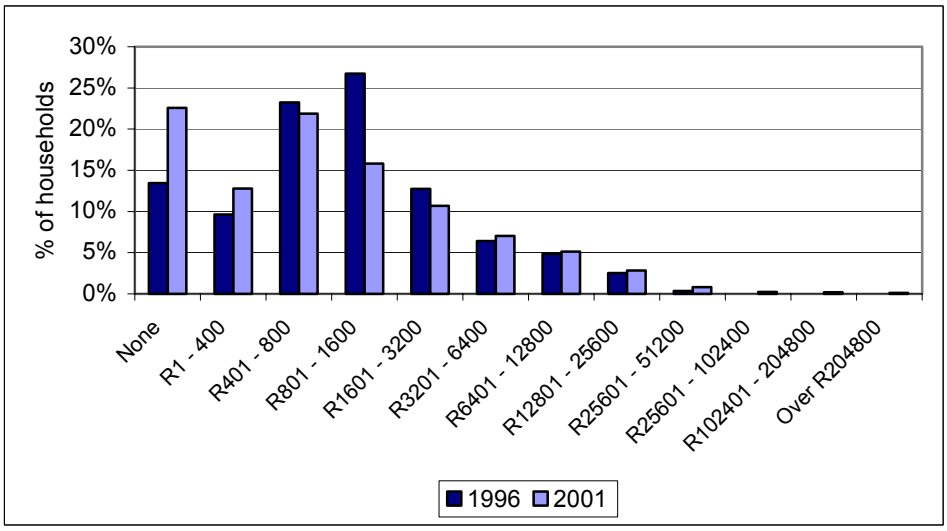
✓ Sekhukhune District Municipality



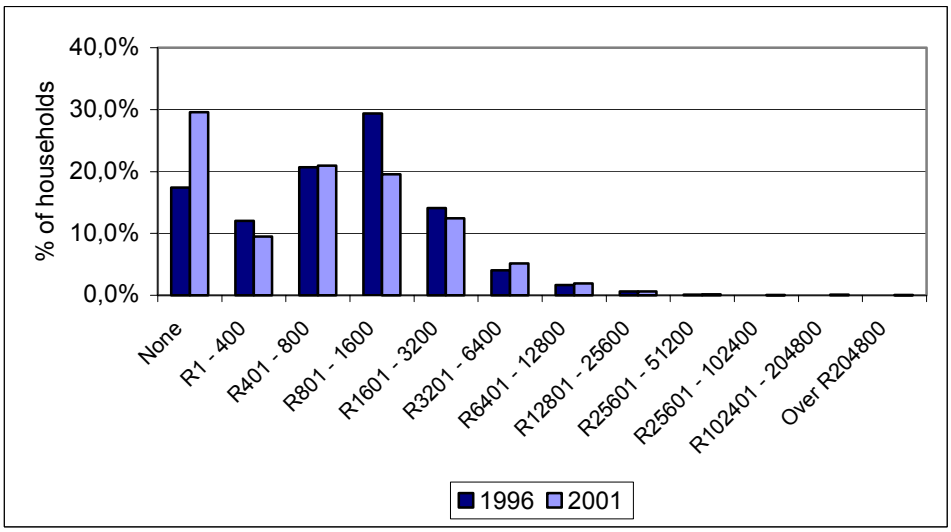
✓ Dr J.S. Moroka Local Municipality



✓ Polokwane Local Municipality



✓ Thembisile Local Municipality



Annexe 9- Evaluation of water services pricing policies in the surveyed area

	Bohlabela DM	Capricorn DM	Sekhukhune DM	Dr J.S. Moroka LM	Polokwane LM	Thembisile LM
Cost-recovery	low	low	low	low	average	average
Economic Affordability	high	high	high	average	high	low
Equity	average	average	average	average	average	low
Justified Need	average	average	average	average	average	average
Low administrative Costs	high	high	high	high	low	high
Identification of beneficiaries	low	low	low	low	high	low
No perverse incentives	low	low	low	low	high	average

Present value per capita

Active individuals

Variable name	Characteristic modality	Mean	Standard deviation	Test-value
	Ensemble	345.59	317.49	
Wtreat	C3=Wtreat_Yes	603.13	360.85	3.55
WSourceType	C2=Both	610.17	405.32	3.17
BillingSyst	C7=Metered	745.33	264.17	2.22
SewTreat	C4=SewT_Yes	541.00	336.65	2.10
BillingSyst	C7=Prepaid	659.50	312.62	2.02
BillingSyst	C7=Flat rate	645.00	622.41	1.66
SewTreat	C4=SewT_No	310.70	300.87	-2.10
Wtreat	C3=Wtreat_No	269.84	258.65	-3.55
BillingSyst	C7=None	285.71	251.67	-3.60

Replacement cost per capita

Active individuals

Variable name	Characteristic modality	Mean	Standard deviation	Test-value
	Ensemble	475.65	377.33	
Wtreat	C3=Wtreat_Yes	821.33	337.56	4.01
WSourceType	C2=Both	834.33	416.98	3.61
SewTreat	C4=SewT_Yes	772.20	361.87	2.68
BillingSyst	C7=Metered	915.00	302.22	2.05
WSourceType	C2=GW	417.11	330.30	-1.77
SewTreat	C4=SewT_No	422.70	354.84	-2.68
BillingSyst	C7=None	414.63	327.16	-3.09
Wtreat	C3=Wtreat_No	373.98	324.44	-4.01

Refurbishment cost per capita

Active individuals

Variable name	Characteristic modality	Mean	Standard deviation	Test-value
	Ensemble	40.76	44.44	
Wtreat	C3=Wtreat_Yes	63.40	62.74	2.23
SewTreat	C4=SewT_Yes	62.70	71.03	1.68
SewTreat	C4=SewT_No	36.84	36.41	-1.68
WSourceType	C2=Transfer	16.33	16.36	-1.76
Wtreat	C3=Wtreat_No	34.10	34.69	-2.23

Maintenance cost per capita

Active individuals

Variable name	Characteristic modality	Mean	Standard deviation	Test-value
	Ensemble	11.68	7.89	
Wtreat	C3=Wtreat_Yes	17.40	6.78	3.17
WSourceType	C2=Both	16.42	7.03	2.28
SewTreat	C4=SewT_Yes	16.10	6.46	1.91
SewTreat	C4=SewT_No	10.89	7.86	-1.91
WSourceType	C2=Transfer	6.78	4.76	-1.99
BillingSyst	C7=None	10.66	7.26	-2.47
Wtreat	C3=Wtreat_No	10.00	7.39	-3.17

Operating cost per capita

Active individuals

Variable name	Characteristic modality	Mean	Standard deviation	Test-value
	Ensemble	17.89	18.39	
Wtreat	C3=Wtreat_Yes	39.60	21.63	5.16
WSourceType	C2=Both	37.50	24.93	4.05
SewTreat	C4=SewT_Yes	35.60	18.16	3.28
BillingSyst	C7=Flat rate	43.33	43.02	2.43
WSourceType	C2=Transfer	6.11	5.95	-2.05
SewTreat	C4=SewT_No	14.73	16.54	-3.28
Wtreat	C3=Wtreat_No	11.51	10.98	-5.16

Annexe 11- Characteristic modalities of each groups of the classification

GROUP 1 / 4 (Weight = 2.00 Size = 2)

Variable name	Characteristic modality	% of the modality in the group	% of the modality in the sample	% of the group in the modality	Test-value
O&MTotCost	********** ********	100.00	6.06	50.00	2.77

GROUP 2 / 4 (Weight = 15.00 Size = 15)

Variable name	Characteristic modality	% of the modality in the group	% of the modality in the sample	% of the group in the modality	Test-value
WPurchasePerHead	14.2100 45.13	66.67	19.70	76.92	4.52
DieselC	'Diesel_[40;100%]'	66.67	19.70	76.92	4.52
Diesel%	0.4700 1.00	53.33	13.64	88.89	4.29
ReplacCostHead	772.0000 1730.00	60.00	19.70	69.23	3.83
MaintCostHead	17.0000 34.00	60.00	19.70	69.23	3.83
Handpump%	0.0000 0.20	53.33	16.67	72.73	3.65
HandpumpC	C5=HandPumpNo	46.67	13.64	77.78	3.50
Indigent%C	C9=Indigent_nc	73.33	33.33	50.00	3.36
IndigentC	C8=Indigent_nr	73.33	33.33	50.00	3.36
PresValueHead	555.0000 1525.00	53.33	19.70	61.54	3.15
WConsDayCapit	46.0000 124.00	40.00	12.12	75.00	3.04
DieselPumC	C13=Diesel_[1-4]	60.00	27.27	50.00	2.80
Handpump%	0.2500 0.40	40.00	13.64	66.67	2.74
CalcO&Mcostm3	2.8770 3.54	40.00	13.64	66.67	2.74
CalcO&Mhead	35.0000 58.00	40.00	13.64	66.67	2.74
HandPumC	C12=HandPum_0	46.67	18.18	58.33	2.70
StorCapPerHead	StorCap[0.24-0.84]	46.67	19.70	53.85	2.49
OperatCostHead	32.0000 104.00	46.67	19.70	53.85	2.49
PercentEffectStorCap	0.7500 0.86	40.00	15.15	60.00	2.48
StorCapPerHead	StorCap[0.02-0.04]	0.00	24.24	0.00	-2.39
Diesel%	*Missing data*	0.00	25.76	0.00	-2.52
Handpump%	*Missing data*	0.00	25.76	0.00	-2.52
CalcO&Mcost	*Missing data*	0.00	31.82	0.00	-3.01
CalcO&Mhead	*Missing data*	0.00	31.82	0.00	-3.01
MaintCostm3	*Missing data*	0.00	33.33	0.00	-3.14
IndigentC	*Missing data*	0.00	33.33	0.00	-3.14
ReplacCostm3	*Missing data*	0.00	33.33	0.00	-3.14
WaterConsYear	*Missing data*	0.00	33.33	0.00	-3.14
WConsDayCapit	*Missing data*	0.00	33.33	0.00	-3.14
AvgLoss&UseDay	*Missing data*	0.00	33.33	0.00	-3.14
WPurchasePerHead	0.0000 0.00	0.00	33.33	0.00	-3.14
WPurchase	*Missing data*	0.00	33.33	0.00	-3.14
ElectricC	*Missing data*	0.00	33.33	0.00	-3.14
HandPumC	*Missing data*	0.00	33.33	0.00	-3.14
PresentValuem3	*Missing data*	0.00	33.33	0.00	-3.14
DieselPumC	*Missing data*	0.00	33.33	0.00	-3.14
Indigent%C	*Missing data*	0.00	33.33	0.00	-3.14
RefurbishCostm3	*Missing data*	0.00	33.33	0.00	-3.14
OperatCostm3	*Missing data*	0.00	33.33	0.00	-3.14
CalcO&Mcostm3	*Missing data*	0.00	33.33	0.00	-3.14

GROUP 3 / 4 (Weight = 10.00 Size = 10)

Variable name	Characteristic modality	% of the modality in the group	% of the modality in the sample	% of the group in the modality	Test-value
SchemeAge	Age[14.4-90]	100.00	18.18	83.33	6.18
PercentEffectStorCap	0.0000 0.50	60.00	19.70	46.15	2.80
PresValueHead	14.0000 112.00	60.00	21.21	42.86	2.63
TotStorageCap	0.0000 70.00	60.00	21.21	42.86	2.63
StorCapPerHead	StorCap[0-0.01]	60.00	21.21	42.86	2.63
MaintCostHead	0.0000 5.00	60.00	21.21	42.86	2.63
ReplacCostHead	18.0000 173.00	60.00	21.21	42.86	2.63
CommunityC	C10=Commun_[1-3]	70.00	31.82	33.33	2.37

GROUP 4 / 4 (Weight = 39.00 Size = 39)

Variable name	Characteristic modality	% of the modality in the group	% of the modality in the sample	% of the group in the modality	Test-value
StorCapPerHead	StorCap[0.02-0.04]	38.46	24.24	93.75	3.14
SchemeAge	Age[9.8_10.00]	41.03	27.27	88.89	2.86
Handpump%	0.4300 0.65	25.64	15.15	100.00	2.75
CommunityC	C10=Commun_[6-10]	28.21	18.18	91.67	2.33
IndigentC	C8=Indigent_nr	20.51	33.33	36.36	-2.39
Indigent%C	C9=Indigent_nc	20.51	33.33	36.36	-2.39
StorCapPerHead	StorCap[0.24-0.84]	7.69	19.70	23.08	-2.63
MaintCostHead	17.0000 34.00	7.69	19.70	23.08	-2.63
DieselC	'Diesel_[40;100%]'	7.69	19.70	23.08	-2.63
ReplacCostHead	772.0000 1730.00	7.69	19.70	23.08	-2.63
WPurchasePerHead	14.2100 45.13	7.69	19.70	23.08	-2.63
Handpump%	0.0000 0.20	5.13	16.67	18.18	-2.69
Diesel%	0.4700 1.00	2.56	13.64	11.11	-2.81
HandpumpC	C5=HandPumpNo	2.56	13.64	11.11	-2.81
SchemeAge	Age[14.4-90]	0.00	18.18	0.00	-4.49

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Maître de stage : Dr Sylvie Morardet

Titre :
Institutional Framework, Water Pricing Structures and Costs of Domestic Water Services in Rural Poor Areas of the Olifants River Basin, South Africa

Résumé :

Les systèmes de tarification-subvention de l'eau domestique, l'organisation du secteur de l'eau domestique et les coûts générés par les infrastructures pour ce même service sont des facteurs clés pour l'amélioration des conditions de vie dans les pays en développement. Des objectifs clés liés à ces systèmes de tarification-subvention peuvent être identifiés. Il s'agit d'atteindre le recouvrement des coûts, l'efficacité économique, l'accessibilité économique, l'équité et en ce qui concerne les subventions de justifier un besoin ainsi que d'éviter des incitations perverses et d'avoir de faibles coûts administratifs. Cette étude explore dans quelle mesure les systèmes de tarification-subvention utilisés dans le basin de l'Olifants en Afrique du Sud répondent à ces différents objectifs. Cette étude s'intéresse également aux coûts générés par les réseaux d'eau domestique dans cette même région.

Elle présente le contexte sud-africain du secteur de l'eau domestique ainsi que le contexte socio-économique de la région d'étude. Pour expliciter ses questions de recherche, elle pose également le problème et les principaux aspects des systèmes de tarification-subvention dans les pays en développement de manière générale et en Afrique du Sud en particulier. La méthodologie retenue pour répondre à ces questions de recherche sera présentée en troisième partie. Enfin, la troisième partie présente l'organisation du secteur de l'offre d'eau domestique dans la zone d'étude, les systèmes de tarification-subvention mis en place et leur analyse et enfin une typologie des réseaux d'approvisionnement en eau domestique dans cette même zone.

Abstract :

Water pricing (in its broad sense, which means water tariff setting and subsidies), water services sector organisations and costs generated by infrastructures are key factor for enhancing livelihood in developing countries. Some key objectives of any water pricing policies can be identified: cost-recovery, economic efficiency, economic affordability, equity, justified need, no perverse incentive, low administrative costs. This study explores in what extent water pricing policies implemented in the Olifants River Basin, South Africa, respond to these various objectives. This study is also interested in costs generated by domestic water networks in the same area.

The present study introduces the South African context of domestic water services, strongly marked by a decentralisation willing. It also presents the Olifants River Basin in a physical and socio-economic point of view. To plant the problem, it also develops water pricing policies related economic issues in developing countries in general, and in South Africa in particular. In the third place, it presents the methodology adopted to answer the research questions. At least, results in term of water sector organisation, of presentation and evaluation of the water pricing policies implemented in the study area and of the conditions of networks in the same area are presented

Mots-clés :
Water pricing, subsidy, domestic water, costs of networks, developing countries, South Africa

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